

TENDER DOCUMENTS
PARKS CANADA PT PELEE PARK
ALTERATIONS TO VISITOR THEATRE
LEAMINGTON, ONTARIO

PROJECT No. xxxxxxxx

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DIVISION 01
GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

- .1 Work under this Contract includes the supply of all materials, labour, energy and equipment for Alterations to the Visitor Theatre located within Pt Pelee National Park near Leamington, Ontario, identified as project no. **xxxxxxxxx**.
- .2 This section compliments applicable sections of General Information to Tenderers, as well as the remainder of the Contract Documents.

1.2 DOCUMENTS REQUIRED

- .1 Maintain at the job site, one copy each of following:
 - .1 Full size contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Reviewed Shop Drawings.
 - .5 Change Orders.
 - .6 Other modifications to Contract.
 - .7 Field Test Reports.
 - .8 Copy of approved work schedule.
 - .9 Manufacturers' installation and application instructions.

1.3 SITE CONDITIONS

- .1 A site visit is scheduled as provided in the Tender Notice.

1.4 COST BREAKDOWN

- .1 The 48-hour cost breakdown provided in the Form of Tender will be used as basis for Progress Payment.

1.5 CONTRACTOR'S USE OF SITE

- .1 Use of site: The building will be in operation during the contract period during normal business hours, and all facilities to support those operations must be maintained during those hours.
- .2 Do not unreasonably encumber site with materials or equipment.

1.6 CODES AND STANDARDS

- .1 Construction of this project shall meet the requirements of the following statutes and most recent editions of codes:
 - .1 Occupational Health and Safety Act and latest Ontario Regulations for construction projects.
 - .2 The Building Code Act and Ontario Regulation 925.
 - .3 National Building Code of Canada.
 - .4 National Fire Code.
 - .5 Ontario Electrical Safety Code.
- .2 For the purpose of the Occupational Health and Safety Act, the Contractor for this project will be designated "Constructor" and shall assume the responsibility of the Constructor as set out in the Act and its regulations.
- .3 The Departmental Representative or Designate will monitor the quality and quantity of work, undertake inspections for compliance with specifications and plans, check grades and perform such similar work. Parks Canada, the Departmental Representative or Designate will NOT be a "Constructor" by reason thereof.
- .4 Complete and file all registration and notification forms at the Ministry of Labour with the information required under Section 4 of the Ontario Regulation 213/91 or latest prior to commencing work.

1.7 PERMITS

- .1 Apply for, obtain and pay for all permits that are required for the project, including but not limited to the building permit, plumbing and hydro permits.
- .2 The Departmental Representative or Designate will provide a clean set of Contract Drawings and/or Specifications for each such application as required.
- .3 Arrange and pay for inspections required under permits, including but not limited to the building permit, plumbing, and electrical certificates.
- .4 Arrange for regular inspections and a final inspection with the local Hydro Authority/ESA Inspector.

1.8 SETTING OUT OF WORK

- .1 Assume full responsibility for and execute complete layout of work to locations, lines and elevations indicated.

1.9 LOCATION OF EQUIPMENT AND FIXTURES

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

1.10 CONCEALMENT

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

1.11 CUTTING, FITTING AND PATCHING

- .1 Execute cutting (including excavation), fitting and patching required to make work fit properly.
- .2 Where new work connects with existing and where existing work is altered, cut, patch and make good to match existing work.
- .3 Obtain Departmental Representative or designate's approval before cutting, boring or sleeving load-bearing members and before attaching new installations and/or supports to load-bearing members.
- .4 Make cuts with clean, true, smooth edges. Make patches inconspicuous in final assembly.
- .5 Fit work airtight to pipes, sleeves, ducts and conduits.

1.12 CO-ORDINATION OF TRADES

- .1 Co-ordinate all architectural, mechanical, electrical and structural works for equipment being installed, provide openings in walls and structures for pipes and conduits and excavate and backfill, all in a timely manner so that all the work proceeds expeditiously.

1.13 PRECEDENCE OF DOCUMENTS

- .1 In the event of any conflicts or inconsistencies in the provisions of Contract Documents, such provisions shall take precedence and govern in the order shown in Article 2 of the General Special Provisions.
- .2 Figured dimensions shown on a drawing shall govern even though they may differ from dimensions scaled on the same drawing. Drawings of larger scale shall govern over those of smaller scale on the same date. Detailed Drawings take precedence over General Drawings.
- .3 Division 1 shall govern over all other Divisions of the Contract Technical Specifications.

PART 1 PRODUCTS – NOT APPLICABLE

PART 2 EXECUTION – NOT APPLICABLE

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

- .1 This Section outlines generally the work to be executed under the Contract.
- .2 Supervise, organize, co-ordinate and direct all construction operations of sub-trades and suppliers.
- .3 Provide, install and put in continuous successful operation all equipment and appurtenances. Provide operating assistance to the Departmental Representative or designate as described herein.
- .4 In addition to constructing the works shown on the Drawings, design, construct, maintain and, unless otherwise specified or shown on the Drawings, remove when construction is completed all temporary works and facilities required for the construction of the works.

1.2 GENERAL

- .1 The work consists but not limited to:
 - .1 Erect temporary barriers and protection to ensure safety of the public and workers at all times and to prevent damage to the building and contents from environmental effects such as temperature, rain, wind, snow and ice.
 - .2 Selective demolition to remove items not required for the completed work or to temporarily access areas of the structures for the installation of new materials and equipment.
 - .3 Alterations to the building as described in the Contract Documents and generally to consist of selective demolition, new partitions, insulation, vapour barriers, doors, frames and hardware, aluminum entrance system, sealants, roofing, metal flashing, flooring, painting, plumbing systems and fixtures, heating and air conditioning systems, lighting, power distribution, and controls, audio video systems, associated modifications to existing building systems, and supply of furnishings.
 - .4 Clean up of site, removal of temporary works, and disposal of surplus and waste materials.

1.3 WORK TO CONFORM

- .1 All work shall be built in a thoroughly substantial and workmanlike manner, in accordance with the Specifications, subject to such modifications and additions as may be deemed necessary during its execution. In no case shall any work in excess of the requirements of the Specifications be paid for unless approved in writing.

1.4 BASIS OF PAYMENT

- .1 Payment for the various work components is to be included in the Lump Sum Price items in the Form of Tender, which will serve as the Schedule for payment in normal circumstances.
- .2 The Lump Sum Price shall cover supply of all labour, materials, tools, tests, calibration, equipment, and documentation including manufacturers' representatives, as specified, and/or required for all the components.
- .3 Cost of remedying faults and correcting deficiencies, attributable to the Contractor shall be at Contractor's expense.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

- .1 This section specifies the requirements for scheduled preconstruction and progress meetings.

1.2 ADMINISTRATIVE

- .1 The Department Representative or designate will schedule project meetings throughout the progress of the Work.
- .2 The Department Representative or designate will prepare agenda for meetings.
- .3 The Department Representative or designate will provide physical space for meetings at a facility close to the site.
- .4 The Department Representative or designate shall preside at meetings.
- .5 The Contractor shall record and distribute the minutes. These minutes shall include significant proceedings and decisions and identify "action by" parties.
- .6 The Contractor will reproduce and distribute copies of minutes within five days after each meeting and transmit to meeting participants, affected parties not in attendance and the Departmental Representative or designate.
- .7 Representatives of Contractor, Subcontractor and suppliers when requested to attend meetings shall be qualified and authorized to act on behalf of the party each represents.

1.3 PRECONSTRUCTION MEETING

- .1 After award of the Contract, the Department Representative or designate will request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Senior representatives of the Departmental Representative or designate, Contractor, major Subcontractors, field inspectors and supervisors shall be in attendance.
- .3 The Department Representative or designate will establish the time and location of meeting and notify parties concerned.
- .4 Preconstruction meeting agenda may include the following:
 - .1 Appointment of official representative of participants in the Work.
 - .2 Schedule of Work, progress scheduling in Gantt chart format.

- .3 Schedule of submission of Shop Drawings and samples.
- .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences, sediment control.
- .5 Delivery schedule of specified equipment.
- .6 Site security.
- .7 Contemplated Change Notices, Change Orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
- .8 Departmental Representative or designate-provided equipment.
- .9 Record Drawings.
- .10 Maintenance manuals.
- .11 Take-over procedures, acceptance, warranties.
- .12 Monthly Progress Claims, administrative procedures, photographs, holdbacks.
- .13 Appointment of inspection and testing agencies or firms.
- .14 Insurances, transcript of policies.
- .15 Health and Safety.
- .16 Environmental procedures.

1.4 PROGRESS MEETINGS

- .1 During course of Work, the Department Representative or designate will schedule regular progress review meetings, generally at two week intervals.
- .2 Contractor, major Subcontractors involved in Work and Department Representative or designate are to be in attendance.
- .3 The Contractor will record minutes of meetings and circulate to attending parties and affected parties not in attendance.
- .4 Project progress review meeting 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 Revisions to construction schedule.
 - .8 Progress, schedule, during succeeding work period.
 - .9 Review submittal schedules: expedite as required.
 - .10 Maintenance of quality standards.
 - .11 Pending changes and substitutions.
 - .12 Review proposed changes for effect on construction schedule and on completion date.
 - .13 Review Occupational Health and Safety issues.
 - .14 Review Environmental Plan, procedures and issues.

1.5 BASIS OF PAYMENT

- .1 Payment for Project Meetings is to be included in Lump Sum Price bid in Form of Tender for construction.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

- .1 This Section specifies general requirements and procedures for Contractors' submissions of Shop Drawings, product data and samples to the Department Representative or designate for review. Additional specific requirements for submissions are specified in individual Sections of the specifications.
- .2 Do not proceed with work until relevant submissions are reviewed by Department Representative or designate.
- .3 Present Shop Drawings, product data and samples in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Contractor's responsibility for errors and omissions in submission is not relieved by Department Representative or designate's review of submissions.
- .6 Notify Department Representative or designate, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Department Representative or designate's review of submission, unless Department Representative or designate gives written acceptance of specific deviations.
- .8 Make any changes in submissions which Department Representative or designate may require consistent with Contract Documents and resubmit as directed by Department Representative or designate.
- .9 Notify Department Representative or designate, in writing, when resubmitting, of any revisions other than those requested by Department Representative or designate.

1.2 SUBMISSION REQUIREMENTS

- .1 The General Contractor shall submit shop drawings via email (email addresses to be provided at the time of the pre-construction meeting) using the electronic "Shop Drawings Submission Form". Returned shop drawings shall also be returned via email.

- .2 The General Contractor is responsible for coordination among all trades of all submissions and is to verify the dimensions and conditions for the work prior to submitting the shop drawings for approval.
- .3 Submittals shall be made with reasonable promptness and in accordance with the approved Work and submission schedules. Failure to submit in ample time shall not be considered cause for any extension of Contract Time.
- .4 Coordinate each submission with requirements of work and Contract Documents. Individual submissions will not be reviewed until all related information is available. Review all documents before submission to the Department Representative or designate. Submissions must be complete for each system. Partial systems will not be reviewed.
- .5 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 co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .6 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 Specification section number and applicable Standards.
 - .12 Calculations and reports where specifically noted.

- .13 Completed Equipment Data Sheets as noted in the Contract Specifications.
- .7 After Department Representative or designate's review, distribute electronic copies via email.
- .8 Submit copies of shop drawings for each requirement requested in specification Sections and as Department Representative or designate may reasonably request.
- .9 Submit copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Department Representative or designate where shop drawings will not be prepared due to standardized manufacture of product.
- .10 Submit copies of manufacturer's instructions for requirements requested in specification Sections and as requested by Department Representative or designate.
 - .1 Pre-printed material describing recommended installation requirements for the product, system or material, including offloading and storage requirements, manufacturer recommended spare parts, special notices and Material Safety Data Sheets concerning impedances, and hazards and safety precautions.
- .11 Submit copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Department Representative or designate.
- .12 Delete information not applicable to project.
- .13 Supplement standard information to provide details applicable to project.
- .14 If upon review by Department Representative or designate, 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.
- .15 Do not proceed with work affected by submittals until review is complete.

1.3 SHOP DRAWINGS

- .1 Shop Drawings: original Drawings, or modified standard Drawings provided by Contractor, to illustrate details of portions of Work, which are specific to project requirements.

- .2 All shop drawings shall be provided via email in electronic form.
- .3 Submit one (1) Adobe Acrobat format file (*.pdf) or AutoCAD 2012 or later version (*.dwg) file of drawings, data sheets, etc. for review by the Department Representative or designate.
- .4 Identify each shop drawing giving reference such as:
 - .1 Project name and location.
 - .2 Section of specifications where specified.
 - .3 Location where equipment or material is to be installed.
 - .4 Name of Sub-Contractor or supplier.
 - .5 Other relevant information.
- .5 Check and initial all drawings before submission to the Department Representative or designate. Shop drawings will not be reviewed by the Department Representative or designate unless they have been previously checked and initialed by the Contractor.
- .6 Shop drawings to detail completely equipment to be installed and components thereof, including the location and type of process connections and mounting hardware.
- .7 Shop Drawings shall be complete in all respects and show clear compliance with the Specifications. Where applicable, performance figures of equipment, finishes and reference to other relevant Drawings must be noted on the Shop Drawings. Details of ancillary items being supplied with the particular equipment must be submitted. Piecemeal submissions will not be considered.
- .8 Equipment with electrical or electric components:
 - .1 Shop drawings of equipment furnished with electrical controls or devices are to include electrical wiring diagrams with the Bill or Materials showing manufacturer's catalogue numbers and other rating data required for all relays, timers, starters and other electrical components.
 - .2 Electric circuit diagrams to show complete electrical ratings for all electronic components adjacent to components in diagram as well as universal generic and manufacturer's parts numbers.
- .9 All dimensions must be shown in metric units unless otherwise indicated.
- .10 Revision of Shop Drawings:
 - .1 Make corrections or changes required by Department Representative or designate and re-submit one (1) electronic copy of revised drawings as per above. When resubmitting, notify the Department Representative or designate in writing or revisions other than those requested.

- .2 Do not make any changes to shop drawings after final review without written permission of Department Representative or designate.
- .11 Review of shop drawings by Department Representative or designate to be construed as gratuitous service to the Contractor. Acceptance of contract implies unequivocal responsibility for all equipment specified and furnished under contract.
- .12 Adjustments made on shop drawings by the Department Representative or designate are not intended to change the Contract Price. If adjustments affect the value of work, state such in writing to the Department Representative or designate prior to proceeding with the work.

1.4 PRODUCT DATA

- .1 Product data: manufacturers' catalogue sheets, brochures, literature, performance charts and diagrams, used to illustrate standard manufactured products.
- .2 Submit required number of copies of product data.

1.5 SAMPLES

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

1.6 MOCK-UPS

- .1 Erect mock-ups in accordance with 01 45 00 – Quality Control.

1.7 PROGRESS PHOTOGRAPHS

- .1 Submit progress photographs of all construction phases.
- .2 Record construction details and locations of services prior to concealment.

PART 2 PRODUCTS

2.1 THIS SECTION IS NOT APPLICABLE

PART 3 EXECUTION

3.1 THIS SECTION IS NOT APPLICABLE

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

- .1 This Section provides general details about the Contract Drawings and Specifications.

1.2 GENERAL

- .1 Upon request, the Contractor will be provided up to five CDs and full size printed sets of Contract Drawings and Technical Specifications at no charge.
- .2 Additional sets may be issued upon payment of \$100.00 plus GST to cover the cost of reproduction.

1.3 CONTRACT DRAWINGS

- .1 Additional Drawings showing details in accordance with which work is to be constructed will be furnished from time to time by the Department Representative or designate and will become part of Contract Documents. Such Drawings are for the information of and assistance to the Contractor and will not become a basis for extra payment. The Department Representative or designate may furnish Drawings covering additional work. These will be identified as such.
- .2 Location of utilities shown on Contract Drawings is in accordance with best information available and is not guaranteed.
- .3 Obtain required dimensions not shown on Contract Drawings from the Department Representative or designate before proceeding with construction work.
- .4 Contract Drawings which bear the general and detailed titles accompany and form part of these Specifications. The Drawings are prepared in SI metric units.
- .5 The Drawings shall be read as a whole as details applicable to one Section may appear on the Drawings of another Section or Sections.
- .6 Contract Drawings give general location of piping routes and equipment. Except where specific dimensions are indicated, locate all equipment and piping to limit interference with pedestrian access, crane routes and headroom.

1.4 CONTRACT SPECIFICATIONS

- .1 For easy reference, the Contract Specifications are divided into Divisions. The Specifications shall be read as a whole as details applicable to one Division may appear in another Division or Divisions. The Contractor shall co-ordinate the work done by sub-trades.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

- .1 This Section specifies requirements for preservation and protection of existing services and structures.

1.2 GENERAL

- .1 Comply with all requirements and regulations of Road Authorities and Utility Companies especially those pertaining to protective work, inspection and safety.

1.3 PROTECTION OF EXISTING STRUCTURES AND PROPERTY

- .1 The Contractor shall be held fully responsible by the Departmental Representative or designate for any damage to utilities, properties, buildings, homes or structures adjacent to or in the general area of the work, through settlement of ground, vibration or shock resulting from any cause relating to the work carried out under this Contract. Make good and repair all such damage at own expense.
- .2 The Contractor is responsible to field locate, stake and clearly mark in the field all services which are located on or near the line of the proposed work.
- .3 The Contractor shall obtain certificates from all utility companies having facilities in the area of the proposed works certifying that facilities have been marked to confirm the utility location.
- .4 Sustain in their places and protect from direct or indirect injury, all water and gas mains, public and private sewers and drains, conduits, cables, service pipes, poles, sidewalks, curbs, embankments, structures, equipment and other property in the vicinity of the work.
- .5 Sustain and support structures that are uncovered, weakened, endangered or threatened.
- .6 Prevent dust and dirt from entering existing buildings or areas where equipment is stored or is operating.
- .7 Prevent dust, water or other deleterious substances from entering areas with existing electrical, heating, ventilating, pumping and other equipment. The Contractor will be held responsible for any damage caused by work carried out under this Contract.

- .8 Where existing wall sections are removed or where pipes are installed through existing walls or where any dust-generating operation is necessary, provide a suitable temporary wall or enclosure suitably reinforced and sealed to prevent dust entering the existing area. When work is completed, remove temporary dust control device and thoroughly clean all areas affected by the work.

1.4 PROTECTION AGAINST FREEZING

- .1 Furnish all necessary equipment and fuel for heating buildings and structures during construction. Maintain a minimum temperature of 13°C in interior areas for mechanical, electrical, painting and other work susceptible to frost damage.
- .2 Direct fired, open flame heaters within areas of combustible construction are prohibited.

1.5 PROTECTION, SOUNDNESS AND REPAIR OF NEW CONSTRUCTION

- .1 Protect all newly constructed work from damage. Prevent heavy loading of newly constructed work and repair all damage. Construct all works watertight and correct all imperfect work.
- .2 If, in the final inspection, any deficiencies are found, repair or replace the defective work. Be responsible for satisfactory maintenance and repair of all work undertaken for the specified guaranteed maintenance period. Protect and store all equipment supplied under this Contract.

1.6 PRECONSTRUCTION SURVEY

- .1 Undertake a preconstruction survey of the existing buildings and structures in the vicinity of the proposed construction. Undertake a survey of existing surface finish conditions. Document findings with photographs and in writing to the Department Representative or designate, prior to construction. Unless identified as a pre-existing condition, be responsible for repairing damage due to construction.

1.7 BASIS OF PAYMENT

- .1 Cost of all repair to be at Contractor's expense.
- .2 Cost of all locates to be at the Contractor's expense.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION

PART 1 GENERAL

1.1 CONSTRUCTION SAFETY MEASURES

- .1 Safety is the Contractor's responsibility. The Contractor will be the "Constructor" as defined in the Occupational Health and Safety Act.
- .2 Observe and enforce construction safety measures of National Building Code, latest edition, Part 8, Provincial Government, Workplace Safety & Insurance Board, municipal statutes, WHMIS and local authorities.
- .3 Before any work at the site is started, the Contractor shall have prepared a Project-Specific Health and Safety Plan including health and safety precautions and programs, safety of property on site, and for protection of persons adjacent to site and environment to the extent that they may be affected by conduct of Work. The plan shall be complete with respect to procedures and actions that the Contractor needs to follow in order for the Contractor and all others to comply with all applicable laws and regulations.
- .4 Contractor to comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial, and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.
- .5 The Contractor shall designate a qualified and experienced safety representative at the site.

1.2 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.
- .2 Submit site-specific Health and Safety Plan within seven days after date of Notice to Proceed and prior to commencement of Work. The Health and Safety Plan must include:
 - .1 Results of site specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
- .3 Submit copies of Contractor's authorized representative's work site health and safety inspection reports to Department Representative or designate, and authority having jurisdiction, weekly.
- .4 Submit copies of reports or directions issued by Provincial health and safety inspectors.

- .5 Submit copies of incident and accident reports.
- .6 Contractor to maintain up-to-date WHMIS MSDS - Material Safety Data Sheets on site in an area accessible to working staff, the Department Representative or designate.
- .7 Department Representative or designate will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within after receipt of plan. Revise plan as appropriate and resubmit plan to Department Representative or designate.
- .8 Department Representative or designate's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .9 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Department Representative or designate.
- .10 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.3 FILING OF NOTICE

- .1 File Notice of Project with Provincial authorities prior to initiating Work in the Contract.

1.4 SAFETY ASSESSMENT AND MEETINGS

- .1 Perform site specific safety hazard assessment related to project.
- .2 Schedule and administer Health and Safety meeting with staff and Department Representative or designate prior to commencement of Work.
- .3 Do Work in accordance with health and safety regulations.

1.5 UNFORSEEN HAZARDS

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Department Representative or designate verbally and in writing.

1.6 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Department Representative or designate.
- .2 Provide Department Representative or designate with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Department Representative or designate may stop Work if non-compliance of health and safety regulations is not corrected.

1.7 FIRE SAFETY REQUIREMENTS

- .1 Comply with requirements of FCC No. 301 Standard for Construction Operations, latest edition, issued by Fire Commissioner of Canada (FC).
- .2 This standard may be viewed at Regional Engineer's office and copies may be obtained from:
 - .1 Fire Commissioner of Canada,
Sir Charles Tupper Building,
Riverside Drive,
Ottawa, Canada, K1A 0M2

1.8 OVERLOADING

- .1 Ensure no part of Work is subjected to a load which will endanger its safety or will cause permanent deformation.

1.9 FALSEWORK

- .1 Design and construct falsework in accordance with CSA S269.1 1975, latest edition and Division 3 of these Specifications.
- .2 All falsework design shall be certified by a Professional Engineer licensed to practice in the Province of Ontario.

1.10 SCAFFOLDING

- .1 Design and construct scaffolding in accordance with CSA S269.2 M87 (R2003), latest edition.
- .2 The Shop Drawings shall be submitted to the Department Representative or designate and shall include Detail Drawings and Design Calculations for scaffolding. The Department Representative or designate will not be responsible for review of scaffolding.

- .3 The Detail Drawings and Design Calculations for scaffolding shall bear the signature and stamp of a Professional Engineer registered in Ontario, and experienced in scaffolding design.
- .4 The Professional Engineer, whose signature and seal appear on the Detail Design Drawings and Design Calculations, shall inspect and check the falsework and completed scaffolding and certify in writing that the scaffolding is in accordance with Calculations and Drawings submitted to the Department Representative or designate.
- .5 The falsework and scaffolding shall be re-inspected after any change in detail or placement to ensure that it is properly placed, rigid, and secure before commencing work. Each re-inspection will be certified by the Professional Engineer whose signature and seal appear on the Calculations and Drawings.
- .6 Submit such certifications to the Department Representative or designate before commencing work.

1.11 MATERIALS ON SITE

- .1 Comply with WHMIS requirements regarding all materials stored on site. Submit safety data sheets to Contractor prior to shipping materials.

1.12 CONFINED SPACE ENTRY

- .1 Comply with latest legislative requirements of the Occupational Health and Safety Act (Ontario).
- .2 Submit detailed procedures as part of the Project-Specific Health and Safety Plan.
- .3 Contractor's written procedures shall include a "Coordination Document" for confined space entry involving multiple employees.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

- .1 This section describes the necessary steps and precautions for preserving the natural environment, including mitigating measures to reduce environmental impacts of the work.
- .2 All construction related activities should be confined to the site to avoid additional impacts on archaeological resources and natural heritage features.

1.2 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.
- .2 Prior to commencing construction activities or delivery of materials to site, submit an Environmental Protection Plan for review and approval by the Department Representative or designate. The Environmental Protection Plan is to present comprehensive overview of known or potential environmental issues which must be addressed during construction.
- .3 Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .4 Environmental protection plan shall include:
 - .1 Name(s) of person(s) responsible for ensuring adherence to Environmental Protection Plan.
 - .2 Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from site.
 - .3 Name(s) and qualifications of person(s) responsible for training site personnel.
 - .4 Descriptions of environmental protection personnel training program.
 - .5 Drawings showing locations of proposed temporary excavations or embankments, material storage areas, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.
 - .6 Traffic control plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Plans include measures to minimize amount of mud transported onto paved public roads by vehicles or runoff.
 - .7 Spill Control Plan: including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
 - .8 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.

- .9 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, do not become air borne and travel off project site.
- .10 Contaminant prevention plan that: identifies potentially hazardous substances to be used on job site; identifies intended actions to prevent introduction of such materials into air, water, or ground; and details provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.
- .11 Pesticide treatment plan: to be included and updated, as required.

1.3 FIRES

- .1 Fires and burning of rubbish on site is not permitted.

1.4 DISPOSAL OF WASTES

- .1 Do not bury rubbish and waste materials on site.
- .2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.
- .3 Dispose all waste and remove material and equipment off-site.
- .4 Dispose hazardous waste according to regulations in accordance with 02 61 33.

1.5 SITE CLEARING AND PLANT PROTECTION

- .1 Protect trees and plants on site and adjacent properties.
- .2 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .3 Minimize stripping of topsoil and vegetation.
- .4 Restrict tree removal to areas indicated or designated by the Contract.

1.6 WORK ADJACENT TO WATERWAYS

- .1 Do not operate construction equipment in waterways.
- .2 Do not dump excavated fill, waste material or debris in waterways.

1.7 EQUIPMENT FUELING

- .1 Designate an area within the working limits to be used exclusively for fueling construction equipment. Submit for review a plan for the interception and rapid clean-up of fuel spills should they occur. Maintain the apparatus for cleaning up fuel spills on site.

1.8 CLEANING EQUIPMENT

- .1 Manage construction equipment so that no debris is deposited on any public roadway. Contain construction debris in a designated area within the working limits. Dispose of debris off-site as specified.

1.9 NOISE CONTROL

- .1 The Contractor is to adhere to current municipal noise by-law requirements.
- .2 Use only vehicles and equipment equipped with effective muffling devices. Provide noise barriers on stationary engines and compressors. Provide sufficient muffling and noise barriers to ensure that the noise level at the site boundaries do not exceed local municipal designated levels.

1.10 DUST CONTROL

- .1 Control dust on the site at all times by application of calcium chloride or water.

1.11 ASBESTOS

- .1 If found, Contractor is responsible for removal and disposal of asbestos.
- .2 Contractor shall provide costing to Department Representative or designate for review and approval prior to commencing works.
- .3 Cost of asbestos removal and disposal will be paid by the Departmental Representative or designate.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION

PART 1 GENERAL

1.1 INSPECTION

- .1 Department Representative or designate will engage, as required, independent inspection/testing agencies for the purpose of quality assurance only. That is to verify Contractor's quality control process for construction materials, workmanship, environmental protection, waste disposal, etc.
- .2 Contractor is responsible for quality control. Employment of inspection/testing agencies does not relax responsibility of the Contractor to perform the work in accordance with the contract documents.
- .3 Allow Department Representative or designate 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.
- .4 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Department Representative or designate's instructions, or law of Place of Work.
- .5 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.
- .6 Department Representative or designate 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. If such Work is found in accordance with Contract Documents, Departmental Representative or designate shall pay cost of examination and replacement.

1.2 INDEPENDENT INSPECTION AGENCIES

- .1 Independent Inspection/Testing Agencies will be engaged by Contractor for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Contractor.
- .2 Provide equipment required for executing inspection and testing by appointed agencies.
- .3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.

- .4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Department Representative or designate. Pay costs for retesting and reinspection.

1.3 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.

1.4 PROCEDURES

- .1 Notify appropriate agency and Department Representative or designate 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.

1.5 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 Department Representative or designate 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.

1.6 REPORTS

- .1 Submit four copies of inspection and test reports to Department Representative or designate.
- .2 Provide copies to subcontractor, manufacturer, or fabricator of work being inspected or tested.

1.7 TESTS AND MIX DESIGNS

- .1 Furnish test results as requested.

- .2 Cost of tests beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Department Representative or designate and may be authorized as recoverable.

1.8 EQUIPMENT AND SYSTEMS

- .1 Submit adjustment and balancing reports for mechanical and electrical systems where specified.
- .2 Refer to relevant Sections for definitive requirements.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

- .1 This section describes the details of temporary facilities required for the project.

1.2 ACCESS

- .1 Provide and maintain adequate access to project site.
- .2 Snow removal for access roads and parking areas will be maintained by the Department Representative or designate during period of work.
- .3 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractors' use of roads.

1.3 CONTRACTOR'S SITE OFFICE

- .1 Provide office for Contractor's use with sufficient space, furnishings and amenities where directed by Departmental Representative or designate.
- .2 Maintain site office at minimum 18°C, maximum 25°C during meetings.
- .3 Retain documents required for the administration of the contract in a secured area within site office.

1.4 STORAGE SHEDS

- .1 Provide adequate weather-tight and secure sheds with raised floors, for storage of materials, tools and equipment which are subject to damage by weather.

1.5 SANITARY FACILITIES

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Maintain facilities and area in sanitary condition and remove at completion of project.
- .3 Post notices and take such precautions as required by local health authorities.

1.6 PARKING

- .1 Parking is permitted on the site. Maintain and administer this space as directed.

1.7 SITE ENCLOSURES

- .1 Provide temporary enclosures as required to maintain site security and protection for the general public.
- .2 Erect temporary enclosures around excavations and exterior alterations to the building using new 1.2 m high snow fence wired to rolled steel "T" bar fence posts spaced at 2.4 m oc. Maintain fence in good repair.

1.8 ENCLOSURE OF STRUCTURES

- .1 Provide temporary weather-tight enclosures and protection for exterior openings until permanently enclosed.
- .2 Erect enclosures to allow access for installation of materials and working inside enclosure.
- .3 Design enclosures to withstand wind pressure and snow loading.

1.9 WATER SUPPLY

- .1 Permanent water supply system at the building may be used for construction requirements with prior approval of the Departmental Representative or designate provided that guarantees are not affected.
- .2 Protect water supply from freezing.

1.10 ACCOMMODATION AND MESSING

- .1 Contractor to provide for all messing and accommodation for his forces.
- .2 Do not permit any food or beverages to be brought into or consumed in the place of work.
- .3 Smoking within the building is prohibited.

1.11 HEATING AND VENTILATING

- .1 Pay for costs of temporary heat and ventilation used during construction, including costs of installation, fuel, operation, maintenance and removal of equipment. Use of direct-fired heaters discharging waste products into work areas will not be permitted unless prior approval is given by the Department Representative or designate.
- .2 Provide temporary heat and ventilation in enclosed areas as required to:
 - .1 Facilitate progress of work.
 - .2 Protect work and products against dampness and cold.

- .3 Prevent moisture condensation on surfaces.
- .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
- .5 Provide adequate ventilation to meet health regulations for safe working environment.

- .3 Maintain minimum temperature of 10°C or higher where specified as soon as finishing work is commenced and maintain until acceptance of structure by the Department Representative or designate.

- .4 Ventilating:
 - .1 Prevent accumulations of dust, fumes, mists, vapors or gases in areas occupied during construction.
 - .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
 - .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
 - .4 Ventilate storage spaces containing hazardous or volatile materials.
 - .5 Ventilate temporary sanitary facilities.
 - .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.

- .5 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
 - .1 Conform to applicable codes and standards.
 - .2 Enforce safe practices.
 - .3 Prevent abuse of services.
 - .4 Prevent damage to finishes.
 - .5 Vent direct-fired combustion units to outside.

- .6 Use of new systems for temporary heating, ventilating or air conditioning will not be permitted without prior authorization from the Department Representative or designate.

1.12 REMOVAL OF TEMPORARY FACILITIES

- .1 Remove temporary facilities from site when directed by the Department Representative or designate. All site facilities will be the property of Contractor when the Contract is complete.

1.13 METHOD OF PAYMENT

- .1 Payment for temporary facilities to be included in the Lump Sum Price for Mobilization and Demobilization.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

- .1 This section specifies the requirement for cleaning during and after the works has been completed.

1.2 GENERAL

- .1 Conduct cleaning and disposal operations to comply with local ordinances and antipollution laws, including requirements of WHMIS.
- .2 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .3 Prevent accumulation of waste which creates hazardous conditions.
- .4 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

1.3 MATERIALS

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

1.4 CLEANING DURING CONSTRUCTION

- .1 Maintain the work, including roof and building systems, at least on a daily basis free from accumulations of waste material and debris.
- .2 Provide on-site containers for collection of waste materials and debris.
- .3 Remove waste materials and debris from site.
- .4 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.
- .5 Vacuum clean all building interiors prior to paint application. Continue to vacuum clean finished areas until final completion.

1.5 FINAL CLEANING

- .1 In preparation for acceptance of the project on an Interim or Final Certificate of Completion, perform final cleaning.

- .2 Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials, from interior and exterior finished surfaces including glass and other polished surfaces.
- .3 Clean lighting reflectors, lenses, and other lighting surfaces.
- .4 Broom clean paved surfaces; rake clean other surfaces of grounds.
- .5 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .6 Remove snow and ice from access to buildings.

1.6 BASIS OF PAYMENT

- .1 Payment for works under this section is to be included in Lump Sum Prices in Form of Tender for construction.
- .2 The Lump Sum Price shall cover supply of all labor, materials, tools and equipment, as specified, and/or required.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Text, schedules and procedures for systematic Waste Management Program for construction, deconstruction, demolition, and renovation projects, which may include:
 - .1 Diversion of Materials.
 - .2 Waste Audit (WA).
 - .3 Waste Reduction Workplan (WRW).
 - .4 Demolition Waste Audit (DWA).
 - .5 Materials Source Separation Program (MSSP).

1.2 DEFINITIONS

- .1 Demolition Waste Audit (DWA): Relates to actual waste generated from project.
- .2 Materials Source Separation Program (MSSP): Consists of series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.
- .3 Recyclable: Ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse by others.
- .4 Recycle: Process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
- .5 Recycling: Process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- .6 Reuse: Repeated use of product in same form but not necessarily for same purpose. Reuse includes:
 - .1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
 - .2 Returning reusable items including pallets or unused products to vendors.
- .7 Salvage: Removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.
- .8 Separate Condition: Refers to waste sorted into individual types.

- .9 Source Separation: Acts of keeping different types of waste materials separate beginning from first time they became waste.
- .10 Waste Audit (WA): Detailed inventory of materials in building. Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project. Indicates quantities of reuse, recycling and landfill.
- .11 Waste Management Coordinator (WMC): Contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.
- .12 Waste Reduction Workplan (WRW): Written report which addresses opportunities for reduction, reuse, or recycling of materials. WRW is based on information acquired from WA.

1.3 DOCUMENTS

- .1 Maintain at job site, one copy of following documents:
 - .1 Waste Audit.
 - .2 Waste Reduction Workplan.
 - .3 Material Source Separation Plan.

1.4 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Prepare and submit the following material prior to project start-up, if required by the Departmental Representative or designate:
 - .1 Waste Audit (WA).
 - .2 Waste Reduction Workplan (WRW).
 - .3 Demolition Waste Audit (DWA).
 - .4 Cost/Revenue Analysis Workplan (CRAW).
 - .5 Materials Source Separation Program (MSSP) description.

1.5 WASTE AUDIT (WA)

- .1 Conduct WA prior to project start-up.
- .2 Prepare WA.
- .3 Record, on WA, extent to which materials or products used consist of recycled or reused materials or products.

1.6 WASTE REDUCTION WORKPLAN (WRW)

- .1 Prepare WRW prior to project start-up.
- .2 WRW should include but not limited to:
 - .1 Destination of materials listed.
 - .2 Deconstruction/disassembly techniques and sequencing.
 - .3 Schedule for deconstruction/disassembly.
 - .4 Location.
 - .5 Security.
 - .6 Protection.
 - .7 Clear labelling of storage areas.
 - .8 Details on materials handling and removal procedures.
 - .9 Quantities for materials to be salvaged for reuse or recycled and materials sent to landfill.
- .3 Structure WRW to prioritize actions and follow 3R's hierarchy, with Reduction as first priority, followed by Reuse, then Recycle.
- .4 Describe management of waste.
- .5 Identify opportunities for reduction, reuse, and recycling of materials. Based on information acquired from WA.
- .6 Post WRW or summary where workers at site are able to review content.
- .7 Set realistic goals for waste reduction, recognize existing barriers and develop strategies to overcome these barriers.
- .8 Monitor and report on waste reduction by documenting total volume and cost of actual waste removed from project.

1.7 DEMOLITION WASTE AUDIT (DWA)

- .1 Prepare DWA prior to project start-up.
- .2 Complete DWA.
- .3 Provide inventory of quantities of materials to be salvaged for reuse, recycling, or disposal.

1.8 COST/REVENUE ANALYSIS WORKPLAN (CRAW)

- .1 Prepare CRAW.

1.9 MATERIALS SOURCE SEPARATION PROGRAM (MSSP)

- .1 Prepare MSSP and have ready for use prior to project start-up.
- .2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by Engineer. Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.
- .3 Provide containers to deposit reusable and recyclable materials.
- .4 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.
- .5 Locate separated material(s) in area(s) which minimize material damage.
- .6 Collect, handle, store on-site, and transport off-site, salvaged materials in separate condition.
 - .1 Transport to approved and authorized recycling facility.
- .7 Collect, handle, store on-site, and transport off-site, salvaged materials in combined condition.
 - .1 Ship material(s) to site operating under Certificate of Approval or as directed by Departmental Representative or designate.
 - .2 Materials must be immediately separated into required categories for reuse or recycling.

1.10 WASTE PROCESSING SITES

- .1 Identify appropriate waste processing sites, based on municipal requirements, as required.

1.11 STORAGE, HANDLING AND PROTECTION

- .1 Store, materials to be reused, recycled and salvaged in locations as directed by Engineer.
- .2 Unless specified otherwise, materials for removal become Contractor's property.
- .3 Protect, stockpile, store and catalogue salvaged items.
- .4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
- .5 Protect structural components not removed for demolition from movement or damage.

- .6 Support affected structures. If safety of building is endangered, cease operations and immediately notify Engineer.
- .7 Protect surface drainage, mechanical and electrical from damage and blockage.
- .8 Separate and store materials produced during dismantling of structures in designated areas.
- .9 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.
 - .1 On-site source separation is recommended.
 - .2 Remove co-mingled materials to off-site processing facility for separation.
 - .3 Provide waybills for separated materials.

1.12 DISPOSAL OF WASTES

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of waste, volatile materials, mineral spirits, oil, paint thinner, or excavation material into waterways, storm, or sanitary sewers.
- .3 Remove materials from deconstruction as deconstruction/disassembly Work progresses.
- .4 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.
- .5 Dispose of waste in accordance with Municipal and Provincial regulations.

1.13 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of premises.
- .2 Maintain security measures established by existing facility and provide temporary security measures approved by Engineer as required.

1.14 SCHEDULING

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

PART 2 PRODUCTS

2.1 THIS SECTION IS NOT APPLICABLE

PART 3 EXECUTION

3.1 UNIT/COMPONENT/SUBSECTION

3.2 APPLICATION

- .1 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

3.3 CLEANING

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

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

- .1 This Section specifies requirements of submission of operating and maintenance data for each system necessitating operation and/or maintenance.

1.2 OPERATING AND MAINTENANCE MANUALS

- .1 Prepare three (3) copies of documentation including As-Constructed Shop Drawings to instruct the Departmental Representative or designate's operation and maintenance staff in the operation and associated maintenance of each piece of equipment and system as supplied and installed. Three (3) CDs containing all of the documentation should also be provided.
- .2 Provide 65 mm spine, 215 mm x 280 mm capacity extension-type catalogue binders.
- .3 Each copy shall be permanently numbered 1 to 3.
- .4 Each binder shall be made up as follows:
 - .1 Tab: Table of Contents for the Volume – details the titles of various divisions of the included divider tabs.
 - .2 Tab: Introduction to manual – provide written explanation of the layout of the manual and intended use.
- .5 Each Division shall be provided with the following:
 - .1 Tab: Division Number xx:
 - .1 Index – information in that Division in order of appearance.
 - .2 List of Contractors and Suppliers – names, addresses and telephone numbers.
 - .3 Specification Sections cross reference.
 - .4 Drawing List.
 - .2 The various applicable Sections in each Division shall be organized under separate divider tabs labeled Division/Section Number as required by the project.
- .6 The following information shall be provided for each system and major piece of equipment. Each piece of equipment shall be referred by its tag number. Where manufacturer's literature covers several models or options, the applicable information shall be highlighted or redundant information crossed out:
 - .1 Index of information in that Section in order of appearance.

- .2 Description of systems, components and technical data. Include interfaces, sequences, operational characteristic changes for seasonal operation.
- .3 Maintenance and operating instructions.
- .4 Recommended Spare Parts List.
- .5 Schematics, Single Line and Wiring Diagrams.
- .6 Service representatives - names, addresses and telephone numbers.
- .7 Suppliers for replacement parts - names, addresses and telephone numbers.
- .8 Test results; witness testing commissioning, test results.
- .9 Certification, guarantee, warranty.
- .10 Troubleshooting data.
- .11 Preventive maintenance program complete with suggested check list sheets.
- .12 Inspection Approval Certificates for all types of systems: plumbing and piping, hot air and ventilating, electrical supervisory.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION

PART 1 GENERAL

1.1 RECORD DRAWINGS

- .1 Department Representative or designate will provide two sets of whiteprints for Record Drawing purposes.
- .2 Maintain project “As-Built” Record Drawings and record accurately deviations from Contract Documents caused by site conditions and changes ordered by the Department Representative or designate.
- .3 Mark “As-Built” changes in red coloured ink on one set of whiteprints.
- .4 Record following significant deviations:
 - .1 Depths of various elements of foundation in relation to floor level.
 - .2 Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvement.
 - .3 Location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure.
 - .4 Field changes of dimension and detail.
 - .5 Changes made by Change Order or Field Order.
 - .6 Other significant deviations which are concealed in construction and cannot be identified by visual inspection.
 - .7 Electrical Contractor to indicate on “As-Built” Record Drawings all conduit runs as installed, including conduit sizes, number of wires, and percentage of fill.
- .5 At completion of project and prior to final inspection, neatly transfer “As-Built” notations to second set of whiteprints using fine red marker. Neatly print lettering and number in size to match original. Lines may be drawn free-hand, but shall be neat and accurate. Add at each Drawing Title Block Note: “AS-BUILT DRAWING”. Also circle on List of Drawings each title and number of Drawing marked with “As-Built” changes.
- .6 Submit this set of “As-Built” Record Drawings to the Department Representative or designate.

1.2 PHOTOGRAPHS

- .1 Take sets of photographs during the Contract. The first set of photographs shall be taken prior to commencement of construction and the final set following completion of the project. Intermediate sets shall be taken at least once every week and at major milestones in construction. A minimum of three intermediate photo sets shall be taken.

- .2 Provide photographs to the Department Representative or designate. Digital photographs will be accepted provided they are taken at a resolution of 4 megapixel or greater. Digital photographs or prints shall be identified with the date of taking and the name of the job and the name of the Contractor.
- .3 Submit progress photographs to the Department Representative or designate with monthly application for payment.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION

DIVISION 02

EXISTING CONDITIONS

Part 1 General

1.1 RELATED WORK

.1 Section 01 35 30 – Health and Safety Requirements

1.2 REFERENCES

- .1 CSA S350, Code of Practice for Safety in Demolition of Structures.
- .2 Hazardous Materials Assessment Report dated March 7, 2014, prepared by Pinchin Environmental (Pinchin file 91797).

1.3 EXISTING CONDITIONS

- .1 Structures to be demolished to be based on their condition on date that tender is accepted.
- .2 Items to be salvaged, as identified by Owner and/or Owner's Representative, to be carefully removed protected and handed to Owner and/or Owner's Representative.

1.4 DEMOLITION DRAWINGS

- .1 Where required by authorities having jurisdiction, submit for approval drawings, diagrams or details showing sequence of demolition work and supporting structures and underpinning.
- .2 Temporary supporting structures and shoring systems are to be designed and submittals sealed by a structural Engineer licensed to practice in the province of Ontario.

1.5 PROTECTION

- .1 Prevent movement, settlement or damage of adjacent structures, services, parts of existing building to remain. Provide bracing, shoring and underpinning as required. Make good damage caused by demolition.
- .2 Take precautions to support affected structures and, if safety of building being demolished or adjacent structures or services appears to be endangered, cease operations and notify the Department Representative or designate.
- .3 The building will remain occupied during the work of this project.
- .4 Prevent physical intrusion and damage caused by environmental factors such as wind and rain and the spread of dust and contaminants by means of temporary plywood enclosures, screens, fencing, tarps and other means sealed against other areas of the building as required.

Part 2 Products

Part 3 Execution

3.1 PREPARATION

- .1 Disconnect and re-route electrical and telephone service lines entering areas to be demolished in accordance with authorities having jurisdiction. Post warning signs on electrical lines and equipment which must remain energized to serve other areas of the building during period of demolition.
- .2 Disconnect and cap designated mechanical services in accordance with authorities having jurisdiction where indicated.
- .3 Piping, sewer and water lines: remove and relocate as shown.
- .4 Other underground services: remove and relocate as required.
- .5 Do not disrupt active or energized utilities designated to remain undisturbed.

3.2 SAFETY CODE

- .1 Unless otherwise specified, carry out demolition work in accordance with **Section 01 35 30 Health and Safety Requirements**.

3.3 DEMOLITION

- .1 Demolish and remove in general portions of exterior and interior walls, roofing, ceilings, structures, finishes, fixed furnishings and mechanical and electrical components in the area of work that are not to be incorporated in the completed project.
- .2 At end of each day's work, leave work in safe condition so that no part is in danger of toppling or falling. Protect interiors of parts to be demolished from exterior elements at all times.
- .3 Demolish to minimize dusting.
- .4 Do not sell or burn materials on site.
- .5 Remove and dispose of demolished materials except where noted otherwise and in accordance with authorities having jurisdiction.

3.4 HAZARDOUS MATERIALS:

- .1 Refer to Hazardous Materials Assessment Report dated March 7, 2014, prepared by Pinchin Environmental (Pinchin file 91797) for identification of hazardous materials and instructions for handling and disposal.
- .2 Remove contaminated or dangerous materials as defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimize danger at site or during disposal.

- .3 Make good all surfaces remaining after demolition.

3.5 SALVAGE

- .1 Items to be salvaged: As directed by Department Representative or designate.
- .2 Carefully dismantle items containing materials for salvage and stockpile salvaged materials on site.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Comply with requirements of this Section when performing following work:
 - .1 Removing roofing materials that are suspected of containing asbestos using wet material removal and handling techniques.
 - .2 Removing less than 1 square metre of drywall containing or suspected of containing asbestos-containing joint compound.
 - .3 Cut, shape, grind, drill, scrape or abrade materials mentioned above using hand powered tools, or using power tools equipped with a HEPA filter.

1.2 SECTION INCLUDES

- .1 Requirements and procedures for asbestos abatement on non-friable asbestos-containing materials.

1.3 RELATED SECTIONS

- .1 Section 01 33 23 - Submittal Procedures.
- .2 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.4 REFERENCES

- .1 ONTARIO REGULATION 278/05 - Designated Substance — asbestos on construction projects and in buildings and repair operations.
- .2 Department of Justice Canada (Jus).
 - .1 Canadian Environmental Protection Act, 1999 (CEPA).
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .4 Underwriters' Laboratories of Canada (ULC).
- .5 Transport Canada (TC).
 - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).
- .6 Hazardous Materials Assessment Report dated March 7, 2014, prepared by Pinchin Environmental (Pinchin file 91797).

1.5 DEFINITIONS

- .1 HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.
- .2 Amended Water: water with non-ionic surfactant wetting agent added to reduce water tension to allow thorough wetting of fibres.
- .3 Asbestos-Containing Materials (ACMs): materials identified under Existing Conditions including fallen materials and settled dust.
- .4 Asbestos Work Area: area where work takes place which will, or may, disturb ACMs.
- .5 Authorized Visitors: Engineers, Departmental Representative or designates or designated representatives, and representatives of regulatory agencies.
- .6 Non-Friable Material: material that when dry cannot be crumbled, pulverized or powdered by hand pressure.
- .7 Occupied Area: any area of the building or work site that is outside Asbestos Work Area.
- .8 Polyethylene: polyethylene sheeting or rip-proof polyethylene sheeting with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide protection and isolation.
- .9 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must have appropriate capacity for work.

1.6 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 23 - Submittal Procedures.
- .2 Submit proof satisfactory to Departmental Representative or designate that suitable arrangements have been made to dispose of asbestos-containing waste in accordance with requirements of authority having jurisdiction.
- .3 Submit Provincial and/or local requirements for Notice of Project Form.
- .4 Submit proof of Contractor's Asbestos Liability Insurance.
- .5 Submit to Departmental Representative or designate necessary permits for transportation and disposal of asbestos-containing waste and proof that asbestos-containing waste has been received and properly disposed.

1.7 QUALITY ASSURANCE

- .1 Regulatory Requirements: comply with Federal, Provincial, and local requirements pertaining to asbestos, provided that in case of conflict among these requirements or with these specifications, more stringent requirement applies.
- .2 Comply with regulations in effect at time Work is performed.
- .3 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29 Health and Safety Requirements.
 - .2 Safety Requirements: worker protection.
 - .1 Protective equipment and clothing to be worn by workers while in Asbestos Work Area include:
 - .1 Non-powered reusable or replaceable filter-type respirator equipped with HEPA filter cartridges, personally issued to worker and marked as to efficiency and purpose, suitable for protection against asbestos and acceptable to Provincial Authority having jurisdiction.
 - .2 Disposable-type protective clothing that does not readily retain or permit penetration of asbestos fibres, consisting of full-body covering including head covering with snug-fitting cuffs at wrists, ankles, and neck.
 - .2 Eating, drinking, chewing, and smoking are not permitted in Asbestos Work Area.
 - .3 Before leaving Asbestos Work Area, dispose of protective clothing as contaminated waste as specified.
 - .4 Ensure workers wash hands and face when leaving Asbestos Work Area. Facilities for washing are located as indicated on drawings.
 - .5 Ensure that no person required to enter an Asbestos Work Area has facial hair that affects seal between respirator and face.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Separate for reuse and recycling and place in designated containers Steel Metal Plastic waste in accordance with Waste Management Plan.
- .5 Place materials defined as hazardous or toxic in designated containers.

- .6 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.
- .7 Fold up metal banding, flatten and place in designated area for recycling.
- .8 Disposal of asbestos waste generated by removal activities must comply with Federal, Provincial, Territorial and Municipal regulations. Dispose of asbestos waste in sealed double thickness 6 ml bags or leak proof drums. Label containers with appropriate warning labels.
- .9 Provide manifests describing and listing waste created. Transport containers by approved means to licensed landfill for burial.

1.9 EXISTING CONDITIONS

- .1 Reports and information pertaining to ACMs to be handled, removed, or otherwise disturbed and disposed of during this project are available for inspection at the offices of the Departmental Representative of designate.
- .2 Notify Departmental Representative or designate of friable material discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material pending instructions from Departmental Representative or designate.

1.10 DEPARTMENTAL REPRESENTATIVE'S INSTRUCTIONS

- .1 Before beginning Work, provide Departmental Representative or designate satisfactory proof that every worker has had instruction and training in hazards of asbestos exposure, in personal hygiene and work practices, and in use, cleaning, and disposal of respirators and protective clothing.
- .2 Instruction and training related to respirators includes, following minimum requirements:
 - .1 Fitting of equipment.
 - .2 Inspection and maintenance of equipment.
 - .3 Disinfecting of equipment.
 - .4 Limitations of equipment.
- .3 Instruction and training must be provided by a competent, qualified person.

Part 2 Products

2.1 MATERIALS

- .1 Drop Sheets:
 - .1 Polyethylene: 0.15 mm thick.
 - .2 FR polyethylene: 0.15 mm thick woven fibre reinforced fabric bonded both sides with polyethylene.

- .2 Wetting Agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with water in a concentration to provide thorough wetting of asbestos-containing material.
- .3 Waste Containers: contain waste in two separate containers.
 - .1 Inner container: 0.15 mm thick sealable polyethylene waste bag.
 - .2 Outer container: sealable metal or fibre type where there are sharp objects included in waste material; otherwise outer container may be sealable metal or fibre type or second 0.15 mm thick sealable polyethylene bag.
 - .3 Labelling requirements: affix pre-printed cautionary asbestos warning in both official languages that is visible when ready for removal to disposal site.

Part 3 Execution

3.1 PROCEDURES

- .1 Do construction occupational health and safety in accordance with Section 01545 Safety Requirements.
- .2 Before beginning Work, isolate Asbestos Work Area using, minimum, pre-printed cautionary asbestos warning signs in both official languages that are visible at access routes to Asbestos Work Area.
 - .1 Remove visible dust from surfaces in the work area where dust is likely to be disturbed during course of work.
 - .2 Use HEPA vacuum, or damp cloths where damp cleaning does not create a hazard and is otherwise appropriate.
 - .3 Do not use compressed air to clean up or remove dust from any surface.
- .3 Prevent spread of dust from Asbestos Work Area using measures appropriate to work to be done.
 - .1 Use FR polyethylene drop sheets over flooring such as carpeting that absorbs dust and over flooring in Asbestos Work Area where dust and contamination cannot otherwise be safely contained.
- .4 Wet materials containing asbestos to be cut, ground, abraded, scraped, drilled, or otherwise disturbed unless wetting creates hazard or causes damage.
 - .1 Use garden reservoir type low - velocity fine - mist sprayer.
 - .2 Perform Work to reduce dust creation to lowest levels practicable.
 - .3 Work will be subject to visual inspection and air monitoring.
 - .4 Contamination of surrounding areas indicated by visual inspection or air monitoring will require complete enclosure and clean-up of affected areas.
- .5 Clean-Up:
 - .1 Frequently during Work and immediately after completion of Work, clean up dust and asbestos-containing waste using HEPA vacuum or by damp mopping.
 - .2 Place dust and asbestos-containing waste in sealed dust-tight waste bags. Treat drop sheets and disposable protective clothing as asbestos waste; wet and fold these items to contain dust, then place in plastic bags.

- .3 Clean exterior of each waste-filled bag using damp cloths or HEPA vacuum and place in second clean waste bag immediately prior to removal from Asbestos Work Area.
- .4 Seal waste bags and remove from site. Dispose of in accordance with requirements of Provincial/Territorial and Federal Authority having jurisdiction. Supervise dumping and ensure that dump operator is fully aware of hazardous nature of material to be dumped and that guidelines and regulations for asbestos disposal are followed.
- .5 Perform final thorough clean-up of Work areas and adjacent areas affected by Work using HEPA vacuum.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Comply with requirements of this Section when performing following Work:
 - .1 Removing more than 1 square metre of drywall containing or suspected of containing asbestos-containing joint compound.

1.2 SECTION INCLUDES

- .1 Requirements and procedures for asbestos abatement of minor amounts of chrysotile asbestos-containing materials of the type describe within.

1.3 RELATED SECTIONS

- .1 Section 01 33 23 - Submittal Procedures.
- .2 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.4 REFERENCES

- .1 ONTARIO REGULATION 278/05 - Designated Substance — asbestos on construction projects and in buildings and repair operations.
- .2 Department of Justice Canada (Jus).
 - .1 Canadian Environmental Protection Act, 1999 (CEPA).
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .4 Underwriters' Laboratories of Canada (ULC).
- .5 Hazardous Materials Assessment Report dated March 7, 2014, prepared by Pinchin Environmental (Pinchin file 91797).

1.5 DEFINITIONS

- .1 HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with filter system capable of collecting and retaining fibres greater than 0.3 microns in any dimension at 99.97% efficiency.
- .2 Amended Water: water with non-ionic surfactant wetting agent added to reduce water tension to allow wetting of fibres.
- .3 Asbestos-Containing Materials (ACMs): materials identified under Existing Conditions Article, including fallen materials and settled dust.
- .4 Minor Amounts of ACMs: less than or equal to 0.1 m² of friable material containing chrysotile asbestos.

- .5 Asbestos Work Area: area where work takes place which will, or may disturb ACMs.
- .6 Authorized Visitors: Engineers, or designated representatives, and representatives of regulatory agencies.
- .7 Friable Material: material that when dry can be crumbled, pulverized or powdered by hand pressure and includes such material that is crumbled, pulverized or powdered.
- .8 Occupied Area: any area of building or work site that is outside Asbestos Work Area.
- .9 Polyethylene: polyethylene sheeting or rip-proof polyethylene sheeting with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide protection and isolation.
- .10 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must have appropriate capacity for scope of work.

1.6 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 23 - Submittal Procedures.
- .2 Submit proof satisfactory to Departmental Representative or designate that suitable arrangements have been made to dispose of asbestos-containing waste in accordance with requirements of authority having jurisdiction.
- .3 Submit Provincial/and/or local requirements for Notice of Project Form.
- .4 Submit proof of Contractor's Asbestos Liability Insurance.
- .5 Submit to Departmental Representative or designate necessary permits for transportation and disposal of asbestos-containing waste and proof that asbestos-containing waste has been received and properly disposed.
- .6 Submit proof satisfactory to Departmental Representative or designate that employees have had instruction on hazards of asbestos exposure, respirator use, dress, entry and exit from Asbestos Work Area, and aspects of work procedures and protective measures.
- .7 Submit proof that supervisory personnel have attended asbestos abatement course, of not less than two days duration. Minimum of one supervisor for every ten workers.
- .8 Submit Worker's Compensation Board status and transcription of insurance.
- .9 Submit documentation including test results, fire and flammability data, and Material Safety Data Sheets (MSDS) for chemicals or materials including:
 - .1 Encapsulants.
 - .2 amended water.
 - .3 slow-drying sealer.

1.7 QUALITY ASSURANCE

- .1 Regulatory Requirements: comply with Federal, Provincial/Territorial and local requirements pertaining to asbestos, provided that in case of conflict among these requirements or with these specifications more stringent requirement applies. Comply with regulations in effect at the time work is performed.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29 Health and Safety Requirements.
 - .2 Safety Requirements: worker and visitor protection.
 - .1 Protective equipment and clothing to be worn by workers while in Asbestos Work Area include:
 - .1 Non-powered reusable or replaceable filter-type respirator equipped with HEPA filter cartridges, personally issued to worker and marked as to efficiency and purpose, suitable for protection against asbestos and acceptable to Provincial Authority having jurisdiction.
 - .2 Disposable-type protective clothing that does not readily retain or permit penetration of asbestos fibres, consisting of full-body covering including head covering with snug-fitting cuffs at wrists, ankles, and neck.
 - .2 Eating, drinking, chewing, and smoking are not permitted in Asbestos Work Area.
 - .3 Before leaving Asbestos Work Area, dispose of protective clothing as contaminated waste as specified.
 - .4 Ensure workers wash hands and face when leaving Asbestos Work Area. Facilities for washing are located as indicated on drawings.
 - .5 Ensure that no person required to enter an Asbestos Work Area has facial hair that affects seal between respirator and face.
 - .3 Visitor Protection:
 - .1 Provide protective clothing and approved respirators to Authorized Visitors to work areas.
 - .2 Instruct Authorized Visitors in the use of protective clothing, respirators and procedures.
 - .3 Instruct Authorized Visitors in proper procedures to be followed in entering into and exiting from Asbestos Work Area.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

- .4 Separate for reuse and recycling and place in designated containers Steel Metal Plastic waste in accordance with Waste Management Plan.
- .5 Place materials defined as hazardous or toxic in designated containers.
- .6 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.
- .7 Fold up metal banding, flatten and place in designated area for recycling.
- .8 Disposal of asbestos waste generated by removal activities must comply with Federal, Provincial/Territorial and Municipal regulations. Dispose of asbestos waste in sealed double thickness 6 ml bags or leak proof drums. Label containers with appropriate warning labels.
- .9 Provide manifests describing and listing waste created. Transport containers by approved means to licenced landfill for burial.

1.9 EXISTING CONDITIONS

- .1 Reports and information pertaining to material containing chrysotile asbestos to be handled, removed, or otherwise disturbed and disposed of during this Project are available for inspection at Physical Plant offices.
- .2 Notify Departmental Representative or designate of friable material discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material until instructed by Departmental Representative or designate.

1.10 OWNER'S INSTRUCTIONS

- .1 Before beginning Work, provide Departmental Representative or designate satisfactory proof that every worker has had instruction and training in hazards of asbestos exposure, in personal hygiene and work practices, in use of glove bag procedures, and in use, cleaning, and disposal of respirators and protective clothing.
- .2 Instruction and training related to respirators includes, at minimum:
 - .1 Fitting of equipment.
 - .2 Inspection and maintenance of equipment.
 - .3 Disinfecting of equipment.
 - .4 Limitations of equipment.
- .3 Instruction and training must be provided by competent, qualified person.

Part 2 Products

2.1 MATERIALS

- .1 Drop and Enclosure Sheets.
 - .1 Polyethylene: 0.15 mm thick.
 - .2 FR polyethylene: 0.15 mm thick woven fibre reinforced fabric bonded both sides with polyethylene.
- .2 Wetting Agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with water in concentration to provide thorough wetting of asbestos-containing material.
- .3 Waste Containers: contain waste in two separate containers.
 - .1 Inner container: 0.15 mm thick sealable polyethylene bag or where glove bag method is used, glove bag itself.
 - .2 Outer container: sealable metal or fibre type where there are sharp objects included in waste material; otherwise outer container may be sealable metal or fibre type or second 0.15 mm thick sealable polyethylene bag.
 - .3 Labelling requirements: affix pre-printed cautionary asbestos warning, in both official languages, that is visible when ready for removal to disposal site.
- .4 Glove bag:
 - .1 Acceptable materials: safe-T-Strip products in configuration suitable for Work, or Alternative material approved by addendum during tendering period in accordance with Instructions to Tenderers.
 - .2 Glove bags intended for use in more than one location must be equipped with reversible, double-pull, double-throw zipper on top and at approximately mid-section of bag.
- .5 Tape: tape suitable for sealing polyethylene to surfaces under both dry and wet conditions using amended water.
- .6 Slow - drying sealer: non-staining, clear, water - dispersible type that remains tacky on surface for at least 8 hours and designed for purpose of trapping residual asbestos fibres.
 - .1 Sealer: flame spread and smoke developed rating less than 50 and be compatible with new fireproofing.
- .7 Encapsulant: surface film forming penetrating type conforming to CAN/CGSB-1.205 ULC listed having following characteristics.

Part 3 Execution

3.1 SUPERVISION

- .1 Minimum of one Supervisor for every ten workers is required.
- .2 Approved Supervisor must remain within Asbestos Work Area during disturbance, removal, or other handling of asbestos-containing materials.

3.2 PROCEDURES

- .1 Do construction occupational health and safety in accordance with Section 01545 Safety Requirements.
- .2 Before beginning Work, at each access to Asbestos Work Area, install warning signs in both official languages in upper case 'Helvetica Medium' letters reading as follows, where number in parentheses indicates font size to be used : 'CAUTION ASBESTOS HAZARD AREA (25 mm) / NO UNAUTHORIZED ENTRY (19 mm) / WEAR ASSIGNED PROTECTIVE EQUIPMENT (19 mm) / BREATHING ASBESTOS DUST MAY CAUSE SERIOUS BODILY HARM (7 mm)'.
 - .1 Use HEPA vacuum, or damp cloths where damp cleaning does not create hazard and is otherwise appropriate.
 - .2 Do not use compressed air to clean up or remove dust from any surface.
- .4 Prevent spread of dust from Asbestos Work Area using measures appropriate to work to be done.
 - .1 Use FR polyethylene drop sheets over flooring such as carpeting that absorbs dust and over flooring in work areas where dust or contamination cannot otherwise be safely contained.
 - .2 When removing suspended ceilings and walls themselves do not enclose work area and when removing asbestos containing material from piping or equipment and "glove-bag" method is not used erect enclosure of polyethylene sheeting around work area, shut off mechanical ventilation system serving work area and seal ventilation ducts to and from work area.
- .5 Remove loose material by HEPA vacuum; thoroughly wet friable material containing asbestos to be removed or disturbed before and during Work unless wetting creates hazard or causes damage.
 - .1 Use garden reservoir type low - velocity sprayer or airless spray equipment capable of producing mist or fine spray.
 - .2 Perform Work in a manner to reduce dust creation to lowest levels practicable.
 - .3 Upon completion of Work shift, cover exposed ends of remaining pipe insulation with polyethelene taped in place.

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- .6 Work is subject to visual inspection and air monitoring. Contamination of surrounding areas indicated by visual inspection or air monitoring will require complete enclosure and clean-up of affected areas.
 - .7 Clean-up:
 - .1 Frequently during Work and immediately after completion of work, clean up dust and asbestos-containing waste using HEPA vacuum or by damp mopping.
 - .2 Place dust and asbestos-containing waste in sealed dust-tight waste bags. Treat drop sheets and disposable protective clothing as asbestos waste and wet and fold to contain dust and then place in waste bags.
 - .3 Immediately before their removal from Asbestos Work Area and disposal, clean each filled waste bag using damp cloths or HEPA vacuum and place in second clean waste bag.
 - .4 Seal and remove double-bagged waste from site. Dispose of in accordance with requirements of Provincial/Territorial and Federal authority having jurisdiction. Supervise dumping and ensure that dump operator is fully aware of hazardous nature of material to be dumped and that guidelines and regulations for asbestos disposal are followed.
 - .5 Perform final thorough clean-up of Asbestos Work Areas and adjacent areas affected by Work using HEPA vacuum.

3.3 AIR MONITORING

- .1 From beginning of Work until completion of cleaning operations, Departmental Representative or designate to take air samples on daily basis outside of Asbestos Work Area enclosures in accordance with Health Canada recommendations.
 - .1 Contractor will be responsible for monitoring inside enclosure in accordance with applicable Provincial Occupational Health and Safety Regulations.
- .2 If air monitoring shows that areas outside Asbestos Work Area enclosures are contaminated, enclose, maintain and clean these areas in same manner as that applicable to Asbestos Work Area.
- .3 Ensure that respiratory safety factors are not exceeded.
- .4 During the course of Work, Owner's Representative to measure fibre content of air outside Work areas by means of fibrous aerosol monitors (FAM).
 - .1 When FAM readings exceed 0.25 f/cc, adopt more stringent Work procedures immediately and perform PCM test.
 - .2 Stop Work when PCM measurements exceed 0.01 f/cc and correct procedures.

END OF SECTION

DIVISION 06

WOOD, PLASTICS AND COMPOSITES

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.
- .2 Section 01 45 00 – Quality Control.
- .3 Section 01 61 00 – Material and Equipment.
- .4 Section 01 74 19 – Construction Waste Management and Disposal.
- .5 Section 07 52 00 – Modified Bituminous Membrane Roofing.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA B111-1974(R1998), Wire Nails, Spikes and Staples.
 - .2 CAN/CSA-G164-M92(R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CAN/CSA-O141-91(R1999), Softwood Lumber.
 - .4 CSA O151-M1978(R1998), Canadian Softwood Plywood.
 - .5 CAN/CSA-O325.0-92(R1998), Construction Sheathing.
- .2 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2000.

1.3 QUALITY ASSURANCE

- .1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2 Plywood identification: by grade mark in accordance with applicable CSA standards.
- .3 Plywood, OSB and wood based composite panel construction sheathing identification: by grademark in accordance with applicable CSA standards.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Construction Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, and packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused wood materials from landfill to facility approved by Departmental Representative or designate.
- .5 Do not dispose of preservative treated wood through incineration.
- .6 Do not dispose of preservative treated wood with materials destined for recycling or reuse.
- .7 Dispose of treated wood, end pieces, wood scraps and sawdust at sanitary landfill approved by Departmental Representative or designate.
- .8 Dispose of unused wood preservative material at official hazardous material collections site approved by Departmental Representative or designate.
- .9 Do not dispose of unused preservative material into sewer system, into streams, lakes, onto ground or in other locations where they will pose health or environmental hazard.

PART 2 PRODUCTS

2.1 LUMBER MATERIAL

- .1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% or less in accordance with following standards:
 - .1 CAN/CSA-O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
- .2 Furring, blocking, nailing strips roof curbs and fascia backing:
 - .1 No.2 or better grade, pressure treated where in contact with soil and at roof applications.
 - .2 Dimension sizes: "Standard" light framing or better grade.

2.2 PANEL MATERIALS

- .1 Canadian softwood plywood (CSP): to CSA O151, standard construction.
- .2 Pressure treated or preservative coated where in contact with soil and at roof applications.

2.3 ACCESSORIES

- .1 Nails, spikes and staples: to CSA B111.
- .2 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.

- .3 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, explosive actuated fastening devices, recommended for purpose by manufacturer.

2.4 FINISHES

- .1 Galvanizing: to CAN/CSA-G164, use galvanized fasteners for exterior work interior highly humid areas pressure- preservative fire-retardant treated lumber.

2.5 WOOD PRESERVATIVE

- .1 Surface-applied wood preservative: copper naphthenate or 5% pentachlorophenol solution, water repellent preservative.
- .2 Pentachlorophenol use is restricted to building components that are in ground contact and subject to decay or insect attack only. Where used, pentachlorophenol-treated wood must be covered with two coats of an appropriate sealer.
- .3 Structures built with wood treated with pentachlorophenol and inorganic arsenicals must not be used for storing food nor should the wood come in contact with drinking water.

PART 3 EXECUTION

3.1 PREPARATION

- .1 Treat surfaces of material with wood preservative, before installation.
- .2 Apply preservative by dipping, or by brush to completely saturate and maintain wet film on surface for minimum 3 minute soak on lumber and one minute soak on plywood.
- .3 Re treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.
- .4 Treat material as indicated and as follows:
 - .1 Wood cants, fascia backing, curbs, nailers, sleepers on roof deck.

3.2 INSTALLATION

- .1 Install furring and blocking as required to space-out and support fascia, soffit, siding and other work as required.
- .2 Align and plumb faces of furring and blocking to tolerance of 1:600.
- .3 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.

- .4 Install fascia backing and nailers, and other wood supports as required and secure using galvanized steel fasteners.
- .5 Use caution when working with particle board. Use dust collectors and high quality respirator masks.

3.3 ERECTION

- .1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .2 Countersink bolts where necessary to provide clearance for other work.

3.4 SCHEDULES

- .1 Provide electrical equipment backboards for mounting electrical and telecommunications/data equipment as indicated.
- .2 Use 19 mm thick fire retardant treated plywood on 19 x 38 mm furring spaced at maximum 300 mm centres and at vertical edges of mounting board.

END OF SECTION

Part 1 General

1.1 SCOPE

- .1 This section includes requirements for finish carpentry, supply of cabinets, counter tops, interior window sills and related work.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI A208.1-99, Particleboard.
 - .2 ANSI A208.2-94, Medium Density Fiberboard (MDF).
- .2 Architectural Woodwork Manufacturers Association of Canada (AWMAC)
 - .1 AWMAC Quality Standards for Architectural Woodwork, 1994.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-71.20-M88, Adhesive, Contact, Brushable.
- .4 Canadian Standards Association (CSA)
 - .1 CSA B111-74(R1998), Wire Nails, Spikes and Staples.
 - .2 CSA O112.4-M1977 (R1999), Standards for Wood Adhesives.
 - .3 CSA O121-M89 (R1998), Douglas Fir Plywood.

1.3 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with **Section 01330 - Submittal Procedures**.
- .2 Indicate details of construction, profiles, jointing, fastening and other related details.
- .3 Indicate materials, thicknesses, finishes and hardware.
- .4 Indicate locations of service outlets in casework, typical and special installation conditions, and connections, attachments, anchorage and location of exposed fastenings.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, handle, store and protect materials of this section in accordance with General Requirements.
- .2 Protect millwork against dampness and damage during and after delivery.
- .3 Store millwork in ventilated areas, protected from extreme changes of temperature or humidity.

Part 2 Products

2.1 MATERIALS

- .1 Softwood lumber: unless specified otherwise, S4S, moisture content 19% or less in accordance with following standards:
 - .1 CAN/CSA-O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
 - .3 AWMAC custom premium grade, moisture content as specified.
 - .2 Machine stress-rated lumber is acceptable for all purposes.
 - .3 Hardwood lumber: moisture content 15% or less in accordance with following standards:
 - .1 National Hardwood Lumber Association (NHLA).
 - .2 AWMAC custom grade, moisture content as specified.
 - .4 Canadian softwood plywood (CSP): to CSA O151, standard construction.
 - .5 Laminated plastic for flatwork: GP grade, satin finish, selected from standard solid colour or woodgrain range.
 - .6 Laminated plastic for counter tops and window sills: to lab grade, matte finish
 - .7 Nails and staples: to CSA B111.
 - .8 Wood screws: plated steel, type and size to suit application.
 - .9 Splines: wood.
 - .10 Sealant: clear silicone.
 - .11 Laminated plastic adhesive: contact adhesive to CAN/CGSB-71.20.
 - .1 Test for acceptable VOC emissions in accordance with ASTM D 2369 and ASTM D 2832.
 - .2 Acceptable materials: ECP-44.
- 2.2 Manufactured Units
- .1 Casework.
 - .1 Fabricate casework to AWMAC premium quality grade.
 - .2 Furring, blocking, nailing strips, grounds and rough bucks and sleepers.
 - .1 S2S is acceptable for concealed locations.
 - .2 Board sizes: "Standard" or better grade.
 - .3 Dimension sizes: "Standard" light framing or better grade.
 - .3 Case bodies (ends, divisions and bottoms).
 - .1 Softwood and poplar plywood square edge, 19 mm thick.
 - .4 Backs.

- .1 Softwood and poplar plywood square edge, 12 mm thick.
- .2 Exposed faces and covered with plastic laminate.
- .5 Shelving.
 - .1 Softwood and poplar plywood square edge, 19 mm thick.
 - .2 Exposed faces and edges covered with plastic laminate.
- .2 Drawers
 - .1 Fabricate drawers to AWMAC premium grade supplemented as follows:
 - .2 Sides and Backs.
 - .1 Softwood and poplar plywood square edge, 12 mm thick.
 - .3 Exposed faces covered with plastic laminate.
 - .4 Edges fitted with PVC colour matched moulding, full thickness of panel material, minimum thickness 3 mm, rounded profile.
 - .5 Bottoms.
 - .1 Softwood and poplar plywood 12 mm thick.
 - .6 Fronts.
 - .1 Softwood and poplar plywood square edge, 19 mm thick.
- .3 Doors
 - .1 Fabricate doors to AWMAC premium grade supplemented as follows:
 - .2 Softwood and poplar plywood square edge, 19 mm thick.
 - .3 Exposed faces covered with plastic laminate.
 - .4 Edges fitted with PVC colour matched moulding, full thickness of panel material, minimum thickness 3 mm, rounded profile.
- .4 Counter top
 - .1 Moulded one piece counter top and 100 high backsplash covered with lab grade plastic laminate with square edge rounded profile.
 - .2 Provide sidesplash pieces at each end abutting a wall or other surface.

2.3 FABRICATION

- .1 Provide metal drawer sides, bottom and backs with adjustable stops at file drawers.
- .2 Shop install cabinet hardware for doors, shelves and drawers. Recess shelf standards unless noted otherwise.
- .3 Shelving to cabinetwork to be adjustable unless otherwise noted.
- .4 Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes and other fixtures.
- .5 Shop assemble work for delivery to site in size easily handled and to ensure passage through building openings.
- .6 Obtain governing dimensions before fabricating items which are to accommodate or abut Appliances, equipment and other materials.
- .7 Ensure adjacent parts of continuous laminate work match in colour and pattern.

- .8 Veneer laminated plastic to core material in accordance with adhesive manufacturer's instructions. Ensure core and laminate profiles coincide to provide continuous support and bond over entire surface. Use continuous lengths up to 3000 mm. Keep joints 600 mm from sink cutouts.
- .9 Form shaped profiles and bends as indicated, using postforming grade laminate to laminate manufacturer's instructions.
- .10 Apply laminate backing sheet to reverse side of core of plastic laminate work.
- .11 Apply laminated plastic liner sheet to interior of cabinetry.

Part 3 Execution

3.1 INSTALLATION

- .1 Do architectural woodwork to Quality Standards of the Architectural Woodwork Manufacturers Association of Canada (AWMAC), except where specified otherwise.
- .2 Install prefinished millwork at locations shown on drawings. Position accurately, level, plumb straight.
- .3 Fasten and anchor millwork securely. Provide heavy duty fixture attachments for wall mounted cabinets.
- .4 Use draw bolts in countertop joints.
- .5 Scribe and cut as required to fit abutting walls and to fit properly into recesses and to accommodate piping, columns, fixtures, outlets or other projecting, intersecting or penetrating objects.
- .6 At junction of plastic laminate counter back splash and adjacent wall finish, apply small bead of sealant.
- .7 Apply bituminous coating over wood framing members in contact with masonry or cementitious construction.
- .8 Scribe base and filler pieces to adjacent construction within 2 mm gap.
- .9 Fit hardware accurately and securely in accordance with manufacturer's written instructions.
- .10 Site apply laminated plastic to window sills as indicated. Adhere laminated plastic over entire surface. Make corners with hairline joints. Use full sized laminate sheets. Make joints only where approved. Slightly bevel arises.
- .11 For site application, offset joints in plastic laminate facing from joints in core.

3.2 CLEANING

- .1 Clean millwork and cabinet work inside cupboards and drawers and outside surfaces.
- .2 Remove excess glue from surfaces.

3.3 PROTECTION

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

END OF SECTION

DIVISION 07

THERMAL AND MOISTURE PROTECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C591-01, Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
 - .2 ASTM C1289-05a, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
 - .3 ASTM E96/E96M-05, Standard Test Methods for Water Vapour Transmission of Materials.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 71-GP-24M-77(R1983), Adhesive, Flexible, for Bonding Cellular polystyrene Insulation.
- .3 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings.
 - .2 CAN/ULC-S702-97, Standard for Thermal Insulation, Mineral Fibre, for Buildings.
 - .3 CAN/ULC-S704-03, Standard for Thermal Insulation Polyurethane and Polyisocyanurate, Boards, Faced.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.2 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.
 - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples. Indicate VOC's insulation products and adhesives.
- .2 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Construction Waste Management and Disposal.

- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site for recycling in accordance with Waste Reduction Workplan.

PART 2 PRODUCTS

2.1 INSULATION

- .1 Rigid Insulation: Styrofoam SM by Dow Chemical Canada Inc., or approved equal, expanded closed cell polystyrene to CAN/CGSB-51.20 Type 4.
- .2 Provide in total thickness and depth as shown on the drawings.

2.2 ADHESIVE

- .1 Adhesive (for polystyrene): to CGSB 71-GP-24, compatible with specified insulation.

2.3 TAPE

- .1 Purpose made high tensile self-adhering red mylar tape 50 mm wide specifically intended for the applications.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 WORKMANSHIP

- .1 Install insulation after building substrate materials are dry.
- .2 Install insulation to maintain continuity of thermal protection to building elements and spaces.
- .3 Fit insulation tight around electrical boxes, plumbing and heating pipes and ducts, around exterior doors and windows and other protrusions.
- .4 Keep insulation minimum 75 mm from heat emitting devices.
- .5 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.

- .6 Offset both vertical and horizontal joints in multiple layer applications.
- .7 Do not enclose insulation until it has been inspected and approved by Departmental Representative or designate.

3.3 EXAMINATION

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

3.4 RIGID INSULATION INSTALLATION

- .1 Apply adhesive to substrate in accordance with manufacturer's recommendations. At above grade locations.
- .2 Imbed insulation boards into vapour barrier type adhesive, applied as specified, prior to skinning of adhesive.
- .3 Cover all joints with 50 mm wide self-adhering tape centered on joints.

3.5 CLEANING

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

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S705.1-01: Standard for Thermal Insulation – Spray Applied Rigid Polyurethane Foam, Medium Density – Material Specification.
 - .2 CAN/ULC-S705.2-05: Standard for Thermal Insulation – Spray Applied Rigid Polyurethane Foam, Medium Density, Application.
- .2 CCMC 13467-R – Evaluation of BASF Walltite ECO as an air barrier system.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.2 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.
 - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples. Indicate VOC's insulation products and adhesives.
- .2 Name of installer complete with proof that installer is licensed or approved by Canadian Urethane Foam Contractors Association (CUFCA), National Energy Conservation Association (NECA), or by the Quality and Training Program – Raising Performance To New Heights by BASF and certified by Morrison Hershfield, to perform the installation of the insulation as an insulation/air barrier system.
- .3 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.
 - .2 Submit manufacturer's printed product literature, specifications and datasheet and include:
 - .1 Product characteristics.
 - .1 Performance criteria.
 - .2 Limitations.

1.3 TEST REPORTS

- .1 Submit test reports, verifying qualities of insulation meet or exceed requirements of this specification.

- .2 Submit test reports in accordance with CAN/ULC-S101 for fire endurance and CAN/ULC-S102 for surface burning characteristics.

1.4 QUALITY ASSURANCE

- .1 Personnel licensed or approved by CUFCA, NECA, or by the Quality and Training Program – Raising Performance to New Heights by BASF and certified by Morrison Hershfield must apply the insulating material. These certified individuals must have their certification cards in their possession and available for presentation upon request. The certification cards must show the proper level of certification for the polyurethane foam application and air barrier system being performed as part of this Work; Level 1 (Basic), Level 2 (Superior), or Foam Masters (Elite Level) for the polyurethane foam application and air barrier system. A Foam Masters applicator is automatically approved for all.
- .2 The system applicator shall include and pay all costs for testing of the installation, as required by the licensing/approval authority.
- .3 A copy of the manufacturer's technical manual for the application of sprayed-on polyurethane foam must be kept on site with the section for the air barrier system application guidelines.

1.5 SAFETY REQUIREMENTS

- .1 Protect workers as recommended by CAN/ULC-S705.2 and manufacturer's recommendations:
 - .1 Workers must wear gloves respirators dust masks long sleeved clothing eye protection protective clothing when applying foam insulation.
 - .2 Workers must not eat, drink or smoke while applying foam insulation.

1.6 PROTECTION

- .1 Provide temporary enclosures to prevent spray and noxious vapours from contaminating air beyond application area.
- .2 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of insulation materials.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Construction Waste Management and Disposal.
- .2 Dispose of waste foam daily in location designated by Departmental Representative or designate and decontaminate empty drums in accordance with foam manufacturer's instructions CAN/ULC-S705.2.

- .3 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .4 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site for recycling in accordance with Waste Reduction Workplan.

1.8 ENVIRONMENTAL REQUIREMENTS

- .1 Apply insulation only when surfaces and ambient temperatures are within manufacturers' prescribed limits.

PART 2 PRODUCTS

2.1 SPRAY-IN-PLACE POLYURETHANE FOAM INSULATION

- .1 Polyurethane Foam: a spray applied polyurethane foam, closed cell, medium density, listed under CAN/ULC S705.1, with CCMC #13467-R for use as an insulation/air barrier system, according to CCMC technical guide: Air Barrier System for exterior walls of low-rise buildings, Master Format Section : 07272, with the following physical properties:
 - .1 Product: WALLTITE ECO by BASF.
 - .2 Blowing Agent: product to utilize Zero Ozone Depleting Substance blowing agent.
 - .3 Density (ASTM D-1622) minimum = 28.4 kg/m³ (1.77 lb/ft.³).
 - .4 Compressive strength (ASTM D-1621), parallel to rise (10% compression) = 199 kPa (29 psi).
 - .5 Tensile strength (ASTM D-1623) = 396 kPa (57 psi).
 - .6 Open cell content (ASTM D-2856) = 4.56%.
 - .7 Water absorption (ASTM D-2842) % by volume = 0.62%.
 - .8 Dimensional stability (ASTM D-2126), % volume change after 28 days:
 - +20°C (-4°F) ambient humidity = 0.96%
 - +80°C (176°F) ambient humidity = 5.11%
 - +70°C (158°F) with relative humidity 97% = 8.60%.
 - .9 Thermal resistance approved by CAN/ULC-S705.1.
 - .10 Long Term Thermal Resistance CAN/ULC-S770
 - RSI 0.93/25mm for thicknesses of 25mm to 50mm
 - RSI 0.93/25mm for thicknesses of >50mm to 75mm
 - RSI 0.97/25mm for thicknesses of >75mm to 100mm
 - RSI 1.00/25mm for thicknesses of 100mm and greater.
 - .11 Water vapour permeance (ASTM E-96) – without the skins, core only = 50 ng/Pa•s•m² @ 50mm (0.87 perm @ 2”).
 - .12 Flame spread classification (CAN/ULC-S102, incl. S127) = <500.
 - .13 Smoke development = <500.
 - .14 Volatile Organic Compound (VOC) emissions during aging CAN/ULC S774 below detection limit after 24 hrs.

- .2 Heatlok Soya as manufactured by Demilec Inc. may be approved equal, provided it meets the specified criteria. Submit manufacturer's product literature for review by Consultant. Product shall be in accordance with CCMC #12380-R for insulation, CCMC #12893-R for air barrier material, and in accordance with the technical guide requirements of CCMC #07272 for air-barrier system. Transition membranes, through-wall flashing, primers, sealants, and other related materials shall be of types as recommended by manufacturer.
- .3 Foam-Lok as manufactured by Lapolla Canada may be approved equal, provided it meets the specified criteria. Submit manufacturer's product literature for review by Consultant. Product shall be in accordance with CCMC #13414-L for insulation. Submit testing and approval information certifying use as an air-barrier material and system. Transition membranes, through-wall flashing, primers, sealants, and other related materials shall be of types as recommended by manufacturer.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

- .1 Surfaces must be clean and dry, as required by CAN/ULC-S705.2-98. The substrate must be free of all frost, dust, oil, grease, oxidization, or any other element that may affect adhesion of the system i.e. high moisture content.
- .2 Metallic surfaces should be checked to ensure no oxidization has occurred.
- .3 All transition membranes must be installed prior to application of the polyurethane foam. These membranes must be installed in accordance with the manufacturer's recommendations. Adhesion of the membranes to the substrate must be sufficient to resist the stress applied by the polyurethane foam during the curing time.
- .4 All of the following stages must be completed prior to application of the insulating / air barrier system:
 - .1 Installation of masonry anchoring system.
 - .2 Installation of wood blocking required at all openings.
 - .3 Installation of any electrical or mechanical penetrations.
 - .4 Adjacent areas have been protected via drop sheets or polyethylene masking.

3.2 APPLICATION

- .1 Apply insulation to clean surfaces in accordance with CAN/ULC-S705.2 and manufacturer's printed instructions. Use primer where recommended by manufacturer.
- .2 Apply sprayed foam insulation in thickness 89 mm.

- .3 All excessively wide joints should be covered or filled before applying the polyurethane foam.
- .4 Polyurethane foam when used for insulation purposes, should be sprayed as per the Standard CAN/ULC-S705.2 with a tolerance of +6 /-0 mm in relation to the specified thickness. When the intent of the spray polyurethane is for the insulation / air barrier system and the thickness specified is 25 mm then to respect the air barrier system tests results, the tolerance is +6/-0 mm.
- .5 Avoid the formation of sub-layer air pockets when applying.
- .6 Avoid spraying the foam on any surfaces other than those indicated. Use drop sheets or masking tape to protect other surfaces.
- .7 Once the foam has hardened, remove all overspray from non-prescribed surfaces.
- .8 Do not allow polyurethane foam once applied, to be damaged during work by other trades.
- .9 Ensure the subsequent coverage of the applied insulating foam will be completed within the manufacturer's prescribed time frame.
- .10 Spray the polyurethane foam in overlapping layers, so as to obtain a smooth, uniform surface.
- .11 Do not spray polyurethane foam any closer than 75 mm from chimneys, heating vents, steam pipes, recessed lighting fixtures, and other heat sources. Do not spray the interior of any exit openings or electrical junction boxes.
- .12 All mechanical fixtures should be covered with polyurethane foam in order to reduce thermal bridging.

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 American Society for Testing and Materials International (ASTM)
 - .1 ASTM D412-98a(2002)e1, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 37.58-M86, Membrane, Elastomeric, Cold-Applied Liquid, for Non-Exposed Use in Roofing and Waterproofing.
 - .2 CAN/CGSB-51.33-M89, Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction.
 - .3 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.

1.2 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include:
 - .1 Product characteristics.
 - .2 Performance criteria.
 - .3 Limitations.
- .3 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS).
- .4 Quality assurance submittals:
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .2 Instructions: submit manufacturer's installation instructions and comply with written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Construction Waste Management and Disposal.

PART 2 PRODUCTS

2.1 SHEET VAPOUR BARRIER

- .1 Polyethylene film: to CAN/CGSB-51.34, 0.15 mm (6 mil) thick.

2.2 ACCESSORIES

- .1 Joint sealing tape: air resistant pressure sensitive adhesive tape, red mylar tape type recommended by vapour barrier manufacturer, 50 mm wide for lap joints and perimeter seals, 25 mm wide elsewhere.
- .2 Sealant: compatible with vapour retarder materials, recommended by vapour retarder manufacturer.
- .3 Staples: minimum 6 mm leg.
- .4 Moulded box vapour barrier: factory-moulded polyethylene box for use with recessed electric switch and outlet device boxes.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Sheet Vapour Barrier:
 - .1 Ensure services are installed and inspected prior to installation of retarder.
 - .2 Install sheet vapour retarder on warm side of exterior wall assemblies to form continuous retarder.
 - .3 Use sheets of largest practical size to minimize joints.
 - .4 Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed.

3.2 PERIMETER SEALS

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

3.3 LAP JOINT SEALS

- .1 Seal lap joints of sheet vapour barrier as follows:
 - .1 Attach first sheet to substrate.
 - .2 Apply continuous bead of sealant over solid backing at joint.
 - .3 Lap adjoining sheet minimum 150 mm and press into sealant bead.
 - .4 Install staples through lapped sheets at sealant bead into wood substrate.
 - .5 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.
 - .6 Continuously tape seams with 50mm wide tape where sealant method is impractical.

3.4 ELECTRICAL BOXES

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

3.5 CLEANING

- .1 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Materials and installation for modified bituminous roofing systems, including total removal of existing roofing materials down to roof deck and provision of new insulation, built-up curbs, roofing, flashings, sheet metal, and related work.

1.2 RELATED SECTIONS

- .1 Section 06 10 11 – Rough Carpentry.
- .2 Section 07 62 00 – Sheet Metal Flashings and Trim.
- .3 Section 07 92 10 – Joint Sealing.

1.3 REFERENCES

- .1 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement.
 - .2 CGSB 37-GP-9Ma-83, Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing.
 - .3 CGSB 37-GP-15M-84, Application of Asphalt Primer for Asphalt Roofing, Dampproofing and Waterproofing.
 - .4 CGSB 37-GP-19M-85, Cement, Plastic, Cutback Tar.
 - .5 CAN/CGSB-37.29-M89, Rubber-Asphalt Sealing Compound.
 - .6 CGSB 37-GP-56M-80b(A1985), Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing.
- .2 Canadian Roofing Contractors Association (CRCA).
 - .1 CRCA Roofing Specifications Manual-1997.
- .3 Canadian Standards Association (CSA International).
 - .1 CAN/CSA-A123.3-98, Asphalt Saturated Organic Roofing Felt.
 - .2 CAN/CSA-A123.4-04, Asphalt for Use in Construction of Built-Up Roof Coverings and Waterproofing Systems.
 - .3 CSA A231.1-99, Precast Concrete Paving Slabs.
- .4 Health Canada / Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .5 Underwriters Laboratories' of Canada (ULC).
 - .1 CAN/ULC-S701-01, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .2 CAN/ULC-S704-03, Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
 - .3 CAN/ULC-S706-02, Standard for Wood Fibre Thermal Insulation for Buildings.

1.4 PERFORMANCE REQUIREMENTS

- .1 Compatibility between components of roofing system is essential. Provide written declaration to Departmental Representative or designate stating that materials and components, as assembled in system, are compatible with adjacent materials and job site conditions.

1.5 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.
- .2 Submit two copies of most recent technical roofing components data sheets describing materials' physical properties.
- .3 Submit WHMIS MSDS – Material Safety Data Sheets in accordance with Section 02 61 33 – Hazardous Materials.
 - .1 Indicate VOC content for:
 - .1 Primers.
 - .2 Asphalt.
 - .3 Sealers.
 - .4 Filter fabric.
- .4 Submit shop drawings in accordance with Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.
- .5 Indicate flashing, control joints, tapered insulation details.
- .6 Provide layout for tapered insulation.

1.6 STORAGE AND HANDLING

- .1 Provide and maintain dry, off-ground weatherproof storage.
- .2 Store rolls of felt and membrane in upright position. Store membrane rolls with selvage edge up.
- .3 Remove only in quantities required for same day use.
- .4 Place plywood runways over completed Work to enable movement of material and other traffic.
- .5 Store sealants at +5°C minimum.
- .6 Store insulation protected from daylight and weather and deleterious materials.
- .7 Handle roofing materials in accordance with manufacturer's written directives, to prevent damage or loss of performance.

1.7 PROTECTION

- .1 Fire Extinguishers: maintain one stored pressure rechargeable type with hose and shut-off nozzle, ULC labeled for A, B and C class protection. Size as indicated on roof torch applicator, stored within 6 m of torch applicator.
- .2 Maintain fire watch for 1 hour after each day's roofing operations cease.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Construction Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Separate for reuse and recycling and place in designated containers Steel Metal Plastic waste in accordance with Waste Management Plan.
- .5 Place materials defined as hazardous or toxic in designated containers.
- .6 Clearly label location of salvaged material's storage areas and provide barriers and security devices.
- .7 Ensure emptied containers are sealed and stored safely.
- .8 Fold up metal banding, flatten and place in designated area for recycling.

1.9 ENVIRONMENTAL REQUIREMENTS

- .1 Do not install roofing when temperature remains below -18°C for torch application, or -5°C to manufacturers' recommendations for mop application.
- .2 Minimum temperature for solvent-based adhesive is -5°C.
- .3 Install roofing on dry deck, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into roofing system.

1.10 WARRANTY

- .1 For the Work of this Section 07 52 00 – Modified Bituminous Membrane Roofing, the 12 months warranty period prescribed in subsection GC 32.1 of General Conditions "C" is extended to 24 months.

- .2 Contractor hereby warrants that modified bituminous roofing and membrane flashings will stay in place and remain leak proof in accordance with General Conditions (GC) – CCDC GC 12.3, but for two years.

PART 2 PRODUCTS

2.1 MEMBRANE

- .1 Base sheet: to CGSB 37-GP-56M polyester fibres to ASTM D6164 glass fibres to ASTM D6163 combination of polyester and glass fibres to ASTM D6162.
 - .1 Styrene-Butadiene-Styrene (SBS) elastomeric polymer prefabricated sheet, polyester reinforcement, having nominal weight of 180 g/m².
 - .2 Type 2, fully adhered.
 - .3 Class C - plain surfaced.
 - .4 Grade 1 - standard service.
 - .5 Top and bottom surfaces:
 - .1 Sanded/polyethylene.
 - .6 Base sheet membrane properties: to CGSB 37-GP-56M.
 - .1 Strain energy (longitudinal/transversal): 9.0/7.0 kN/m.
 - .2 Breaking strength (longitudinal/transversal): 17.0/18.0 N/5 cm.
 - .3 Ultimate elongation (longitudinal/transversal): 60/70 %.
 - .4 Tear resistance: 85 N.
 - .5 Cold bending at -30°C: no cracking.
 - .6 Softening point: ∃ 110°C.
 - .7 Static puncture resistance: > 400.
 - .8 Dimensional Stability: -0.3 / 0.3 %.
 - .7 ULC certification: Class A.
- .2 Cap sheet membrane: to CGSB 37-GP-56M combination of polyester and glass fibres to ASTM 6162.
 - .1 Styrene-Butadiene-Styrene (SBS) elastomeric polymer, prefabricated sheet, polyester reinforcement, having nominal weight of 250 g/m².
 - .2 Type 2, fully adhered.
 - .3 Class A-granule surfaced
 - .1 Colour for granular surface: to be determined.
 - .4 Grade 1-standard service.
 - .5 Bottom surface polyethylene.
 - .6 Cap sheet membrane properties: to CGSB 37-GP-56M.
 - .1 Strain energy (longitudinal/transversal): 13.0/10.0 kN/m.
 - .2 Breaking strength (longitudinal/transversal): 25.0/16.0 kN/m.
 - .3 Ultimate elongation (longitudinal/transversal): 63/73 %.
 - .4 Tear resistance: 80 N.
 - .5 Cold bending at -30°C: No cracking.
 - .6 Softening point: ∃ 110°C.
 - .7 Static puncture resistance: > 400.
 - .8 Dimensional Stability: -0.2 / 0.2 %.
 - .7 ULC certification: Class A.

2.2 TAPERED INSULATION

- .1 Boards tapering in thickness to create uniform slope of 1% (1:100), composed of organic/inorganic glass facers bonded to a core of isocyanurate foam insulation. Minimum thickness 12 mm.
- .2 Provide shop drawing indicating proposed layout showing positive slopes to roof drains, crickets at mechanical equipment and other roof obstructions etc.

2.3 INSULATION

- .1 Boards of uniform thickness composed organic/inorganic glass facers bonded to a uniform thickness core of isocyanurate foam insulation. Minimum RSI value 5.3.
- .2 Maximum board size 1.2m x 1.2m, installed in two layers with staggered joints.

2.4 OVERLAY BOARD

- .1 Overlay Board: 6 mm thick asphalt based recovery board with non-woven glass facers, as recommended by the membrane manufacturer.

2.5 SEALING PRODUCT

- .1 Description: Composed of a bitumen/polyurethane waterproofing mono-component and polyester reinforcements. Designed to finish upstands and details. (no-flame installation).
- .2 Specified product: ALSAN FLASHING by SOPREMA.
- .3 Plastic cement: asphalt, to CAN/CGSB-37.5 coal tar, to CGSB 37-GP-19M.
- .4 Sealing compound: to CAN/CGSB-37.29, rubber asphalt type.
- .5 Sealants: Caulking – see Section 07 92 10 – Joint Sealing.

2.6 CARPENTRY

- .1 Refer to Section 06 10 11 – Rough Carpentry.

2.7 CANT STRIPS

- .1 Cut from fibre-board material, to measure 90 mm on slope.

PART 3 EXECUTION

3.1 WORKMANSHIP

- .1 Do examination, preparation and roofing Work in accordance with CRCA Roofing Specification Manual.
- .2 Do priming for asphalt roofing in accordance with CGSB 37-GP-15M.
- .3 Assembly, component and material connections will be made in consideration of appropriate design loads, with reversible mechanical attachments.

3.2 EXAMINATION OF ROOF DECKS

- .1 Prior to beginning of work ensure:
 - .1 Decks are firm, straight, smooth, dry, free of snow, ice or frost, and swept clean of dust and debris. Do not use calcium or salt for ice or snow removal.
 - .2 Curbs have been built.
 - .3 Roof drains have been installed at proper elevations relative to finished roof surface.
 - .4 Plywood and lumber nailer plates have been installed to deck, walls and parapets as indicated.
- .2 Do not install roofing materials during rain or snowfall.

3.3 PROTECTION

- .1 Cover walls, walks and adjacent work where materials hoisted or used.
- .2 Use warning signs and barriers. Maintain in good order until completion of Work.
- .3 Clean off drips and smears of bituminous material immediately.
- .4 Dispose of rain water off roof and away from face of building until roof drains or hoppers installed and connected.
- .5 Protect roof from traffic and damage.
- .6 At end of each day's work or when stoppage occurs due to inclement weather, provide protection for completed Work and materials out of storage.
- .7 Metal connectors and decking will be treated with rust proofing or galvanization.

3.4 CANTS

- .1 Install prefabricated fibre cants over rigid insulation and secure to wood parapet framing.

- .2 Angle cut cants to fit tightly on back and bottom where roof to wall angle varies from 90 degrees.

3.5 EXPOSED MEMBRANE ROOFING APPLICATION

- .1 Tapered insulation application:
 - .1 Apply insulation to vapour retarder or to adjoining board imbedded in hot bitumen.
 - .2 Install tapered insulation as first insulation layer, in accordance with shop drawings.
 - .3 Stagger joints between layers 150 mm minimum.
- .2 Uniform thickness insulation application:
 - .1 Apply insulation to tapered insulation imbedded in hot bitumen.
 - .2 Stagger joints between layers 150 mm minimum.
- .3 Overlay Board: mechanically attached:
 - .1 Adhere overlay board to insulation and secure with fasteners through washers into roof deck spaced in accordance with FM-Global requirements for an I-60 rating.
 - .2 Place boards in parallel rows with end joints staggered. Cap joints approximately 25 mm.
- .4 Base sheet application:
 - .1 Starting at low point of roof, perpendicular to slope, unroll base sheet, align and reroll from both ends.
 - .2 Unroll and embed base sheet in uniform coating of asphalt applied at rate of 1.2 kg/m², at 230°C.
 - .3 Lap sheets 75 mm minimum for side and 150 mm minimum for end laps.
 - .4 Application to be free of blisters, wrinkles and fishmouths.
- .5 Cap sheet application:
 - .1 Starting at low point on roof, perpendicular to slope, unroll cap sheet, align and reroll from both ends.
 - .2 Apply boards to substrate embed in uniform coating of asphalt applied at rate of 1.2 kg/m², at 230°C. All vertical joints between boards and insulation will be staggered.
 - .3 All the panels must be in perfect connection, without any significant differences in level, and must be adhered on all their surfaces completely.
 - .4 Apply only as many boards as can be covered in the same day.
 - .5 Around the drain, cut out a slight slope of 0 to 10 mm in a 600 mm radius.
 - .6 Lap sheets 75 mm minimum for side laps and 150 mm minimum for end laps. Offset joints in cap sheet 300 mm minimum from those in base sheet.
 - .7 Application to be free of blisters, fishmouths and wrinkles.
 - .8 Do membrane application in accordance with manufacturer's recommendations.

- .6 Flashings:
 - .1 Complete installation of flashing base sheet stripping prior to installing membrane cap sheet.
 - .2 Nail mop torch base and cap sheet onto substrate in 1 m wide strips.
 - .3 Lap flashing base sheet to membrane base sheet minimum 150 mm and seal by mopping or torch welding.
 - .4 Lap flashing cap sheet to membrane cap sheet 250 mm minimum and torch weld.
 - .5 Provide 75 mm minimum side lap and seal.
 - .6 Properly secure flashings to their support, without sags, blisters, fishmouths or wrinkles.
 - .7 Do work in accordance with manufacturer's recommendations Section 07 62 00 – Sheet Metal Flashing and Trim.

- .7 Roof penetrations:
 - .1 Install roof drain pans, vent stack covers, fall protection and other roof penetration flashings and seal to membrane in accordance with manufacturer's recommendations and details.

- .8 Scuppers:
 - .1 Provide pre finished sheet metal scuppers to extend beyond building face by 150 mm.
 - .2 Adhere roofing membrane and flashings to scuppers and seal all intersections for fully waterproof construction.

3.6 FIELD QUALITY CONTROL

- .1 Inspection and testing of roofing application will be carried out by testing laboratory designated by Departmental Representative or designate.
- .2 Costs of tests will be paid under cash allowance by Owner.

3.7 CLEANING

- .1 Remove bituminous markings from finished surfaces.
- .2 In areas where finished surfaces are soiled caused by work of this section, consult manufacturer of surfaces for cleaning advice and complying with their documented instructions.
- .3 Repair or replace defaced or disfigured finishes caused by work of this section.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.
- .2 Section 01 74 19 – Construction Waste Management and Disposal.
- .3 Section 07 52 00 – Modified Bituminous Membrane Roofing.
- .4 Section 07 92 10 – Joint Sealing.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM International)
 - .1 ASTM A606-01, Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance.
 - .2 ASTM A653/A653M-01a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .3 ASTM A792/A792M-02, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - .4 ASTM D523-89(1999), Standard Test Method for Specular Gloss.
 - .5 ASTM D822-01, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
- .2 Canadian Roofing Contractors Association (CRCA)
 - .1 Roofing Specifications Manual 1997.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-19.13-M87, sealing compound, one component, silicone base, chemical curing.
 - .2 CAN/CGSB-19.24-M90, sealing compound, multi-component, chemical curing.
 - .3 CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement.
 - .4 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
 - .5 CAN/CGSB-93.1-M85, Sheet Aluminum Alloy, Prefinished, Residential.

- .4 Canadian Standards Association (CSA International)
 - .1 CSA A123.3-98, Asphalt Saturated Organic Roofing Felt.
 - .2 CSA B111-1974(R1998), Wire Nails, Spikes and Staples.

1.3 SAMPLES

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

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Construction Waste Management and Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Place materials defined as hazardous or toxic in designated containers.
- .5 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .6 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative or designate.
- .7 Unused paint and sealant material must be disposed of at an official hazardous material collections site as approved by Departmental Representative or designate.
- .8 Unused paint and sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
- .9 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 PRODUCTS

2.1 SHEET METAL MATERIALS

- .1 Zinc coated steel sheet: commercial quality to ASTM A653/A653M, with Z275 designation zinc coating.
- .2 Aluminum-zinc alloy coated steel sheet: to ASTM A792/A792M, commercial quality.

2.2 PREFINISHED STEEL SHEET

- .1 Prefinished steel with factory applied polyvinylidene fluoride.
 - .1 Class F1S.
 - .2 Colour selected from manufacturer's standard range to match pre-finished metal roofing.
 - .3 Specular gloss: 30 units +/- in accordance with ASTM D523.
 - .4 Coating thickness: not less than 22 micrometres.

2.3 ACCESSORIES

- .1 Isolation coating: alkali resistant bituminous paint.
- .2 Plastic cement: to CAN/CGSB 37.5.
- .3 Underlay for metal flashing: No. 15 perforated asphalt felt to CSA A123.3.
- .4 Sealant: refer to Section 07 92 10 – Joint Sealing.
- .5 Cleats: of same material, and temper as sheet metal, minimum 50 mm wide. Thickness, same as sheet metal being secured.
- .6 Fasteners: of same material as sheet metal, to CSA B111, ring thread flat head roofing nails of length and thickness suitable for metal flashing application.
- .7 Washers: of same material as sheet metal, 1 mm thick with rubber packings.
- .8 Touch-up paint: as recommended by prefinished material manufacturer.

2.4 FABRICATION

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

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install sheet metal work in accordance with CRCA FL series details, and in accordance with good building practice.
- .2 Use concealed fastenings except where approved before installation.
- .3 Provide underlay under sheet metal. Secure in place and lap joints 100 mm.
- .4 Form scuppers, flashings, copings and fascias to profiles indicated, or required.
- .5 Form pieces in maximum practical lengths. Make allowance for expansion at joints. Hem exposed edges 13 mm on underside. Exposed raw edges not permitted.
- .6 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .7 Apply isolation coating to flashing surfaces contacting dissimilar materials where electrolytic or chemical reactions could occur.
- .8 Install continuous locking strips for concealed anchorage of fascia drips, fasten at 300 mm centres maximum.
- .9 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs. Flash joints using S-lock forming tight fit over hook strips, as detailed.
- .10 Lock end joints and caulk with sealant.
- .11 Install surface mounted reglets true and level, and caulk top of reglet with sealant.
- .12 Insert metal flashing under cap flashing to form weather tight junction.
- .13 Turn top edge of flashing into recessed reglet or mortar joint minimum of 25 mm. Lead wedge flashing securely into joint.
- .14 Miter corners and double seam.
- .15 Provide all metal flashings required for the proper execution and completion of the work, including flashings for roof penetrations, and install in approved manner.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Materials, preparation and application for caulking and sealants.
- .2 Text to complete other various Sections containing sealant or caulking specifications, including:
 - .1 Section 07 52 00 – Modified Bituminous Membrane Roofing.

1.2 RELATED SECTIONS

- .1 Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.
- .2 Section 01 45 00 – Quality Control.
- .3 Section 01 61 00 – Material and Equipment.
- .4 Section 01 74 19 – Construction Waste Management and Disposal.

1.3 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C919-02, Standard Practice for Use of Sealants in Acoustical Applications.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 19-GP-5M-1984, Sealing Compound, One Component, Acrylic Base, Solvent Curing (Issue of 1976 reaffirmed, incorporating Amendment No.1).
 - .2 CAN/CGSB-19.13-M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.
 - .3 CGSB-19-GP-14M-1984, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing (Reaffirmation of April 1976).
 - .4 CAN/CGSB-19.17-M90, One-Component Acrylic Emulsion Base Sealing Compound.
 - .5 CAN/CGSB-19.24-M90, Multi-component, Chemical Curing Sealing Compound.
- .3 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act, 1999 (CEPA).

- .4 General Services Administration (GSA) - Federal Specifications (FS)
 - .1 FS-SS-S-200-E(2)1993, Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold Applied, for Portland Cement Concrete Pavement.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.
- .2 Manufacturer's product to describe.
 - .1 Caulking compound.
 - .2 Primers.
 - .3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.
- .3 Submit samples in accordance with Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.
- .4 Submit duplicate samples of each type of material and colour.
- .5 Cured samples of exposed sealants for each color where required to match adjacent material.
- .6 Submit manufacturer's instructions in accordance with Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.
 - .1 Instructions to include installation instructions for each product used.

1.5 QUALITY ASSURANCE

- .1 Carry out the supply and installation of sealants and caulking work by recognized Specialist Applicators having at least five years of proven satisfactory experience and having skilled workmen thoroughly trained and competent in all phases of caulking work.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, handle, store and protect materials in accordance with Section 01 61 00 – Material and Equipment.
- .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.

- .3 Store materials in dry location in such manner that no damage will be done to materials or building.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Construction Waste Reduction Workplan.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Place materials defined as hazardous or toxic in designated containers.
- .5 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.
- .6 Unused sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
- .7 Divert unused joint sealing material from landfill to official hazardous material collections site approved by Departmental Representative.
- .8 Empty plastic joint sealer containers are not recyclable. Do not dispose of empty containers with plastic materials destined for recycling.
- .9 Fold up metal banding, flatten, and place in designated area for recycling.

1.8 PROJECT CONDITIONS

- .1 Environmental Limitations:
 - .1 Do not proceed with installation of joint sealants under following conditions:
 - .1 When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4°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.

1.9 ENVIRONMENTAL REQUIREMENTS

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

1.10 WARRANTY

- .1 Provide written warranty covering the work of this Section for a period of three years from the date of Substantial Performance of the Contract.
- .2 Defective work shall include but not be restricted to leakage, cracking, crumbling, melting, running, loss of adhesion, loss of cohesion, staining of adjoining or adjacent surfaces or work.

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 offgas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize offgas time.
- .3 Where sealants are qualified with primers use only these primers.

2.2 SEALANT MATERIAL DESIGNATIONS

- .1 Sealants – Type A:
 - .1 Multi-component sealants to meet CGSB Specification CAN/CGSB-19.24, or single component sealant to meet CGSB Specification CAN/CGSB-19.13, to be used for:
 - .1 Interior and exterior joints around perimeters of metal door including thresholds and sills.
 - .2 Interior and exterior joints around perimeters of louvre frames.
 - .3 Exterior control joints.

- .4 Roof flashings.
- .2 Use one of the following sealants:
 - .1 Dymeric by Tremco (Canada) Limited.
 - .2 Proglaze by Tremco (Canada) Ltd.
 - .3 1200 Sealant by CGE Canada Ltd.
 - .4 795 Sealant by Dow Corning Canada.
- .2 Sealants – Type B:
 - .1 Acrylic solvent release, one part sealant, to meet CGSB Specification 19-GP-5M, to be used for all other locations where caulking beads remain exposed.
 - .2 Use one of the following sealants:
 - .1 Mono by Tremco (Canada) Limited.
 - .2 Acryflex by Sternson Ltd.
 - .3 Parr-Crylic by Parr Sealants of Canada Ltd.
 - .4 PR12-100 Vinyl Acrylic by PRC Canada Ltd.
- .3 Primers:
 - .1 To be of a type recommended by sealant manufacturer for the appropriate sealant and corresponding substrate.
- .4 Preformed Compressible and Non-Compressible back-up materials.
 - .1 Polyethylene, Urethane, Neoprene or Vinyl Foam.
 - .1 Extruded open closed cell foam backer rod.
 - .2 Size: oversize 30 to 50%.
 - .2 Neoprene or Butyl Rubber.
 - .1 Round solid rod, Shore A hardness 70.
 - .3 High Density Foam.
 - .1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m³ density, or neoprene foam backer, size as recommended by manufacturer.
 - .4 Bond Breaker Tape.
 - .1 Polyethylene bond breaker tape which will not bond to sealant.

2.3 COLOURS

- .1 Colours of sealant, shall match the predominant material to which sealant is applied.

2.4 JOINT CLEANER

- .1 Non-corrosive and non-taining 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 MIXING

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

3.6 APPLICATION

- .1 Sealant.
 - .1 Apply sealant in accordance with manufacturer's written instructions.
 - .2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
 - .3 Apply sealant in continuous beads.
 - .4 Apply sealant using gun with proper size nozzle.

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

END OF SECTION

DIVISION 08

OPENINGS

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 61 00 – Common Product Requirements.
- .3 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .4 Section 07 92 10 – Joint Sealing: Caulking of joints between frames and other building components.
- .5 Section 08 71 10 – Door Hardware: Supply of finish hardware, including weatherstripping and mounting heights.
- .6 Section 09 91 00 – Painting and Protective Coatings.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM International)
 - .1 ASTM A653/A653M-03, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.ASTM B29-92 (1997), Specification for Refined LeadASTM B749-97, Specification for Lead and Lead Alloy Strip, Sheet and Plate Products.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.CGSB 41-GP-19Ma-84, Rigid Vinyl Extrusions for Windows and Doors.
- .3 Canadian Standards Association (CSA International)
 - .1 G40.20/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CSA W59-M1989 (R2001), Welded Steel Construction (Metal Arc Welding) (Metric Version).
- .4 Canadian Steel Door Manufacturers' Association, (CSDMA)
 - .1 CSDMA, Specifications for Commercial Steel Doors and Frames, 1990.
 - .2 CSDMA, Recommended Selection and Usage Guide for Commercial Steel Doors, 1990.
- .5 National Fire Protection Association (NFPA)
 - .1 NFPA 80-99, Standard for Fire Doors and Fire Windows.NFPA 252-99, Standard Methods of Fire Tests of Door Assemblies.

- .6 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN4-S104-M80, Fire Tests of Door Assemblies. CAN4-S105-M85, Fire Door Frames Meeting the Performance Required by CAN4-S104.
 - .2 CAN/ULC-S701-01, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .3 CAN/ULC-S702-97, Mineral Fibre Thermal Insulation for Buildings.
 - .4 CAN/ULC-S704-03, Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

1.3 DESIGN REQUIREMENTS

- .1 Design exterior frame assembly to accommodate to expansion and contraction when subjected to minimum and maximum surface temperature of -35°C to 35°C .
- .2 Maximum deflection for exterior steel entrance screens under wind load of 1.2 kPa not to exceed 1/175th of span.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, glazed louvred, arrangement of hardware and fire rating and finishes.
- .3 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings and reinforcing firerating finishes.
- .4 Indicate details of construction and installation of all components of the work.
- .5 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.
- .6 Submit test and Departmental Representative or designate data, and installation instructions.

1.5 REQUIREMENTS

- .1 Steel fire rated doors and frames: labelled and listed by an organization accredited by Standards Council of Canada in conformance with CAN4-S104M, CAN4-S105M and NFPA 252 for ratings specified or indicated.

- .2 Provide fire labelled frame products for those openings requiring fire protection ratings, as scheduled. Test products in strict conformance with CAN4-S104, ASTM E152 or NFPA 252 and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.

1.6 WARRANTY

- .1 Materials and workmanship shall be warranted by manufacturer in accordance with Canadian Steel Door Manufacturers' Association, (CSDMA) Standard Warranty for Steel Doors and Frames.

1.7 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements.
- .2 Provide and maintain dry, off-ground weatherproof storage.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site for recycling in accordance with Waste Management Plan.
- .4 Divert unused paint and sealant materials from landfill to an approved, official hazardous material collections site.
- .5 Do not dispose of unused paint and sealant materials into sewer systems, into lakes, streams, onto ground or in other locations where it will pose health or environmental hazard.
- .6 Divert unused metal materials from landfill to an approved metal recycling facility.
- .7 Divert unused wood materials from landfill to an approved recycling facility.
- .8 Damaged or broken glazing materials are not recyclable. These materials must not be disposed of with materials destined for recycling.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- .1 Only steel frame products manufactured by Canadian Steel Door Manufacturers' Association, (CSDMA) members are eligible for use on this project.

2.2 MATERIALS

- .1 Hot dipped galvanized steel sheet: to ASTM A653M, ZF75, minimum base steel thickness in accordance with CSDMA Table 1 – Thickness for Component Parts.
- .2 Reinforcement channel: to CSA G40.20/G40.21, Type 44W, hot dipped galvanized.
- .3 Fire-rated doors and frames: Material and construction in accordance with listing requirements. Doors to be flush type with no face seams.

2.3 DOOR CORE MATERIALS

- .1 Honeycomb construction:
 - .1 Structural small cell, 24.5 mm maximum kraft paper 'honeycomb', weight: 36.3 kg per ream minimum, density: 16.5 kg/m³ minimum sanded to required thickness.
- .2 Insulated:
 - .1 Expanded polystyrene: CAN/ULC-S701, density 16 to 32 kg/m³.

2.4 ADHESIVES

- .1 Honeycomb cores and steel components: heat resistant, spray grade, resin reinforced neoprene/rubber (polychloroprene) based, low viscosity, contact cement.
- .2 Polystyrene cores: heat resistant, epoxy resin based, low viscosity, contact cement.
- .3 Lock-seam doors: fire resistant, resin reinforced polychloroprene, high viscosity, sealant/adhesive.

2.5 PRIMER

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

2.6 PAINT

- .1 Field paint steel doors and frames in accordance with 09 91 00 – Painting and Protective Coatings. Protect weatherstrips from paint. Provide final finish shall be free of scratches or other blemishes.

2.7 ACCESSORIES

- .1 Door silencers: single stud rubber/neoprene type.
- .2 Exterior top and bottom caps: rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19Ma steel.
- .3 Door bottom seal: to Section 08 71 10 – Door Hardware.
- .4 Metallic paste filler: to manufacturer's standard.
- .5 Accessories (doors and frames) and minimum base steel thickness:
 - .1 Lock/strike reinforcements: 1.6 mm
 - .2 Hinge reinforcements: 2.7 mm
 - .3 Flush bolt reinforcements: 1.6 mm
 - .4 Reinforcements for surface applied hardware: 1.2 mm
 - .5 Top or bottom channels: 1.2 mm
 - .6 Glass trim, screw fixed or snap-in types: 0.9 mm
 - .7 Mortar guard boxes: 0.8 mm
 - .8 Floor anchors: 1.6 mm
 - .9 Jamb spreaders: 0.9 mm
- .6 Sealant: to Section 07 92 10 – Joint Sealing.

2.8 FRAMES FABRICATION GENERAL

- .1 Fabricate frames in accordance with CSDMA specifications, reviewed Shop Drawings and listing requirements.
- .2 Fabricate frames to profiles and maximum face sizes as indicated.
- .3 Finish: hot dipped galvanized after fabrication.
- .4 Blank, reinforce, drill and tap frames for mortised, templated hardware, and electronic hardware using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.
- .5 Protect mortised cutouts with steel guard boxes welded to frame.
- .6 Prepare frame for door silencers, 3 for single door, and 2 at head for double door.
- .7 Manufacturer's nameplates on frames and screens are not permitted.
- .8 Conceal fastenings except where exposed fastenings are indicated.
- .9 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.
- .10 Insulate exterior frame components with mineral wool insulation.

2.9 FRAME ANCHORAGE

- .1 Provide appropriate anchorage to floor and wall construction.
- .2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb, minimum 3 anchors per jamb.
- .3 Provide 2 anchors for rebate opening heights up to 1520 mm and 1 additional anchor for each additional 760 mm of height or fraction thereof.

2.10 FRAMES: WELDED TYPE

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

2.11 DOOR FABRICATION GENERAL

- .1 Fabricate doors in accordance with CSDMA specifications, reviewed Shop Drawings and listing requirements.
- .2 Doors: swing type, flush, with provision for single, sealed insulated glass units, and louvre openings as indicated.
- .3 Interior doors: honeycomb hollow steel construction.
- .4 Exterior doors: insulated polystyrene core construction.
- .5 Fabricate doors with longitudinal edges mechanically interlocked with visible seams.
- .6 Bevel hinge and lock edges of doors, 3 mm in 50 mm.
- .7 Blank, reinforce, drill doors and tap for mortised, templated hardware and electronic hardware.

- .8 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.
- .9 Reinforce doors where required, for surface mounted hardware.
- .10 Provide flush PVC steel top caps to exterior doors.
- .11 Provide inverted, recessed, spot welded channels to top and bottom of interior doors.
- .12 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.
- .13 Provide 127 mm backset for all locksets and latchsets where indicated in the Door Schedule.

2.12 HOLLOW STEEL CONSTRUCTION

- .1 Form each face sheet for exterior doors from 1.6 mm (16 gauge) galvanized sheet steel with polystyrene core laminated under pressure to face sheets.
- .2 Form each face sheet for interior doors from 1.3 mm (18 gauge) galvanized sheet steel with honeycomb or temperature rise rated core laminated under pressure to face sheets.
- .3 Reinforce doors with vertical stiffeners, securely welded to each face sheet at 150 mm on centre maximum.

2.13 THERMALLY BROKEN DOORS AND FRAMES

- .1 Fabricate thermally broken doors by using insulated core and separating exterior parts from interior parts with continuous interlocking thermal break.
- .2 Thermal break: rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19Ma.
- .3 Fabricate thermally broken frames separating exterior parts from interior parts with continuous interlocking thermal break.
- .4 Welding of thermally broken frames must not cause thermal transfers between exterior and interior surfaces of frame sections.
- .5 Fill voids in frame with mineral wool insulation prior to insulation.

PART 3 EXECUTION

3.1 INSTALLATION GENERAL

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

3.2 FRAME INSTALLATION

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

3.3 DOOR INSTALLATION

- .1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 10 – Door Hardware.
- .2 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows.
 - .1 Hinge side: 1.0 mm.
 - .2 Latchside and head: 1.5 mm.
 - .3 Finished floor and thresholds: 13 mm.
- .3 Adjust operable parts for correct function.
- .4 Install louvres.
- .5 Install vinyl top caps in out swinging exterior doors for weather protection.

3.4 FINISH REPAIRS

- .1 Touch up with primer finishes damaged during installation.

- .2 Fill exposed frame anchors and surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.
- .2 Section 01 74 19 – Construction Waste Management and Disposal.
- .3 Section 07 92 10 – Joint Sealing.
- .4 Section 08 50 00 – Windows and Glazing.
- .5 Division 26: Electrical power connections.

1.2 REFERENCES

- .1 Aluminum Association (AA).
 - .1 DAF 45-03, Designation System for Aluminum Finishes.
- .2 American Architectural Manufacturers Association (AAMA).
 - .1 AAMA 609-93, Voluntary Guide Specification for Cleaning and Maintenance of Architectural Anodized Aluminum.
- .3 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM E330-02, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- .4 Canadian General Standards Board (CGSB).
 - .1 CGSB 1.40-97, Primer, Structural Steel, Oil Alkyd Type.
 - .2 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.
- .5 Canadian Standards Association (CSA International).
 - .1 CAN/CSA-G40.20/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.

1.3 SYSTEM DESCRIPTION

- .1 Design Criteria.
 - .1 Design frames and doors in exterior walls to:
 - .1 Limit deflection of mullions to maximum 1/175th of clear span when tested to ASTM E330 under wind load of 1.2 kPa.
 - .2 Movement within system.

- .3 Movement between system and perimeter framing components or substrate.
- .2 Size glass thickness and glass unit dimensions to limits in accordance with CAN/CGSB-12.20.
- .3 Provide continuous air barrier and vapour retarder through door system. Primarily in line with inside pane of glass and heel bead of glazing compound.

1.4 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheets in accordance with Section 01 33 23 - Submittal Procedures for Shop Drawings, Product Data and Samples.
 - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 23 - Submittal Procedures for Shop Drawings, Product Data and Samples. Indicate VOC's for caulking materials during application and curing.

1.5 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.
- .2 Indicate materials and profiles and provide full-size, scaled details of components for each type of door and frame. Indicate:
 - .1 Interior trim and exterior junctions with adjacent construction.
 - .2 Junctions between combination units.
 - .3 Elevations of units.
 - .4 Core thicknesses of components.
 - .5 Type and location of exposed finishes, method of anchorage, number of anchors, supports, reinforcement, and accessories.
 - .6 Location of caulking.
 - .7 Each type of door system including location.
 - .8 Arrangement of hardware and required clearances.
- .3 Submit catalogue details for each type of door and frame illustrating profiles, dimensions, finishing hardware and methods of assembly.

1.6 DOOR SCHEDULES

- .1 Door sizes shown are nominal sizes only; make all necessary allowances for clearances.

1.7 DELIVERY, STORAGE, AND HANDLING

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

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Construction Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Dispose of corrugated cardboard polystyrene plastic packaging material in appropriate on-site bin for recycling in accordance with site Waste Reduction Workplan.
- .4 Divert used metal cut-offs from landfill by disposal into the on-site metals recycling bin at nearest metal recycling facility.

1.9 MAINTENANCE

- .1 At the completion of the work, provide the building maintenance staff with the following:
 - .1 Two sets of wrenches for door closers.
- .2 Maintenance data for cleaning and maintenance of aluminum finishes, manufacturer's instructions and diagrams for all door hardware, operators, sensors, controls for incorporation into manual specified in Section 01 78 23 – Operating and Maintenance Data.
- .3 Also brief the maintenance staff regarding the proper care of hardware such as lubrication of locks, adjustments of door closers, cleaning, general maintenance, etc.

1.10 WARRANTY

- .1 Provide a written warranty covering the aluminum doors and frames for a minimum of one year against leakage, malfunction, defective material and workmanship.
- .2 It shall be stated that, subject to normal usage, if any defects in the work of this Section become evident within the warranty period, the Contractor shall make all necessary repairs and replacements to the work without additional charge.

- .3 He shall also pay for making good any adjacent work damaged by him, or damaged through defects in the work, during construction and warranty periods without additional cost to the Departmental Representative or designate.

PART 2 PRODUCTS

2.1 ACCEPTABLE SOURCES

- .1 This Section of the Specifications is based on the products of Kawneer Company.
- .2 Manufacturers of compatible entrance systems and frames having comparable products conforming to the requirements of this Section, considered acceptable for use:
 - .1 Commercial Aluminum.
 - .2 Lorlea Architectural Systems.
 - .3 Alumicor.
 - .4 Commdoor.
 - .5 Departmental Representative or designate-approved equal are acceptable.
- .3 Swing Door Entrance System
 - .1 Kawneer 350 Standard Entrance.
 - .2 Vertical stiles 90 mm with 160 mm mid rail and 200 high bottom rail.
 - .3 Hardware to include touch bar panic device for exiting, exterior 25 mm diam stainless steel pull, dead lock with keyed cylinder and interior thumb turn, three ball bearing stainless steel hinges, perimeter weather stripping, door sweep, and aluminum threshold.
 - .4 Size and reinforce framing to integrate and support a concealed powered door operator.
 - .5 Power door operator:
 - .1 Integrated in framing above door, complete system with interior and exterior recessed switches, 114 diam. round push pads with engraved international graphic symbol, electromagnetic strike, interconnected control wiring and all devices, medium bronze anodized or powder coated aluminium cover, CSA approved, ULc listed.
 - .1 Acceptable product: Stanley Magic Swing.
 - .2 Departmental Representative or designate approved equal.
- .4 Aluminum Framing:
 - .1 Exterior framing: Kawneer "Tri-fab 451 T", thermally broken, size 50.8 X 114.3 mm members, designed to accept insulating glass.
 - .2 Framing to provide for flush glazing on all sides, through sight lines, no projecting stops on face joints, fully resilient settings by use of gaskets on both sides of glass.

- .5 Glazing:
 - .1 Clear tempered insulated sealed units with beveled glazing stops.

2.2 MATERIALS

- .1 Aluminum extrusions: Aluminum Association alloy AA6063-T5 anodizing quality with clean straight sharply defined profiles, free from defects impairing strength, performance, or appearance.
- .2 Sheet aluminum: Aluminum Association alloy AA1100-H14 or AA5005-H32 or H34 anodizing quality.
- .3 Steel reinforcement: to CAN/CSA-G40.20/G40.21, grade 300 W.
- .4 Fasteners: aluminum or stainless steel for aluminum to aluminum contact. Stainless steel for aluminum to steel contact, finished to match adjacent material.
- .5 Weatherstrip and glazing gaskets: extruded closed cell or dense elastomer of durometer appropriate to the function.
- .6 Door bumpers: black neoprene.
- .7 Isolation coating: bituminous paint, best grade asphalt utility enamel.
- .8 Glazing: to Section 08 50 00 – Windows and Glazing.
- .9 Sealants for aluminum framing components: as recommended by framing system manufacturer.

2.3 ALUMINUM FINISHES

- .1 Finish exposed surfaces of aluminum framing and door components in accordance with Aluminum Association Designation System for Aluminum Finishes.
 - .1 Medium bronze anodic finish: designated AA-M12C22A31 #28.

2.4 STEEL FINISHES

- .1 Finish steel clips, anchors and reinforcing steel with steel primer to CGSB 1.40 zinc coating to CSA G164.

2.5 FABRICATION

- .1 Doors and framing to be compatible and supplied by installer.
- .2 Fabricate units where practical in shop. The methods of construction, reinforcement anchorage, details of finish, jointing, etc. shown on reviewed Shop Drawings shall be accurately followed.

- .3 Provide structural steel reinforcement as required.
- .4 Corners of doors shall be accurately joined and fitted to flush hairline joints. All welding shall be on the unexposed sides to prevent pitting, discolouration, weld halo or other surface imperfections. Bottom, top and side rails of doors shall be a continuous extruded section.
- .5 Conceal all fastenings.
- .6 Mortise, reinforce, drill and tap doors, frames and reinforcements to receive hardware.
- .7 Isolate aluminum from direct contact with dissimilar metals, concrete and masonry with isolation coating.
- .8 Provide weep holes in horizontal members as required. Weep holes shall drain to the exterior.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Set frames plumb, square, level at correct elevation in alignment with adjacent work.
- .2 Use concealed fastenings where possible. Where the use of concealed fasteners is not feasible, use flat-headed screws in countersunk holes. Exposed bolt or nut heads are not permitted.
- .3 Match exposed fastenings with finish or surfaces on which they occur.
- .4 Assess each component for appearance and colour. Any variations in appearance and colour will not be permitted.
- .5 Anchor all work securely and accurately to the structure in the required position, in a manner not restricting thermal and wind movement of the doors. Lock all adjacent settings after alignment.
- .6 Install doors and hardware in accordance with hardware templates and manufacturer's instructions.

- .7 Adjust operable parts for correct function.
- .8 Make allowances for deflection of structure to ensure that structural loads are not transmitted to frames.

3.3 GLAZING

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

3.4 CAULKING

- .1 Seal joints to provide weathertight seal at outside and air, vapour seal at inside.
- .2 Apply sealant in accordance with Section 07 92 10 – Joint Sealing. Conceal sealant within the aluminum work except where exposed use is permitted by Departmental Representative or designate.

3.5 FIELD QUALITY CONTROL

- .1 Have manufacturer of products supplied under this Section review Work involved in handling, installation/application, protection and cleaning of its products, and submit written reports in acceptable format to verify compliance of Work with Contract.
- .2 Manufacturer's field services: 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.

3.6 ADJUSTMENTS

- .1 At the time of installation, all doors shall be adjusted to operate smoothly and shall be weathertight when locked. The hardware shall be properly adjusted and lubricated.
- .2 Re-inspect and adjust operating door mechanisms prior to turn over of building to Departmental Representative or designate.

3.7 CLEANING

- .1 Perform cleaning of aluminum components in accordance with AAMA 609.1 – Voluntary Guide Specification for Cleaning and Maintenance of Architectural Anodized Aluminum.
- .2 Perform cleaning as soon as possible after installation to remove construction and accumulated environmental dirt.
- .3 Clean aluminum with damp rag and approved non-abrasive cleaner.

- .4 Remove traces of primer, caulking, epoxy and filler materials; clean doors and frames.
- .5 Clean glass and glazing materials with approved non-abrasive cleaner.
- .6 All work to be left clean and free of discolouration or damage.
- .7 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.
- .2 Section 01 61 00 – Material and Equipment.
- .3 Section 01 74 19 – Construction Waste Management and Disposal.
- .4 Section 01 78 23 – Operating and Maintenance Data
- .5 Section 08 11 14 – Metal Doors and Frames.
- .6 Section 08 11 16 – Aluminum Entrance.

1.2 REFERENCES

- .1 Canadian Steel Door and Frame Manufacturers' Association (CSDFMA).
 - .1 CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction): standard hardware location dimensions.
- .2 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-69.17-M86(R1993), Bored and Preassembled Locks and Latches.
 - .2 CAN/CGSB-69.18-M90/ANSI/BHMA A156.1-1981, Butts and Hinges.
 - .3 CAN/CGSB-69.19-93/ANSI/BHMA A156.3-1984, Exit Devices.
 - .4 CAN/CGSB-69.20-M90/ANSI/BHMA A156.4-1986, Door Controls (Closers).
 - .5 CAN/CGSB-69.21-M90/ANSI/BHMA A156.5-1984, Auxiliary Locks and Associated Products.
 - .6 CAN/CGSB-69.22-M90/ANSI/BHMA A156.6-1986, Architectural Door Trim.
 - .7 CAN/CGSB-69.24-M90/ANSI/BHMA A156.8-1982, Door Controls – Overhead Holders.
 - .8 CAN/CGSB-69.29-93/ANSI/BHMA A156.13-1987, Mortise Locks and Latches.
 - .9 CAN/CGSB-69.31-M89/ANSI/BHMA A156.15-1981, Closer/Holder Release Device.
 - .10 CAN/CGSB-69.32-M90/ANSI/BHMA A156.16-1981, Auxiliary Hardware.
 - .11 CAN/CGSB-69.34-93/ANSI/BHMA A156.18-1987, Materials and Finishes.

1.3 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.
- .2 Samples:
 - .1 Submit samples in accordance with Section 01 33 23 – Submittal Procedures for shop Drawings, Product Data and Samples.
 - .2 Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware package number.
 - .3 After approval samples will be returned for incorporation in the Work.
- .3 Hardware List:
 - .1 Submit contract hardware list in accordance with Section 01 33 23 – Submittal Procedures for shop Drawings, Product Data and Samples.
 - .2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.
- .4 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.
- .5 Closeout Submittals
 - .1 Provide operation and maintenance data for door closers, locksets, door holders for incorporation into manual specified in Section 01 78 23 – Operating and Maintenance Data.

1.4 QUALITY ASSURANCE

- .1 Regulatory Requirements:
 - .1 Hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, Shipping, Handling and Unloading:
 - .1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 – Common Product Requirements.
 - .2 Package each item of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.

- .2 Storage and Protection:
 - .1 Store finishing hardware in locked, clean and dry area.

1.6 WASTE DISPOSAL AND MANAGEMENT

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Construction Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Dispose of corrugated cardboard, polystyrene and plastic packaging material in appropriate on-site bin for recycling in accordance with site waste management program.

1.7 MAINTENANCE

- .1 Extra Materials:
 - .1 Provide maintenance materials in accordance with Section 01 78 23 – Operating and Maintenance Data.
 - .2 Supply two sets of wrenches for door closers, locksets and exit hardware.

PART 2 PRODUCTS

2.1 HARDWARE ITEMS

- .1 Use one manufacturer's products only for similar items.
- .2 Power door operator incorporated in aluminum entrance system is specified in Section 08 11 16 Aluminum Entrance System.

2.2 DOOR HARDWARE

- .1 Butts and hinges: to CAN/CGSB-69.18, (3 per door for doors up to 2135 and 4 per door for doors up to 2440 in height or over 914 in width), NRP, stainless steel.
 - .1 Acceptable products:
 - .1 Hagar AB850 x 114 x 114.
 - .2 Stanley CB199 x 114 x 114.
 - .3 Departmental Representative or designate approved equal.
- .2 Exit devices: to CAN/CGSB-69.19, rim exit device, ULC rated, with cylinder core and exterior lever handle trim.
 - .1 Acceptable products:
 - .1 Von Duprin 98 series.
 - .2 Sargent 8800 series.
 - .3 Departmental Representative or designate approved equal.

- .3 Door Closers and Accessories:
 - .1 Door controls (closers): to CAN/CGSB-69.20, one per door. All door closers shall be through bolted. Finish aluminum lacquer.
 - .1 Acceptable products:
 - .1 LCN 4040 Super Smoothee by LCN closers.
 - .2 Departmental Representative or designate approved equal.
 - .2 Door controls – overhead holders: to CAN/CGSB-69.24, extruded bronze, 110 degree hold-open and stop, one per door.
 - .1 Acceptable products:
 - .1 Sargent 598H.
 - .2 Departmental Representative or designate approved equal.
- .4 Architectural door trim: to CAN/CGSB-69.22, as listed below.
 - .1 Door protection plates: kick plate type, 1.27 mm thick stainless steel 3.2 mm thick.
 - .1 Acceptable products:
 - .1 Canadian Builders Hardware.
 - .2 Departmental Representative or designate approved equal.
- .5 Auxiliary hardware: to CAN/CGSB-69.32, as listed below.
 - .1 Surface bolt: (200 mm), heavy duty top and bottom.
 - .1 Acceptable products:
 - .1 Canadian Builders Hardware F67.
 - .2 Ives SB1630TBL 1289.
 - .3 Departmental Representative or designate approved equal.
- .6 Thresholds: 150 mm, extruded aluminum with thermal break.
 - .1 Acceptable products:
 - .1 K. N. Crowder CT-46.
 - .2 Departmental Representative or designate approved equal.
- .7 Weatherstripping:
 - .1 Head and jamb seal: Adjustable spring loaded, vinyl in extruded aluminum trim
 - .1 Acceptable products:
 - .1 K. N. Crowder W44.
 - .2 Departmental Representative or designate approved equal.
 - .2 Door bottom seal: Neoprene rubber in extruded aluminum trim
 - .1 Acceptable products:
 - .1 K. N. Crowder Type CT-54 Automatic door bottom.
 - .2 Departmental Representative or designate approved equal.
- .8 Astragal: full height mounted, interior magnetic in extruded aluminum trim and pile strip in extruded aluminum trim on exterior.
 - .1 Acceptable products:
 - .1 Zero International, No.40 Interior and No.41 Exterior.
 - .2 Departmental Representative or designate approved equal.

2.3 FASTENINGS

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

2.4 KEYING

- .1 Lay out keying system in consultation with the Departmental Representative or designate. Keying system shall include keying alike, keying differently, keying in groups, submaster keying and grand master keying locks as necessary to meet the requirements of the Departmental Representative or designate.
- .2 Keying chart and related explanatory data shall be prepared and submitted to the Departmental Representative or designate for approval, and lock work shall not be commenced until written confirmation of keying arrangements is received from the Departmental Representative or designate.
- .3 Provide keys in duplicate for every lock.
- .4 Stamp keying code numbers on keys and cylinders.
- .5 Provide cabinet for key control with two tag security system complete with key loan register, three-way cross reference index, and cabinet door locking device.
- .6 All locks shall be operated by a construction master key in construction cylinder cores while the building is under construction, but shall not operate when the temporary construction cores are replaced with permanent master keyed cylinders at completion of the building.
- .7 Provide all permanent cores and keys to Departmental Representative or designate.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

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

3.3 ADJUSTING

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

3.4 CLEANING

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

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

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.
- .2 Section 01 74 19 – Construction Waste Management and Disposal.
- .3 Section 01 78 23 – Operating and Maintenance Data.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM):
 - .1 ASTM E84-12b, Standard Test Method for Surface Burning Characteristics of Building Materials.
- .2 National Fire Protection Association (NFPA):
 - .1 NFPA 101 - 2012, Life Safety Code; Class A (1).
- .3 Toronto Green Standard, Revised December 31, 2010
 - .1 Ecology; Glass and Other Design Features for Migratory Birds.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate the Work of this Section with the installation of glazing; Sequence work so that installation of bird friendly films coincides with installation of glass materials without causing delay to the Work.

1.4 SUBMITTALS

- .1 Provide requested information in accordance with Section 01 33 00 Submittals Procedures.
- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
 - .1 Product Data: Submit manufacturers product data for each type of product specified.
 - .2 Samples for Initial Selection: Submit one (1) sample 300mm x 300mm of each type of bird friendly films showing pattern spacing and colour of visible markers.
 - .3 Samples for Verification: Submit two (2) samples 300mm x 300mm for verification for each type and colour of bird friendly films specified in this Section prior to ordering samples from film manufacturer.

1.5 CLOSEOUT SUBMITTALS

- .1 Submit manufacturer's written instructions for cleaning solutions, materials and procedures, include name of original installer and contact information in accordance with Section 01 78 23 Operating and Maintenance Data.
 - .1 Provide specific warning of any maintenance practice or materials that may damage or disfigure the finished Work.

1.6 QUALITY ASSURANCE

- .1 Qualifications: Provide proof of qualifications when requested by Consultant:
 - .1 Manufacturer / Supplier: Obtain materials from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties.
 - .2 Installers: Execute Work of this Section using qualified personnel skilled in installation of work of this Section, having a minimum of three (3) years proven experience of installations similar in material, design, and extent to that indicated for this Project.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements: Deliver and store packaged materials in their original containers with manufacturer's labels and seals intact.
- .2 Store as recommended by manufacturer in a weatherproof enclosure, and protect materials during handling and application to prevent damage.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Construction Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate paper plastic polystyrene corrugated cardboard packaging material in appropriate on site for recycling in accordance with Waste Management Plan.
- .4 Dispose of unused finish and adhesive materials at official hazardous material collections site approved by Departmental Representative or designate.
- .5 Do not dispose of unused finish and adhesive materials into sewer system, into streams, lakes, onto ground or in other locations where it will pose health or environmental hazard.

1.9 SITE CONDITIONS

- .1 Ambient Conditions: Proceed with bird friendly film installation when ambient and substrate temperature conditions are within limits permitted by manufacturer and when glass substrates are free from dirt or wetness arising from frost, condensation, or other causes detrimental to adhesion.
 - .1 Temperature Range: Between 4 deg C and 38 deg C.

1.10 WARRANTY

- .1 Provide manufacturer's vertical surface warranty, against defects in materials for the period of six (6) years, and labour for one (1) year, commencing from the date of Substantial Performance of Work.

PART 2 PRODUCTS

2.1 MANUFACTURER

- .1 Materials Manufacturer:
 - .1 "Colidescape", uniform white opaque appearance from exterior, clear from interior.
- .2 Departmental Representative or designate approved equivalent are acceptable.

2.2 PERFORMANCE REQUIREMENTS

- .1 Design Performance:
 - .1 Visible Marker Spacing: Meeting highest requirements indicated in the City of Toronto Green Development Standard.

2.3 MATERIALS

- .1 Bird Friendly Film: Single layer poly vinyl chloride, 50.8 microns, with exterior permanent adhesive.

PART 3 EXECUTION

3.1 INSTALLERS

- .1 Subject to compliance with warranty requirements, only certified installers shall install bird anti-collision film systems specified in this section.

3.2 EXAMINATION

- .1 Verification of Conditions: Examine glazing and surrounding adjacent surfaces for conditions affecting installation.
- .2 Notify Contractor in writing of any conditions that are not acceptable.

- .3 Proceed with installation after verification and correction of surface conditions acceptable to manufacturer.

3.3 PREPARATION

- .1 Clean glass surfaces of substances that could impair glazing film bond including mildew, oil, grease, dirt and other foreign materials immediately before beginning installation of films.
- .2 Protect window frames and surrounding conditions from damage during installation.

3.4 INSTALLATION

- .1 Install in accordance with the manufacturer's written instructions and the contract documents, plumb, true, and level over clean glazing.
- .2 Install film continuously with no gaps or overlaps and as follows:
 - .1 First surface applied.
 - .2 Installed without seams.
 - .3 Do not remove release liner from film until just before each piece of film is ready for installation.
 - .4 Install film on glazing centered within mullions aligned with adjoining windows.
 - .5 Remove air bubbles, wrinkles, blisters, and other defects.

3.5 CLEANING AND PROTECTION

- .1 Progress Cleaning: Leave work area clean at the end of each work day, ensuring safe movement of passing pedestrians.
- .2 Final Cleaning: At completion of installation, clean all surfaces so they are free of foreign matter using cleaners recommended by material manufacturer.

END OF SECTION

DIVISION 09

FINISHES

PART 1 GENERAL

1.1 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.34-M86 (R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
 - .2 CAN/CGSB-71.25-M88, Adhesive, for Bonding Drywall to Wood Framing and Metal Studs.
- .2 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-1988 (R2000), Surface Burning Characteristics of Building Materials and Assemblies.

1.2 DELIVERY, STORAGE AND HANDLING

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

1.3 SITE ENVIRONMENTAL REQUIREMENTS

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

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 35 43 – Environmental Procedures.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal packaging material for recycling.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Standard board: to ASTM C36/C36M regular, 12 mm and Type X, 12 mm and 16 mm thick, 1220 mm wide x maximum practical length, ends square cut, edges bevelled.
- .2 Water-resistant board: to ASTM C630/C630M 16 mm thick x 1220 wide x maximum practical length.
- .3 Abuse resistant board: 16 mm x 1220 mm wide x maximum practical length. CGC Sheetrock Abuse Resistant Panels or equivalent meeting same penetration, chisel, indentation, and abrasion resistance performance testing. Use fire rated board at ULC rated assemblies.
- .4 Metal furring runners, hangers, tie wires, inserts and anchors.
- .5 Drywall furring channels: 0.5 mm core thickness galvanized steel channels for screw attachment of gypsum board.
- .6 Resilient clips, drywall furring: 0.5 mm base steel thickness galvanized steel for resilient attachment of gypsum board.
- .7 Nails: to ASTM C514.
- .8 Steel drill screws: to ASTM C1002.
- .9 Stud adhesive: to CAN/CGSB-71.25, ASTM C557.
- .10 Laminating compound: as recommended by manufacturer, asbestos-free.
- .11 Casing beads, corner beads, control joints and edge trim: to ASTM C1047, metal, zinc-coated by electrolytic process, 0.5 mm base thickness, perforated flanges, one piece length per location.
- .12 Sealants: in accordance with Section 07 92 10 – Joint Sealing.
- .13 Polyethylene: to CAN/CGSB-51.34, Type 2.
- .14 Joint compound: to ASTM C475, asbestos-free.

PART 3 EXECUTION

3.1 ERECTION

- .1 Do application and finishing of gypsum board in accordance with ASTM C840 except where specified otherwise.

- .2 Do application of gypsum sheathing in accordance with ASTM C1280.
- .3 Erect hangers and runner channels for suspended gypsum board ceilings and bulkhead in accordance with ASTM C840 except where specified otherwise.
- .4 Install work level to tolerance of 1:1200.
- .5 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles, where required.
- .6 Install 20 x 65 furring channels parallel to, and at exact locations of steel stud partition header track.
- .7 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.
- .8 Install wall furring for gypsum board wall finishes in accordance with ASTM C840, except where specified otherwise.
- .9 Furr duct shafts, beams, columns, pipes and exposed services where indicated.

3.2 APPLICATION

- .1 Do not apply gypsum board until bucks, anchors, blocking, sound attenuation, electrical and mechanical works are approved.
- .2 Apply single layer gypsum board to wood and metal furring or framing using screw fasteners. Maximum spacing of screws 300 mm on centre.
 - .1 Single-Layer Application:
 - .1 Apply gypsum board on ceilings prior to application of walls in accordance with ASTM C840.
 - .2 Apply gypsum board vertically or horizontally, providing sheet lengths that will minimize end joints.
 - .3 Apply single layer gypsum board to concrete or concrete block surfaces, where indicated, using laminating adhesive.
 - .1 Comply with gypsum board manufacturer's recommendations.
 - .2 Brace or fasten gypsum board until fastening adhesive has set.
 - .3 Mechanically fasten gypsum board at top and bottom of each sheet.
- .4 Apply water-resistant gypsum board where acrylic wall and ceiling panels are to be applied and locations where indicated on drawings. Apply water-resistant sealant to edges, ends, cut-outs which expose gypsum core and to fastener heads.
- .5 Install ceiling boards in direction that will minimize number of end-butt joints.
- .6 Install gypsum board on walls vertically to avoid end-butt joints.
- .7 Install gypsum board with face side out.

- .8 Do not install damaged or damp boards.
- .9 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

3.3 INSTALLATION

- .1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure 6" on centre.
- .2 Install casing beads around perimeter of bulkhead.
- .3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated.
- .4 Splice corners and intersections together and secure to each member with 3 screws.
- .5 Install access doors to electrical and mechanical fixtures specified in respective sections.
 - .1 Rigidly secure frames to furring or framing systems.
- .6 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.
- .7 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with Association of the Wall and Ceiling Industries (AWCI) International Recommended Specification on Levels of Gypsum Board Finish:
 - .1 Levels of finish:
 - .1 Level 4: Embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges.
- .8 Finish corner beads and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.
- .9 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.
- .10 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.

- .11 Completed installation to be smooth, level or plumb, free from waves, other defects and ready for surface finish.
- .12 Apply one coat of white primer sealer over surface to be textured. When dry apply textured finish in accordance with manufacturer's instructions.
- .13 Mix joint compound slightly thinner than for joint taping.
- .14 Apply thin coat to entire surface using trowel or drywall broadknife to fill surface texture differences, variations or tool marks.
- .15 Allow skim coat to dry completely.
- .16 Remove ridges by light sanding or wiping with damp cloth.
- .17 Provide protection that ensures gypsum drywall work will remain without damage or deterioration at time of substantial completion.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 09 21 16 - Gypsum Board Assemblies.
- .2 This section includes the requirements for non-load bearing interior light gauge metal framing as well as wind load bearing exterior wall stud framing.

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM C645-00, Specification for Non-structural Steel Framing Members.
 - .2 ASTM C754-00, Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- .2 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-1.40-97, Primer, Structural Steel, Oil Alkyd Type.
- .3 Environmental Choice Program (ECP).
 - .1 CCD-047a -98, Paints - Surface Coatings.
 - .2 CCD-048-98, Surface Coatings - Recycled Water-borne.

1.3 QUALITY ASSURANCE

- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 35 43 Environmental Procedures.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility approved by Consultant.
- .5 Divert unused gypsum materials from landfill to recycling facility approved by Consultant.

Part 2 Products

2.1 MATERIALS

- .1 Non-load bearing internal channel stud framing: to ASTM C645, 92 mm stud size, roll formed from 25 ga. (0.59 mm) thickness hot dipped galvanized steel sheet, for screw attachment of gypsum board. Knock-out service holes at 450 centres.
- .2 Exterior wind bearing studs: Bailey Metal Products 600S162-43: 152 x 42.3 with 12mm lip, .043 inch (1.1 mm) thick, spaced at 400 on centre complete with floor and double head track.
- .3 Floor and ceiling tracks: to ASTM C645, in widths to suit stud sizes, 32 flange height.
- .4 Metal channel stiffener: 67 x 22 mm size, 25ga thick cold rolled steel, hot dipped galvanized steel.
- .5 Insulating strip: rubberized, moisture resistant 3 mm thick foam strip, 12 wide, with self sticking adhesive on one face, lengths as required.

2.2 DESIGN REQUIREMENTS

- .1 For design and details of wind bearing exterior wall metal stud framing systems, submit Shop Drawings stamped and signed by a qualified Professional Engineer, licensed in the Province of Ontario, and experienced in structural design.
- .2 Design wind load 30 pounds per square foot (1.45 kilopascals) unfactored.

Part 3 Execution

3.1 ERECTION

- .1 Align partition tracks at floor and ceiling and secure at 600 on centre maximum.
- .2 Place studs vertically at 400 on centre and not more than 50 mm from abutting walls, and at each side of openings and corners. Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.
- .3 Erect metal studding to tolerance of 1:1000.
- .4 Attach studs to bottom and ceiling track using screws.
- .5 Co-ordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.
- .6 Co-ordinate erection of studs with installation of door frames and special supports or anchorage for work specified in other Sections.
- .7 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified. Secure studs together, 50 apart using column clips or other approved means of fastening placed alongside frame anchor clips.

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- .8 Install heavy gauge single jamb studs at openings.
- .9 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs. Secure track to studs at each end, in accordance with manufacturer's instructions. Install intermediate studs above and below openings in same manner and spacing as wall studs.
- .10 Frame openings and around built-in equipment, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.
- .11 Install steel studs or furring channel between studs for attaching electrical and other boxes.
- .12 Extend partitions to underside of slab except where noted otherwise on drawings.
- .13 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs. Use 50 leg ceiling tracks.
- .14 Install continuous insulating strips to isolate studs from un-insulated surfaces.
- .15 Install two continuous beads of acoustical sealant under studs and tracks around perimeter of sound control partitions.
- .16 Provide double head track under structural components to accommodate anticipated vertical deflection.

3.2 CLEANING

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

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American National Standards Institute (ANSI)/Ceramic Tile Institute (CTI)
 - .1 ANSI A108.1-99, Specification for the Installation of Ceramic Tile (Includes ANSI A108.1A-C, 108.4-.13, A118.1-.10, ANSI A136.1).
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 71-GP-22M-78, Adhesive, Organic, for Installation of Ceramic Wall Tile.
 - .2 CAN/CGSB-75.1-M88, Tile, Ceramic.
 - .3 CAN/CGSB-25.20-95, Surface Sealer for Floors.
- .3 Terrazzo Tile and Marble Association of Canada (TTMAC)
 - .1 Tile Specification Guide 09300 2000, Tile Installation Manual.
 - .2 Tile Maintenance Guide 2000.

1.2 QUALITY ASSURANCE

- .1 Qualifications: The preparation of sub base and installation of materials described in this section shall be executed by a company who is a member in good standing with the Terrazzo, Tile and Marble Association of Canada.
- .2 This work shall be installed by workers who are skilled in the use of these materials and installation methods and in accordance with the recommendations of the manufacturer under the direct supervision of a competent foreman.

1.3 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00 Submittal Procedures.
- .2 Include manufacturer's information on:
 - .1 Ceramic tile, marked to show each type, size, and shape required.
 - .2 Divider strip.
 - .3 Levelling compound.
 - .4 Latex-Portland cement mortar and grout.
 - .5 Commercial Portland cement grout.
 - .6 Organic adhesive.
 - .7 Slip resistant tile.
 - .8 Waterproofing isolation membrane.
 - .9 Fasteners.
 - .10 EPDM membrane.

1.4 SAMPLES

- .1 Submit samples in accordance with Section 01 33 00 Submittals.

- .2 Base tile: submit duplicate 300 x 300 mm sample panels of each colour, texture, size, and pattern of tile.
- .3 Floor tile: submit duplicate 300 x 300 mm sample panels of each colour, texture, size, and pattern of tile.
- .4 Trim shapes, bullnose cap and cove including bullnose cap and base pieces at internal and external corners of vertical surfaces, each type, colour, and size.
- .5 Adhere tile samples to 11 mm thick plywood and grout joints to represent project installation.

1.5 DELIVERY, STORAGE AND HANDLING

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

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 35 43 Environmental requirements.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

1.7 ENVIRONMENTAL CONDITIONS

- .1 Maintain air temperature and structural base temperature at ceramic tile installation area above 12 °C for 48 h before, during, and 48 h after, installation.
- .2 Do not install tiles at temperatures less than 12 °C or above 38 °C.
- .3 Do not apply epoxy mortar and grouts at temperatures below 15 °C or above 25 °C.

1.8 EXTRA MATERIAL

- .1 Provide maintenance materials in accordance with Special Provisions of the contract.
- .2 Provide minimum 2% or 10 tiles minimum of each type and colour of tile required for project for maintenance use. Store where directed.
- .3 Maintenance material to be of same production run as installed material.

Part 2 Products

2.1 FLOOR TILE

- .1 CT – 1:
 - .1 Ceramic tile: to CAN/CGSB-75.1-M88, Type 4, Class MR 1, 600 x 300 x 9 mm size, square edges, slip resistant surface.
 - .2 Matching coved base, 100 mm high, square top with PVC top edge trim.
 - .3 Product: Vitra Colour Dot series, matte finish, colour: from standard product range, distributed by Centura.

2.2 TRIM SHAPES

- .1 Conform to applicable requirements of adjoining floor and wall tile.
- .2 Use slip resistant trim shapes for horizontal surfaces of showers, overflow ledges, recessed steps, shower curbs, drying area curbs, and stools.
- .3 Use trim shapes sizes conforming to size of adjoining field wall tile, including existing spaces, unless specified otherwise.
- .4 Internal and External Corners: Provide trim shapes as follows:
 - .1 Bullnose shapes for external corners including edges.
 - .2 Coved shapes for internal corners.

2.3 MORTAR AND ADHESIVE MATERIALS

- .1 Portland cement: to CSA-A5, type 10.
- .2 Sand: to ASTM C144, passing 16 mesh.
- .3 Hydrated lime: to ASTM C207.
- .4 Latex additive: formulated for use in Portland cement mortar and thin set bond coat.
- .5 Water: potable and free of minerals and chemicals which are detrimental to mortar and grout mixes.

2.4 BOND COAT

- .1 Latex modified Portland Cement mortar: to ANSI A108.1, two-component universal dry-set mortar.

2.5 GROUT

- .1 Colouring Pigments:
 - .1 Pure mineral pigments, lime proof and nonfading, complying with ASTM C979.
 - .2 Colouring pigments to be added to grout by manufacturer.
 - .3 Job coloured grout are not acceptable.

- .2 Latex-Portland Cement Grout: to ANSI A108.1, fast curing, high early strength, polymer-modified, stain resistant, sanded mix for floors, unsanded mix for walls and floors with polished tiles commercial tile grout.

2.6 ACCESSORIES

- .1 Transition Strips: purpose made metal extrusion; stainless steel type.
- .2 Sealant: in accordance with Section 07 92 10 - Joint Sealing.
- .3 Floor sealer and protective coating: to tile and grout manufacturer's recommendations.
- .4 Top cap/trim: Schluter Jolly PVC trim in colour to match adjacent tile.
- .5 Marble sills: 19mm x width of base plus 6mm overhang each side at entrances to showers.
- .6 EPDM membrane: 45 mil one piece membrane to line shower areas under sloped mortar bed, clamped to floor drains.

2.7 MIXES

- .1 Mortars and adhesives:
 - .2 Contractor to review suitability of products and installation methods prior to ordering of any materials and comment on suitability for long term durability of the finished installation, considering the condition of substrate, intended use, and products to be installed.
 - .3 Mortar bed at showers: latex modified portland cement based mortar to build up uniform slope at shower floors.
 - .4 Thin set mortar: latex modified ANSI 118.1, or ANSI 118.4 (CGSP 71-GP-30M), for glazed and unglazed floor tile, water absorption class MR 2.
 - .1 Kerabond or Ultraflex II by Mapei,
 - .2 Multicure modified system by C-Cure, or
 - .3 Versatile by Flextile.
 - .5 Organic adhesive: pre-mixed, for wall tiles.
 - .6 Mix bond and levelling coats, and grout to manufacturer's instructions.
 - .7 Adjust water volumes to suit water content of sand.

2.8 PATCHING AND LEVELING COMPOUND

- .1 Portland cement base, acrylic polymer compound, manufactured specifically for resurfacing and levelling concrete floors. Products containing gypsum are not acceptable.
- .2 Have not less than the following physical properties:
 - .1 Compressive strength - 25 MPa.
 - .2 Tensile strength - 7 MPa.

- .3 Flexural strength - 7 MPa.
- .4 Density - 1.9.
- .3 Capable of being applied in layers up to 50 mm thick, being brought to feather edge, and being trowelled to smooth finish.
- .4 Ready for use in 48 hours after application.

2.9 CLEANING COMPOUNDS

- .1 Specifically designed for cleaning masonry and concrete and which will not prevent bond of subsequent tile setting materials including patching and levelling compounds and elastomeric waterproofing membrane and coat.
- .2 Materials containing acid or caustic material are not acceptable.

Part 3 Execution

3.1 WORKMANSHIP

- .1 Do tile work in accordance with TTMAC Tile Installation Manual 2000 , "Ceramic Tile", except where specified otherwise.
- .2 Install seamless EPDM membrane in one piece to allow perimeter to extend 150 mm up walls above base of shower floors, adhering to sub base, clamped to floor drain.
- .3 Install mortar bed in shower areas to ensure positive 2% slope toward floor drains from all locations. Minimum bed depth 50mm at drains.
- .4 Apply tile or backing coats to clean and sound surfaces.
- .5 Fit tile around corners, fitments, fixtures, drains and other built-in objects. Maintain uniform joint appearance. Cut edges smooth and even. Do not split tiles.
- .6 Maximum surface tolerance 1:800.
- .7 Make joints between tile uniform and approximately 1.5 mm wide, plumb, straight, true, even and flush with adjacent tile. Ensure sheet layout not visible after installation. Align patterns.
- .8 Lay out tiles so perimeter tiles are minimum 1/2 size.
- .9 Sound tiles after setting and replace hollow-sounding units to obtain full bond.
- .10 Make internal angles square, external angles rounded bullnosed.
- .11 Use round bullnose edged tiles at termination of wall tile panels, except where panel abuts projecting surface or differing plane.
- .12 Provide PVC cap along top of ceramic tile base and at exposed edges of wall tile at exterior corners to terminate edges.

- .13 Install divider strips at junction of tile flooring and dissimilar materials.
- .14 Allow minimum 24 h after installation of tiles, before grouting.
- .15 Install marble sills at entrances to shower areas.
- .16 Clean installed tile surfaces after installation and grouting cured.
- .17 Make control joints where indicated. Make joint width same as tile joints. Fill control joints with sealant in accordance with Section 07 92 10 - Joint Sealing. Keep building expansion joints free of mortar and grout.

3.2 FLOOR SEALER AND PROTECTIVE COATING

- .1 Apply in accordance with manufacturer's instructions.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 This section describes requirements for suspension systems and acoustic panels.
- .2 Mechanical and electrical divisions for trim for recessed mechanical fixtures and light fixtures.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM International)
 - .1 ASTM C635-00, Specifications for the Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
 - .2 ASTM C636-96, Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.

1.3 DESIGN REQUIREMENTS

- .1 Maximum deflection: 1/360th of span to ASTM C635 deflection test.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Special Provisions of the contract.
- .2 Submit reflected ceiling plans for special grid patterns as indicated.
- .3 Indicate lay-out and acoustical unit support at ceiling fixture.

1.5 SAMPLES

- .1 Submit samples in accordance with Special Provisions of the contract.
- .2 Submit one representative model of ceiling suspension system.
- .3 Submit duplicate 12" square samples of acoustical units.
- .4 Ceiling system to show basic construction and assembly, treatment at walls, recessed fixtures, splicing, interlocking, finishes, acoustical unit installation.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Protect on site stored or installed absorptive material from moisture damage.
- .2 Store extra materials required for maintenance, where directed by Departmental Representative or designate.

- .3 Waste Management and Disposal:
 - .1 Separate waste materials in accordance with Special Provisions of the contract.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - .3 Separate for recycling and place in designated containers waste in accordance with Waste Reduction Workplan.
 - .4 Place materials defined as hazardous or toxic in designated containers.
 - .5 Handle and dispose of hazardous materials in accordance with Regional and Municipal regulations.
 - .6 Fold up metal and plastic banding, flatten and place in designated area for recycling.

1.7 ENVIRONMENTAL REQUIREMENTS

- .1 Permit wet work to dry before beginning to install.
- .2 Maintain uniform minimum temperature of 15°C and humidity of 20 to 40% before and during installation.
- .3 Store materials in work area 48 hours prior to installation.

1.8 EXTRA MATERIALS

- .1 Provide acoustical units amounting to minimum 2% of gross ceiling area required for project, but no less than 5 full tiles in original product packaging and protection, clearly identified as to installed rooms or locations.
- .2 Ensure extra materials are from same production run as installed materials.
- .3 Clearly identify type of acoustic unit, including colour and texture.
- .4 Deliver to Departmental Representative or designate upon completion of the work of this section.

1.9 REGULATORY REQUIREMENTS

- .1 Fire-resistance rated suspension system: certified by a Canadian Certification Organization accredited by Standards Council of Canada.

1.10 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Special Provisions of the contract.
- .2 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative or designate.

- .3 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .4 Dispose of packaging material in appropriate on-site bin for recycling in accordance with site Waste Reduction Work plan.

PART 2 PRODUCTS

2.1 MATERIALS – SUSPENSION SYSTEMS

- .1 Intermediate duty system to ASTM C635.
- .2 Basic materials for suspension system: commercial quality cold rolled steel, zinc coated.
- .3 Suspension system: non fire rated, acceptable products:
 - .1 Armstrong World Industries: Prelude.
 - .2 CGC: Series Donn DX Quick Release.
 - .3 Bailey: Standard B.E. Safe-T-Lock.
- .4 Exposed tee bar grid components: shop painted satin white or black enamel to match tile colour. Components die cut. Main tee with double web, rectangular bulb and 1” rolled cap on exposed face. Cross tee with rectangular bulb; web extended to form positive interlock with main tee webs; lower flange extended and offset to provide flush intersection.
- .5 Hanger wire: galvanized soft annealed steel wire.
 - .1 12 ga overall thickness for access tile ceilings.
- .6 Hanger inserts: purpose made.
- .7 Carrying channels where required: 1 1/2”x 1 1/2” channel, of 25ga thick galvanized steel.
- .8 Accessories: splices, clips, wire ties, retainers and wall moulding flush, to complement suspension system components, as recommended by system manufacturer.

2.2 MATERIALS – ACOUSTIC PANELS

- .1 Acoustic units for suspended ceiling system: to CAN/CGSB-92.1, ASTM E1264.
 - .1 Type 3.
 - .2 Class A.
 - .3 Wet formed mineral fibre containing 58% recycled content.
 - .4 Textures: fine.
 - .5 Noise Reduction Coefficient (NRC) designation of 0.60.
 - .6 Ceiling Attenuation Class (CAC) rating 30, in accordance with ASTM E1264.

- .7 Light Reflectance (LR) range of .85.
 - .8 Edge type: square.
 - .9 Colour white/black.
 - .10 Approved for damp/humid locations without sagging.
 - .11 Size 24" x 48" x 3/4" thick.
 - .12 Shape: flat.
-
- .2 Adhesive: low VOC type recommended by acoustic unit manufacturer.
 - .3 Staples, nails and screws: to CSA B111 non-corrosive finish as recommended by acoustic unit manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Installation: in accordance with ASTM C636 except where specified otherwise.
- .2 Install suspension system to manufacturer's instructions.
- .3 Do not erect ceiling suspension system until work above ceiling has been inspected by Departmental Representative or designate.
- .4 Secure hangers to overhead structure using attachment methods to manufacturer's instructions.
- .5 Install hangers spaced at maximum 4'-0" centres and within 6" from ends of main tees.
- .6 Lay out system according to reflected ceiling plan.
- .7 Ensure suspension system is co-ordinated with location of related components.
- .8 Install wall moulding to provide correct ceiling height.
- .9 Completed suspension system to support super-imposed loads, such as lighting fixtures diffusers and grilles.
- .10 Support at light fixtures, diffusers with additional ceiling suspension hangers within 6" of each corner and at maximum 24" around perimeter of fixture.
- .11 Interlock cross member to main runner to provide rigid assembly.
- .12 Frame at openings for light fixtures, air diffusers, speakers and at changes in ceiling heights.
- .13 Install access splines to provide 50 percent ceiling access.
- .14 Finished ceiling system to be square with adjoining walls and level within 1:1000.

- .15 Install acoustical panels and tiles in ceiling suspension system.
- .16 Scribe acoustic units to fit adjacent work.
- .17 All panel edges to be supported by metal track or trim shapes.
- .18 Butt joints tight.

3.2 INTERFACE WITH OTHER WORK

- .1 Co-ordinate ceiling work to accommodate components of other sections, such as light fixtures, diffusers to be built into acoustical ceiling components.

3.3 CLEANING

- .1 Touch up scratches, abrasions, voids and other defects in painted surfaces.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.
- .2 Section 01 74 19 – Construction Waste Management And Disposal.
- .3 Section 01 78 23 – Operating and Maintenance Data.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM International).
 - .1 ASTM D2369 [03], Test Methods for Volatile Content of Coatings.
 - .2 ASTM D2394 [93(1999)], Method For Simulating Service Testing of Wood and Wood Based Finished Flooring.
- .2 Canadian Lumbermen's Association (CLA).
 - .1 CLA Grading Rules for Canadian Hardwood Strip Flooring 1997.
- .3 Canadian Standards Association (CSA International).
 - .1 CSA O151 [M1978], Canadian Softwood Plywood.
 - .2 CAN/CSA-O325.0-[92(R1998)], Construction Sheathing.
 - .3 CAN3 Z299.0 [86(R2002)], Guide for Selecting and Implementing the CAN3 Z299 85 Quality Assurance Program Standards.
 - .4 CAN/CSA-Z808-[96], A Sustainable Forest Management System: Guidance Document.
 - .5 CAN/CSA ISO 14040 [97], Environmental Management Life Cycle Assessment Principles and Framework.
- .4 Environmental Choice Program (ECP).
 - .1 CCD-045-[95], Adhesives.

1.3 SAMPLES

- .1 Submit samples in accordance with Section 01 33 23 - Submittal Procedures for Shop Drawings, Product Data and Samples.
- .2 Submit duplicate flooring strips in size specified, 300 mm long including nosing, treads, edge strips and caps.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for wood flooring for incorporation into manual specified in Section 01 78 23 – Operating and Maintenance Data.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Store materials in fully enclosed ventilated, clean and dry storage space in areas of installation for minimum of 72 hours prior to commencing of work.
- .2 Ensure concrete, masonry, sheet rock, paint and framing members are thoroughly dry before flooring is delivered.
- .3 Do not truck or unload flooring in rain, snow or excessively humid conditions.
- .4 Cover flooring with tarpaulin or vinyl if atmosphere is foggy or damp.
- .5 Store in enclosed, well ventilated room with weather proof windows.
- .6 Leave adequate room for good air circulation around stacks of flooring.
- .7 Maintain heat near occupancy levels for five days prior to deliver.
- .8 Deliver flooring and break into small lots in rooms where it will be installed.
- .9 Open packaging and allow 3 days for acclimation.
- .10 Check and record moisture content of both flooring and subflooring before beginning installation.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Construction Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site for recycling in accordance with Waste Management Plan.
- .4 Dispose of unused finish and adhesive materials at official hazardous material collections site approved by Departmental Representative or designate.
- .5 Do not dispose of unused finish and adhesive materials into sewer system, into streams, lakes, onto ground or in other locations where it will pose health or environmental hazard.

1.7 ENVIRONMENTAL REQUIREMENTS

- .1 Maintain air temperature and structural base temperature at flooring installation area above 20°C for 48 hours before, during and for 48 hours after installation.

1.8 EXTRA MATERIALS

- .1 Provide maintenance materials of wood strip flooring in accordance with Section 01 78 23 – Operating and Maintenance Data.
- .2 Provide 5 m² of each colour, pattern and type flooring material required for this project for maintenance use.
- .3 Extra materials to be from same production run as installed materials.
- .4 Clearly identify each container of flooring.
- .5 Deliver to Departmental Representative or designate, upon completion of the work of this section.
- .6 Store where directed by Departmental Representative or designate.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Hard maple strip flooring: finished 19 mm thick x 83 mm wide random lengths, tongue and groove edges and matched ends, grade to CLA Grading Rules for Canadian Hardwood Strip Flooring. Grade stamp each bundle of flooring.
- .2 Sleepers:
 - .1 38 mm x 89 mm group 1 density, kiln dried lumber.
 - .2 Preservative treated with product suitable for interior installation.
 - .3 Moisture content no greater than 12%.
- .3 Nails: purpose designed barbed nails for power nailing, length and gauge as recommended by flooring manufacturer.
- .4 Subfloor:
 - .1 Sheathing:
 - .1 Plywood to CSA O151, sheathing grade.
 - .2 No. 2 group 1 softwood suitable for subfloors over wood joists exterior sheathing grade plywood.
 - .3 16 mm performance rated product.

PART 3 EXECUTION

3.1 INSPECTION

- .1 Ensure substrate is dry, by using test methods acceptable to flooring manufacturer.

3.2 PREPARATION

- .1 Wood Subfloor.
 - .1 Sheet Underlayment:
 - .1 Install with grain of faces at right angles to joists.
 - .2 Nail every 150 mm along each joist.
 - .3 Subfloor: flat, clean, dry, structurally sound and free of squeaks and protruding nails and/or staples.
 - .4 Nailing Schedule: adequate, typically every 15.2 cm along panel ends and every 30.4 cm along intermediate supports.
 - .5 Nail spacing evident on panel edges.
 - .6 Flatten edge swell as required.
 - .7 Sweep subfloor clean.

3.3 INSTALLATION

- .1 Install No.15 felt directly below finish flooring.
- .2 Install finish flooring, as indicated, parallel to long dimension of room at right angle to joists.
- .3 Machine nail fastening. Maintain tight joints and board ends. Install to manufacturer's written instructions.
- .4 Maintain 50 mm expansion space at perimeter of floor surface.
- .5 Install base continuously at floor perimeter. Secure to wall surface with screws and plugs. Ensure base does not contact floor surface and is not secured to it.
- .6 Install floor sockets at locations indicated. Secure socket housing in sub floor, ensuring vertical and plumb. Secure lid and frame in floating wood floor surface flush and square.

3.4 CLEANING

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .2 Clean flooring and base surfaces to flooring manufacturer's printed instructions.
- .3 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

3.5 PROTECTION OF FINISHED WORK

- .1 Protect new floors from time of final set of adhesive until final inspection.

- .2 Prohibit traffic on floor for 48 hours after installation.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 American Society for Testing and Materials (ASTM International)
 - .1 ASTM D1335, Tuft Bind of Pile Floor Coverings.
 - .2 ASTM D1667, Standard Specification for Flexible Cellular Materials-Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam).
 - .3 ASTM D3936 Standard Test Method for Resistance to Delamination of the Secondary Backing of Pile Yarn Floor Covering.
 - .4 ASTM E84, Test Method for Surface Burning Characteristics of Building Materials.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-4.2 No.27.6-[M91], Textile Test Methods - Flame Resistance - Methemine Tablet Test for Textile Floor Coverings.
 - .2 CAN/CGSB-4.2 No.77.1-[94]/ISO 4919:1978, Textile Test Methods - Carpets - Determination of Tuft Withdrawal Force.
 - .3 CGSB 4-GP-36M-[78], Carpet Underlay, Fiber Type.
 - .4 CAN/CGSB-4.129-[93(R1997)], Carpets for Commercial Use.
 - .5 CGSB 20-GP-23M-[78], Cushion, Carpet, Flexible Polymeric Material.
- .3 Carpet and Rug Institute (CRI)
 - .1 CRI-104-[96], Standard Installation of Commercial Carpet.
 - .2 IAQ Carpet Testing Program.
- .4 National Floor Covering Association (NFCA)
 - .1 Floor Covering Specification Manual [1998].
- .5 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-[88(R2000)], Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC-S102.2-[88(R2000)], Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials and Assemblies.

1.2 QUALITY ASSURANCE

- .1 This work shall be installed by workers who are skilled in the use of these materials and installation methods and in accordance with the recommendations of the manufacturer under the direct supervision of a competent foreman.

1.3 PRODUCT DATA

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

- .2 For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate.
- .3 Shop Drawings: Show the following:
 - .1 Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
 - .2 Carpet tile type, color, and dye lot.
 - .3 Type of installation.
 - .4 Pattern of installation.
 - .5 Pattern type, location, and direction.
 - .6 Pile direction.
 - .7 Type, color, and location of insets and borders.
 - .8 Type, color, and location of edge, transition, and other accessory strips.
 - .9 Transition details to other flooring materials.

1.4 SAMPLES

- .1 Submit samples in accordance with Section 01 33 00 Submittals.
- .2 Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - .1 1. Carpet Tile: Full-size Sample.
 - .2 2. Exposed Edge, Transition, and other Accessory Stripping: 12-inch-long Samples.

1.5 MAINTENANCE DATA

- .1 For carpet tiles to include in maintenance manuals. Include the following:
 - .1 Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - .2 Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials in containers with labels legible and intact and grade-seals unbroken.
- .2 Store material so as to prevent damage or contamination.

- .3 Store materials in a dry area, protected from freezing, staining and physical damage.
- .4 Store cementations materials on a dry surface.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 35 43 - Environmental requirements.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

1.8 ENVIRONMENTAL CONDITIONS

- .1 Maintain air temperature and structural base temperature at ceramic tile installation area above 12 °C for 48 h before, during, and 48 h after, installation.
- .2 Do not install tiles at temperatures less than 12 °C or above 38 °C.
- .3 Do not apply epoxy mortar and grouts at temperatures below 15 °C or above 25 °C.

1.9 EXTRA MATERIAL

- .1 Provide maintenance materials in accordance with Special Provisions of the contract.
- .2 Provide minimum 2% or 10 tiles minimum of each type and colour of tile required for project for maintenance use. Store where directed.
- .3 Maintenance material to be of same production run as installed material.

PART 2 PRODUCTS

2.1 MANUFACTURER

- .1 Subject to minimum requirements listed above and below, provide carpeting as specified on finish schedule.
 - .1 Any change in products or manufacturer must comply with Substitution Section.
 - .2 Mark each carpet tile carton according to style, color, pattern, dye lot, and quantity. Within each continuous carpet area, install carpet from same dye lot.3. Where specified, carpet tile, shall employ a non-directional installation procedure. (1/4 turn in not acceptable).

- .3 Where specified, carpet tile manufacturer shall guarantee “no dye lots” so future replacement orders will work instantly with existing product.

2.2 CARPET TILE:

- .1 Products: As indicated on Finish Drawings:
 - .1 Fiber Type: Invista Type 6, 6 nylon.
 - .2 Pile Characteristic: Tufted textured loop.
 - .3 Density: 5,735 oz./cu. yd.
 - .4 Pile Thickness: 0.113 inches for finished carpet tile per ASTM D D-418.
 - .5 Stitches: 8 per inch.
 - .6 Gage: 1/12 per inch.
 - .7 Yarn Pile Weight: 18 oz./sq. yd.
 - .8 Backing Structure: GlasBac Composite.
 - .9 Size: 50 cm x 50 cm.
 - .10 Applied Soil-Resistance Treatment: Protekt2 w/ Zonyl 8779 Flurochemical.
 - .11 Antimicrobial Treatment: Broad Spectrum (inhibits fungi, gram positive and gram-negative bacteria)
 - .1 EPA registered antimicrobial.
 - .2 EPA technical data sheet for carpet use.
 - .3 Contains no arsenic and no heavy metals.
 - .4 Is non halogenated, no fluorine, no chlorine, no bromine, no iodine.
 - .5 Is non phenolic.
 - .6 Contains no formaldehyde.
 - .7 Low water soluble (40 ppm).
 - .8 Vapor pressure of 12mm Hg at 27 degrees C.
 - .9 An oral LD50 toxicity rate of 2.3 grams/kg.
 - .10 Independent lab test data can be obtained to verify evidence of bioefficacy.
 - .12 Performance Characteristics: As listed in Manufacturer’s Literature.

2.3 INSTALLATION ACCESSORIES

- .1 Trowelable Leveling and Patching Compounds: Latex type as recommended by carpet manufacturer and is compatible with carpet adhesive and curing/sealing compound on concrete.
 - .1 Releasable Pressure Sensitive Type Adhesive – Use the following as recommended by the carpet manufacturer which will allow removal of carpet tile at any time without damaging carpet or adhesion properties.

- .2 Carpet Edge Guard
 - .1 Vinyl or Rubber: Extruded or molded heavy-duty vinyl or rubber carpet edge guard of size and profile indicated and with a minimum two inch wide anchorage flange. Colors to be selected by Departmental Representative or designate from among standard colors available within the industry.
 - .2 Metal: Where carpet is adjacent to tile product provide metal edge guard as indicated in drawings and Specification Section 09 30 13 - Ceramic Tiling.
- .2 Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
 - .1 1. VOC Limits: Provide adhesives that comply with the following limits for VOC content when tested according to ASTM D 5116:
 - .1 Total VOCs: 10.00 mg/sq. m x h.
 - .2 Formaldehyde: 0.05 mg/sq. m x h.
 - .3 2-Ethyl-1-Hexanol: 3.00 mg/sq. m x h.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
- .2 Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 - .1 New concrete shall be allowed to cure for ninety (90) days prior to carpet tile installation.
 - .2 Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer. Moisture barrier carpets should not be installed unless the calcium chloride testing finds three (3) pounds or less of vapor emission. Also, test the chemical pH of the concrete slab to insure pH reading is not greater than 10.
 - .3 Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

- .3 Proceed with installation only after unsatisfactory conditions have been corrected and the longevity of the installation is assured.

3.2 PREPARATION

- .1 General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- .2 The Trade Contractor shall measure carefully and check all dimensions and other conditions in the field to insure proper fit. Trade Contractor shall be totally responsible for the accuracy of his measurements on total yardage requirements, individual floor yardage requirements, and dye lot yardage requirements. No request for carpet or installation extras from the Owner will be considered due to measurement or takeoff errors by the Trade Contractor.
 - .1 Trade Contractor shall coordinate all installation activities with the General Contractor.
 - .2 Sequence carpeting with other work so as to minimize possibility of damage and soiling of carpet during remainder of construction period. Do not commence carpet installation until painting and finishing work is complete and ceiling and other overhead work has been approved and completed, unless specifically approved by Departmental Representative or designate in writing.
- .3 Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/16 inch wide or wider and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.
- .4 Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.
- .5 Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.
- .6 Confirm compatibility of adhesive with curing compounds of concrete floors.
- .7 Environmental Conditions – Area to be carpeted must be pre-heated at a minimum of 20 deg C for at least 72 hours prior to installation with the relative humidity of no more than 65%. A minimum temperature of 10 deg C shall be maintained thereafter. Carpet and adhesive must be stored at a minimum temperature of 20 deg C for 72 hours prior to installation.

- .8 Broom and vacuum clean substrates to be covered immediately before installing carpet tile.
- .9 Once the Trade Contractor commences installation work under this contract, it shall be assumed that the condition of the floor has been accepted and any repairs or further corrections in the floor surface shall become the responsibility of the Trade Contractor.

3.3 INSTALLATION

- .1 Installation Method: As recommended in writing by carpet tile manufacturer and in keeping with the Carpet and Rug Institute's Installation Standard.
- .2 Installation contractor shall be a Carpet and Rug Institute Certified installation professional.
- .3 Maintain dye lot integrity. Do not mix dye lots in same area.
- .4 Use leveling compound where necessary. Any floor filling or leveling shall have a minimum of 1219mm of feather.
- .5 All carpet shall be installed with pile lay in the same direction, except as indicated by manufacturer's instructions.
- .6 Cutting shall be done in accordance with the manufacturer's recommendation, using the tools designed for the carpet being installed. Pattern size or loop integrity shall not be compromised by the trade contractor's use of trace cuts or double cuts on any side seam.
- .7 Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- .8 Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- .9 Run carpet under open bottom items such as heating convectors and install tight against walls, columns, and cabinets so that the entire floor area is covered with carpet. Cover over all floor type door closers.
- .10 Install edging guard at all openings and doors whenever carpet terminates, unless indicated otherwise. Prior to installation, report to the Project Manager all other obstructions which may occur.
- .11 Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

- .12 Install pattern parallel to walls and borders.
- .13 Do not bridge building expansion joint with continuous carpeting. Provide for movements.
- .14 Tufted patterns must be row cut on both side seams to maintain pattern integrity.

3.4 CLEANING AND PROTECTION

- .1 Perform the following operations immediately after installing carpet tile:
 - .1 Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 - .2 Remove yarns that protrude from carpet tile surface.
 - .3 Remove rejected carpeting with new carpeting.
 - .4 Vacuum carpet tile using commercial machine with face-beater element.
- .2 Protect installed carpet tile to comply with CRI 104, Section 16, "Protection of Indoor Installations."
- .3 Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.
- .4 If heavy furniture or equipment is to be moved over areas where carpet tile is already installed, plywood or masonite board must completely cover area where heavy objects will be rolled or slid.

3.5 INSPECTION

- .1 Preliminary Acceptance – Upon completion of the carpet installation of each floor, it shall be inspected by Owner, the General Contractor, Trade Contractor, and Departmental Representative or designate.
- .2 Upon completion of the installation, verify that work is complete, properly installed and acceptable. Remove and replace all work not found acceptable to the owner at the installer's expense.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.
- .2 Section 01 74 19 – Construction Waste Management and Disposal.
- .3 Section 01 78 23 – Operating and Maintenance Data.

1.2 SUBMITTALS

- .1 Submit samples and product data in accordance with Section 01 33 23 - Submittal Procedures for Shop Drawings, Product Data and Samples.
- .2 Product Data: For each type of core and facing material, and mounting indicated.
- .3 Submit duplicate sample panels for each type of core and facing material, and mounting indicated assembled in panels sized approximately 152mm by 152mm.
- .4 Submitted samples to include images scaled to fit sample size.

1.3 WARRANTY

- .1 Warranty Period: One year.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for wood flooring for incorporation into manual specified in Section 01 78 23 – Operating and Maintenance Data.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Store materials in fully enclosed ventilated, clean and dry storage space in areas of installation for minimum of 72 hours prior to commencing of work.
- .2 Ensure concrete, masonry, sheet rock, paint and framing members are thoroughly dry before panels are delivered.
- .3 Do not truck or unload flooring in rain, snow or excessively humid conditions.
- .4 Cover panels with tarpaulin or vinyl if atmosphere is foggy or damp.
- .5 Store in enclosed, well ventilated room with weather proof windows.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Construction Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site for recycling in accordance with Waste Management Plan.
- .4 Dispose of unused finish and adhesive materials at official hazardous material collections site approved by Departmental Representative or designate.
- .5 Do not dispose of unused finish and adhesive materials into sewer system, into streams, lakes, onto ground or in other locations where it will pose health or environmental hazard.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- .1 Noise S.T.O.P. Fabrisorb Decorative Acoustical Wall Panels:
 - .1 Decorative Fabric Wrapped Custom Acoustical Wall Panels by Acoustical Surfaces, Inc.
 - .2 123 Columbia Court North Suite 210.
 - .3 Chaska, MN 55318.
 - .4 1 (952) 448 – 5300.
 - .5 www.AcousticalSurfaces.com.
- .2 Departmental Representative or designate approved equivalent are acceptable.

2.2 DECORATIVE ACOUSTICAL WALL PANELS

- .1 Panel Materials:
 - .1 Core Material: 96 K/m³ to 112 K/m³ density glass fiber.
 - .2 Core Thickness: 25.4mm and 50.8mm.
 - .3 Sizes: 1219mm x 1219mm and Custom sizes as indicated on Drawings.
 - .4 Mounting: Mechanical Clips.
 - .5 Edge Details: Square.
 - .6 Edge Treatments: Chemically Hardened.
 - .7 Acoustical Properties for 96 K/m³ to 112 K/m³ glass fiber:
 - .1 For 25.4mm thickness: NRC of 0.85.
 - .2 For 50.8mm thickness: NRC of 1.15.
 - .8 Fire Resistance: This pattern meets the requirements of National Fire Protection Association (NFPA) Class A or 1.

- .1 Flame Spread: 15.
- .2 Smoke Developed: 40.
- .2 Fabric Facing Materials:
 - .1 Type: Guilford FR 701 2100 Fabric Facings.
 - .2 Style and Color: As selected by Departmental Representative or designate from manufacturer's standard selection.
 - .3 Panel Images: to be provided to manufacturer by Departmental Representative or designate.
 - .4 Fire Resistance: This pattern meets the requirements of National Fire Protection Association (NFPA) Class A or 1.
 - .1 Flame Spread: 5.
 - .2 Smoke Developed: 70.
 - .5 Attachment Materials:
 - .1 Adhesive: AGS-29 or PSA-29 panel adhesive.
 - .2 Hook & Loop fasteners.
 - .3 Mechanical clips.
 - .4 Impaling clips.
 - .5 Magnetic clips.
 - .6 Splines.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 General: Comply with decorative acoustical wall panel manufacturer's written instructions for installation and type of mounting specified.

3.2 MECHANICAL CLIPS

- .1 The panel clips are mounted onto the panels at the time of shipment. The wall clips are installed on the wall at the location established by the position of the panel clips or wall bars.
- .2 Ensure substrate is dry, by using test methods acceptable to flooring manufacturer.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Moisture testing of substrates.
- .2 Surface preparation of substrates as required for acceptance of paint, including cleaning, small crack repair, patching, caulking, and making good surfaces and areas to limits defined under MPI Repainting Maintenance Manual requirements.
- .3 Specific pre-treatments noted herein or specified in the MPI Repainting Maintenance Manual.
- .4 Sealing/touch-up, spot priming, and/or full priming surfaces for repainting in accordance with MPI Repainting Maintenance Manual requirements.
- .5 Provision of safe and adequate ventilation as required where toxic and/or volatile/flammable materials are being used over and above temporary ventilation supplied by others.

1.2 REFERENCES

- .1 Maintenance Repainting Manual by the Master Painters Institute (MPI), including Identifiers, Evaluation, Systems, Preparation and Approved Product List.
- .2 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings) of the Environmental Protection Agency (EPA).
- .3 National Fire Code of Canada.

1.3 QUALITY ASSURANCE

- .1 Contractor shall have a minimum of five years proven satisfactory experience. Provide a list of last three comparable jobs including, job name and location, specifying authority, and project manager.
- .2 Qualified journeymen who have a "Tradesman Qualification Certificate of Proficiency" shall be engaged in painting work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with applicable trade regulations.
- .3 Conform to latest MPI requirements for interior painting work including cleaning, preparation and priming.

- .4 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) shall be in accordance with the latest edition of the MPI Approved Product List and shall be from a single manufacturer for each system used.
- .5 Paint materials such as linseed oil, shellac, turpentine, etc. shall be the highest quality product of an approved manufacturer listed in MPI Maintenance Repainting Manual and shall be compatible with other coating materials as required.
- .6 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Departmental Representative or designate .
- .7 Standard of Acceptance: When viewed using final lighting source surfaces shall indicate the following:
 - .1 Walls: No defects visible from a distance of 1000 mm at 90° to surface.
 - .2 Ceilings: No defects visible from floor at 45° to surface.
 - .3 Final coat to exhibit uniformity of colour and sheen across full surface area.

1.4 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

- .1 Provide indoor paint products meeting MPI "Environmentally Friendly" E2 ratings based on VOC (EPA Method 24) content levels.

1.5 INSPECTION REQUIREMENTS

- .1 Interior surfaces requiring repainting shall be inspected by both painting contractor who will notify Departmental Representative or designate and General Contractor in writing of defects or problems, prior to commencing repainting work, or after surface preparation if unseen substrate damage is discovered.
- .2 Where an assessed degree of surface degradation of DSD-1 to DSD-3 before preparation of surfaces for repainting is revealed to be DSD-4 after preparation, repair or replacement of such unforeseen defects discovered shall be rectified by others, as mutually agreed, before repainting is started.

1.6 SUBMITTALS

- .1 Submit product data and manufacturer's installation/application instructions for each paint and coating product to be used in accordance with the requirements of Section 01 30 00 – Submittal Procedures.
- .2 Submit full range colour sample chips for review and selection. Indicate where colour availability is restricted.
- .3 Submit WHMIS MSDS - Material Safety Data Sheets for paint and coating materials in accordance with Section.

- .4 Upon completion, submit records of products used. List products in relation to finish system and include the following:
 - .1 Product name, type and use (i.e., materials and location).
 - .2 Manufacturer's product number.
 - .3 Colour code numbers.
 - .4 MPI Environmentally Friendly classification system rating.
 - .5 Manufacturer's Material Safety Data Sheets (MSDS).

1.7 QUALITY CONTROL

- .1 Provide a mock-up in accordance with requirements of Section 01 33 00.
- .2 Prepare and repaint mock-up designated interior room, surface or item to requirements specified herein, with specified paint or coating showing selected colours, gloss/sheen, textures and workmanship to MPI Maintenance Repainting Manual standards for review and approval.
- .3 When approved, repainted room, surface and/or item shall become acceptable standard of finish quality and workmanship for similar on-site interior repainting work.

1.8 DELIVERY, HANDLING AND STORAGE

- .1 Deliver, store and handle materials in accordance with Division 1 requirements of the contract.
- .2 Deliver and store materials in original containers, sealed, with labels intact.
- .3 Labels shall clearly indicate:
 - .1 Manufacturer's name and address.
 - .2 Type of paint or coating.
 - .3 Compliance with applicable standard.
 - .4 Colour number in accordance with established colour schedule.
- .4 Remove damaged, opened and rejected materials from site.
- .5 Observe manufacturer's recommendations for storage and handling.
- .6 Store materials and equipment in a secure, dry, well-ventilated area with temperature range between 7°C to 30°C. Store materials and supplies away from heat generating devices and sensitive products above minimum temperature as recommended by manufacturer.
- .7 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Departmental Representative or designate. After completion of operations, return areas to clean condition to approval of Departmental Representative or designate.

- .8 Remove paint materials from storage in quantities required for same day use.
- .9 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
- .10 Fire Safety Requirements:
 - .1 Provide one 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.
 - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
 - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

1.9 SITE REQUIREMENTS

- .1 Heating, Ventilation and Lighting:
 - .1 Perform no repainting work unless adequate and continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above 10°C for 24 hours before, during and after paint application and until paint has cured sufficiently.
 - .2 Ventilate enclosed spaces. Where required, provide continuous ventilation for seven days after completion of application of paint.
 - .3 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements. The use of gas-fired appliances is not permitted.
 - .4 Perform no painting work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
 - .1 Unless specifically pre-approved by specifying body, Paint Inspection Agency and, applied product manufacturer, perform no repainting work when:
 - .1 Ambient air and substrate temperatures are below 10°C.
 - .2 Substrate temperature is over 32°C unless paint is specifically formulated for application at high temperatures.
 - .3 Relative humidity within area to be repainted is above 85%.
 - .2 Conduct moisture tests using a properly calibrated electronic Moisture Meter, except use a simple "cover patch test" on concrete floors to be repainted.
 - .3 Perform no repainting work when maximum moisture content of substrate exceeds:
 - .1 12% for concrete and masonry (clay and concrete brick/block).
 - .2 15% for wood.

- .3 12% for plaster and gypsum board.
- .4 Test painted 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 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 noted herein.
 - .3 Apply paint when previous coat of paint is dry or adequately cured, unless otherwise pre-approved by the specific coating manufacturer.

1.10 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Special Provisions of the contract.
- .2 Paint, stain and wood preservative finishes and related materials (thinners, solvents, etc.) are hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.
- .3 Materials that cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
- .4 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
- .5 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into the ground the following procedures shall be strictly adhered to:
 - .1 Retain cleaning water for water-based materials to allow sediments to be filtered out. In no case shall equipment be cleaned using free draining water.
 - .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
 - .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
 - .4 Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.
 - .5 Empty paint cans are to be dry prior to disposal or recycling (where available).
 - .6 Close and seal tightly partly used cans of materials including sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.

- .6 Where paint recycling is available, collect waste materials by type and provide for delivery to recycling or collection facility.
- .7 Set aside and protect surplus and uncontaminated finish materials: Deliver to or arrange collection by employees, individuals, or organizations for verifiable re-use or re-manufacturing.

1.11 EXTRA MATERIALS

- .1 Submit maintenance materials in accordance with Special Provisions of the contract.
- .2 Submit one – four litre can of each type and colour of finish coating. Identify type and colour in relation to established colour schedule and finish system.
- .3 Deliver to Owner and store where directed.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Paint materials listed in the latest edition of the MPI Approved Product List (APL) as supplied by one of following manufacturers are acceptable for use on this project:
 - .1 ICI Devoe.
 - .2 Pittsburgh Paints.
 - .3 Colour Your World.
 - .4 Pratt and Lambert.
 - .5 Benjamin Moore.
 - .6 Para Paints.
- .2 Where required by authorities having jurisdiction, paints and coatings shall provide a fire resistant rating.
- .3 Paint materials for repaint systems shall be products of a single manufacturer.
- .4 Paints and coatings must be manufactured and transported in a manner that steps of processes, including disposal of waste products arising therefrom, will meet requirements of applicable governmental acts, by-laws and regulations including, for facilities located in Canada, Fisheries Act and Canadian Environmental Protection Act (CEPA).
- .5 Paints and coatings must not be formulated or manufactured with formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.

2.2 COLOURS

- .1 Departmental Representative or designate will provide Colour Schedule after Contract award.
- .2 Colour schedule will be based upon selection of five base colours and three accent colours. No more than eight colours will be selected for the entire project and no more than three colours will be selected in each area.
- .3 Selection of colours will be from manufacturer's full range of colours.
- .4 Where specific products are available in a restricted range of colours, selection will be based on the limited range.
- .5 First coat in a two coat (Premium) repaint system to be tinted slightly lighter colour than top coat to show visible difference between coats.

2.3 MIXING AND TINTING

- .1 Perform colour tinting operations prior to delivery of paint to site.
- .2 Paste, powder or catalyzed paint mixes shall be mixed in strict accordance with manufacturer's written instructions.
- .3 Where thinner is used, addition shall not exceed paint manufacturer's recommendations. Do not use kerosene or such organic solvents to thin water-based paints.
- .4 Thin paint for spraying according in strict 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.

2.4 GLOSS/SHEEN RATINGS

- .1 Paint gloss shall be defined as the sheen rating of applied paint, in accordance with the following MPI gloss / sheen standard values:

Gloss Level Category	Units @ 60°	Units @ 85°
G1 - matte finish	0 to 5	maximum 10
G2 - velvet finish	0 to 10	10 to 35
G3 - eggshell finish	10 to 25	10 to 35
G4 - satin finish	20 to 35	minimum 35
G5 - semi-gloss finish	35 to 70	
G6 - gloss finish	70 to 85	
G7 - high gloss finish	> 85	

- .2 Gloss level ratings of repainted surfaces shall be as specified herein and as noted on Finish Schedule.

2.5 INTERIOR PAINTING SYSTEMS

- .1 Applies to new finishes over previously unpainted surfaces or new shop primed surfaces to be field painted.
- .2 Refer to Finish Schedule on Architectural drawings for locations.
- .3 Structural steel, metal fabrications, and joists, including exposed mechanical equipment, pipes, ducts, and conduit in ceiling space (overhead , wherever exposed to view):
 - .1 Latex primer – 1 coat.
 - .2 Latex G2 finish – 2 coats.
- .4 Galvanized and non galvanized metal: doors, frames, railings, structural and miscellaneous metals (within floor to underside of ceilings)
 - .1 Alkyd - G5 finish – 2 coats.
- .5 Plaster and gypsum board: gypsum wallboard, drywall, "sheet rock type material", and textured finishes:
 - .1 Latex primer/sealer, 1 coat.
 - .2 Latex G3 finish – 2 coats.
- .6 Canvas and cotton coverings.
 - .1 Latex G1 finish – 2 coats.

2.6 INTERIOR RE-PAINTING SYSTEMS

- .1 Applies to previously painted surfaces, not new or shop primed.
- .2 Galvanized metal: doors, frames, railings, misc. steel, pipes, overhead decking, and ducts.
 - .1 Alkyd - G5 finish – 2 coats.
- .3 Plaster and gypsum board: gypsum wallboard, drywall, "sheet rock type material", and textured finishes:
 - .1 Latex G3 finish – 2 coats.
- .4 Canvas and cotton coverings.
 - .1 Latex G1 finish – 2 coats.

2.7 EXTERIOR PAINTING AND RE-PAINTING SYSTEMS

- .1 Galvanized Metal:
 - .1 Galv, metal primer – 1 coat.
 - .2 Alkyd G5 level finish – 2 coats.

PART 3 EXECUTION

3.1 GENERAL

- .1 Perform preparation and operations for interior painting in accordance with MPI Maintenance Repainting Manual requirements except where otherwise specified.
- .2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.2 EXISTING CONDITIONS

- .1 Prior to commencing work, thoroughly examine site conditions and existing interior substrates to be repainted. Report in writing to Departmental Representative or designate damages, defects, or unsatisfactory or unfavourable conditions or surfaces that will adversely affect this work.
- .2 Conduct moisture testing of surfaces to be painted using a properly calibrated electronic moisture meter, except test concrete floors for moisture using a simple "cover patch test" and report findings to Departmental Representative or designate . Maximum moisture content shall not exceed limits specified herein.
- .3 No repainting work shall commence until such adverse conditions and defects have been corrected and surfaces and conditions are acceptable to the Painting Subcontractor and Inspection Agency. Commencement of work shall not be held to imply acceptance of surfaces except as qualified herein.
- .4 Degree of surface deterioration (DSD) shall be assessed using MPI Identifiers and Assessment criteria indicated in the MPI Maintenance Repainting Manual. MPI DSD ratings and descriptions are as follows:

Condition	Description
DSD-0	Sound Surface (includes visual (aesthetic) defects that do not affect film's protective properties).
DSD-1	Slightly Deteriorated Surface (indicating fading; gloss reduction, slight surface contamination, minor pin holes scratches, etc.).
DSD-2	Moderately Deteriorated Surface (small areas of peeling, flaking, slight cracking, staining, etc.).
DSD-3	Severely Deteriorated Surface (heavy peeling, flaking, cracking, checking, scratches, scuffs, abrasion, small holes and gouges).
DSD-4	Substrate Damage (repair or replacement of surface required by others).

3.3 PROTECTION

- .1 Protect existing surfaces and adjacent fixtures and furnishings from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such surfaces as directed by Departmental Representative or designate.
- .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
- .3 Protect factory finished products and equipment.
- .4 Protect general public and building occupants in and about the building.
- .5 Removal of electrical cover plates, light fixtures, surface hardware on doors, bath accessories and surface mounted equipment, fittings and fastenings shall be done prior to undertaking re-painting operations by General Contractor. Items shall be securely stored and re-installed by General Contractor after painting is completed.
- .6 Move and cover furniture and portable equipment as necessary to carry out repainting operations. Replace as painting operations progress.
- .7 As repainting operations progress, place "WET PAINT" signs in occupied areas to approval of Departmental Representative or designate.

3.4 CLEANING AND PREPARATION

- .1 Clean and prepare interior surfaces to be repainted in accordance with MPI Maintenance Repainting Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
 - .1 Remove dust, dirt, and surface debris by vacuuming, wiping with dry, clean cloths or compressed air.
 - .2 Remove chipped, loose, scaling, sealants and caulking materials, fasteners, adhesive residues etc. or other surface blemishes which would impair the final results.
 - .3 Patch small holes and depressions in drywall finishes with appropriate patching compound and sand flush with adjacent finish.
 - .4 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and surface contaminants.
 - .5 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
 - .6 Allow surfaces to drain completely and to dry thoroughly. Allow sufficient drying time and test surfaces using an electronic moisture meter before commencing work.
 - .7 Use water-based cleaners in place of organic solvents where surfaces will be repainted using water based paints.

- .8 Many water-based paints cannot be removed with water once dried. Minimize the use of kerosene or such organic solvents to clean up water-based paints.
- .2 Clean metal surfaces to be repainted by removing rust, dirt, oil, grease and foreign substances in accordance with MPI requirements. Remove such contaminants from surfaces, pockets and corners to be repainted by brushing with clean brushes, blowing with clean dry compressed air, or brushing/vacuum cleaning as required.
- .3 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before priming and between applications of remaining coats. Touch-up, spot prime, and apply primer, paint, or pre-treatment as soon as possible after cleaning and before deterioration occurs.
- .4 Do not apply paint until prepared surfaces have been accepted by Departmental Representative or designate.
- .5 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.

3.5 APPLICATION

- .1 Apply paint by method that is best suited for substrate being repainted using brush roller air sprayer and/or airless sprayer. Conform to manufacturer's application instructions unless specified otherwise. Methods of application shall be as pre-approved by Departmental Representative or designate before commencing the work.
- .2 Brush and Roller Application:
 - .1 Apply paint in a uniform layer using brush and/or roller of types suitable for application.
 - .2 Work paint into cracks, crevices and corners.
 - .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
 - .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces shall be free of roller tracking and heavy stipple.
 - .5 Remove runs, sags and brush marks from finished work and repaint.
- .3 Spray Application:
 - .1 Provide and maintain equipment that is suitable for intended purpose, capable of properly atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
 - .2 Keep paint ingredients properly mixed in containers during paint application by continuous mechanical agitation intermittent agitation frequently as necessary.
 - .3 Apply paint in a uniform layer, with overlapping at edges of spray pattern.
 - .4 Back roll spray applications and brush out runs and sags immediately.

- .5 Use brushes to work paint into cracks, crevices and places which are not adequately painted by spray.
- .4 Use dipping, sheepskins or daubers when no other method is practical in places of difficult access and when specifically authorized by Departmental Representative or designate.
- .5 Apply paint coats in a continuous manner and allow surfaces to dry and properly cure between coats for minimum time period as recommended by manufacturer. Minimum dry film thickness of coats shall not be less than that recommended by the manufacturer. Repaint thin spots or bare areas before next coat of paint is applied.
- .6 Sand and dust between coats to remove visible defects.
- .7 Repaint surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.
- .8 Repaint top, bottom, and vertical edges of doors to be repainted.
- .9 Repaint closets and alcoves to match existing, unless otherwise scheduled or noted.

3.6 MECHANICAL/ELECTRICAL EQUIPMENT

- .1 Unless otherwise noted, repainting shall also include exposed to view/previously painted mechanical and electrical equipment and components (panels, conduits, piping, hangers, ductwork, ventilation fan enclosures, etc.).
- .2 Touch up scratches and marks and repaint such mechanical and electrical equipment and components with colour, and sheen finish to match existing unless otherwise noted or scheduled.
- .3 Do not paint over name plates or instruction labels.
- .4 Leave unfinished exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish.
- .5 Keep sprinkler heads free of paint.
- .6 Do not paint interior transformers and substation equipment.

3.7 CLEAN-UP

- .1 Remove paint where spilled, splashed, splattered or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.

- .2 Keep work area free from an unnecessary accumulation of tools, equipment, surplus materials and debris.
- .3 Remove combustible rubbish materials and empty paint cans each day and safely dispose of same in accordance with requirements of authorities having jurisdiction.
- .4 Clean equipment and dispose of wash water used for water borne materials, solvents used for oil based materials as well as other cleaning and protective materials (e.g. rags, drop cloths, masking papers, etc.), paints, thinners, paint removers/strippers in accordance with the safety requirements of authorities having jurisdiction and as noted herein.
- .5 Painting equipment shall be cleaned in leak-proof containers that will permit particulate matter to settle out and be collected. Sediment remaining from cleaning operations shall be recycled or disposed of in a manner acceptable to authorities having jurisdiction.
- .6 Paint and coatings in excess of repainting requirements shall be recycled as noted herein.

3.8 RESTORATION

- .1 Clean and re-install hardware items removed before undertaken painting operations.
- .2 Remove protective coverings and warning signs as soon as practical after operations cease.
- .3 Remove paint splashings on affected exposed surfaces. Remove smears and spatter immediately as operations progress, using compatible solvent.
- .4 Protect freshly completed surfaces from paint droppings and dust to approval of Departmental Representative or designate. Avoid scuffing newly applied paint.
- .5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Departmental Representative or designate.

END OF SECTION

DIVISION 10
SPECIALTIES

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.
- .2 Section 01 45 00 – Quality Control.
- .3 Section 01 61 00 – Material and Equipment.
- .4 Section 01 74 19 – Construction Waste Management and Disposal.

1.2 SUMMARY

- .1 This Section includes the following:
 - 1. Manually operated, paired panel operable partitions.
 - 2. Coordinate with other divisions as required for:
 - .1 Division 03 Sections for concrete tolerances.
 - .2 Division 05 Sections for primary structural support, including pre-punching of support members by structural steel supplier per operable partition supplier's template.
 - .3 Division 06 Sections for wood framing and supports, and all blocking at head and jambs as required.
 - .4 Division 09 Sections for wall and ceiling framing at head and jambs.

1.3 QUALITY ASSURANCE

- .1 **Installer Qualifications:** An experienced installer who is certified in writing by the operable partition manufacturer, as qualified to install the manufacturer's partition systems for work similar in material, design, and extent to that indicated for this Project.
- .2 **Acoustical Performance:** Test operable partitions in an independent acoustical laboratory in accordance with ASTM E90 test procedure to attain no less than the STC rating specified. Provide a complete and unedited written test report by the testing laboratory upon request.
- .3 Preparation of the opening shall conform to the criteria set forth per ASTM E557 *Standard Practice for Architectural Application and Installation of Operable Partitions*.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Construction Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, and packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused wood materials from landfill to facility approved by Departmental Representative or designate.
- .5 Do not dispose of preservative treated wood through incineration.
- .6 Do not dispose of preservative treated wood with materials destined for recycling or reuse.
- .7 Dispose of treated wood, end pieces, wood scraps and sawdust at sanitary landfill approved by Departmental Representative or designate.
- .8 Dispose of unused wood preservative material at official hazardous material collections site approved by Departmental Representative or designate.
- .9 Do not dispose of unused preservative material into sewer system, into streams, lakes, onto ground or in other locations where they will pose health or environmental hazard.

1.5 SUBMITTALS

- .1 Product Data: Material descriptions, construction details, finishes, installation details, and operating instructions for each type of operable partition, component, and accessory specified.
- .2 Shop Drawings: Show location and extent of operable partitions. Include plans, elevations, sections, details, attachments to other construction, and accessories. Indicate dimensions, weights, conditions at openings, and at storage areas, and required installation, storage, and operating clearances. Indicate location and installation requirements for hardware and track, including floor tolerances required and direction of travel. Indicate blocking to be provided by others.
- .3 Setting Drawings: Show imbedded items and cutouts required in other work, including support beam punching template.

- .4 Samples: Color samples demonstrating full range of finishes available. Verification samples will be available in same thickness and material indicated for the work.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Clearly mark packages and panels with numbering systems used on Shop Drawings. Do not use permanent markings on panels.
- .2 Protect panels during delivery, storage, and handling to comply with manufacturer's direction and as required to prevent damage.

1.7 WARRANTY

- .1 Provide written warranty by manufacturer of operable partitions agreeing to repair or replace any components with manufacturing defects.
- .2 Warranty period: Two (2) years.

PART 2 PRODUCTS

2.1 PRODUCTS

- .1 Subject to compliance with the requirements, provide the following product:
 - .1 Acousti-Seal #932FS manually operated, floor supported paired panel operable partition by Modernfold Inc.

2.2 OPERATION

- .1 Series of paired flat panels hinged together in pairs, manually operated, floor supported with no mechanical floor seals.
- .2 Final Closure: Hinged panel closure.

2.3 PANEL CONSTRUCTION

- .1 Nominal 3-inch (76mm) thick panels in manufacturer's standard 48-inch (1220mm) widths. All panel horizontal and vertical framing members fabricated from minimum 18-gage formed steel with overlapped and welded corners for rigidity. Top channel is reinforced to support suspension system components. Frame is designed so that full vertical edges of panels are of formed steel and provide concealed protection of the edges of the panel skin.

- .2 Panel skin: 22-gage steel faced 1/2-inch (13 mm) gypsum board, class “A” rated single material or composite layers continuously bonded to panel frame. Acoustical ratings of panels with this construction: 50STC.
- .3 Hinges for Panels, Closure Panels, Pass Doors, and Pocket Doors shall be: Full leaf butt hinges, attached directly to panel frame with welded hinge anchor plates within panel to further support hinge mounting to frame. Lifetime warranty on hinges. Hinges mounted into panel edge or vertical astragal are not acceptable.
- .4 Panel Trim: No vertical trim required or allowed on edges of panels; minimal groove appearance at panel joints.
- .5 Panel Weights: 50 STC (with steel facing) – 8.5 lbs./square foot.

2.4 PANEL FINISHES

- .1 Panel face finish shall be: (refer to drawings for locations)
 - .1 Wall covering and upholstery fabric with surface treatment to resist stains.
 - .2 Partial height steel markerboard work surface.
 - .3 Partial height 1/4-inch (6.35 mm) natural cork tackboard with vinyl or fabric covering.
 - .4 High pressure plastic laminate on MDF board.
 - .5 Wood veneer on MDF board.

2.5 PANEL TRIM

- .1 Exposed panel trim of one consistent color from manufacturer’s standard offering.

2.6 SOUND SEALS

- .1 Vertical Interlocking Sound Seals between panels: Roll-formed steel astragals, with reversible tongue and groove configuration in each panel edge for universal panel operation. Rigid plastic astragals or astragals in only one panel edge are not acceptable.
- .2 Horizontal Top and Bottom Seals: Continuous contact extruded vinyl bulb shape with pairs of non-contacting vinyl fingers to prevent distortion without the need for mechanically operated parts.

2.7 SUSPENSION SYSTEM

- .1 #17 Floor Supported Suspension System:
 - .1 Floor Track: Minimum 16-gage stainless steel shall support nominally 80% or more of the panel weight. Surface mounted application shall require no alteration of the floor surface. Recessed floor track shall require a kerf no wider than 1-inch (25 mm) nor deeper than 1-inch (25 mm).
 - .2 Suspension Tracks: Minimum 11-gage, 0.12-inch (3 mm) roll-formed steel track, suitable for either direct mounting to a wood header or supported by adjustable steel hanger brackets, supporting the load-bearing surface of the track, connected to structural support by pairs of 3/8-inch (9.5 mm) diameter threaded rods. Aluminum track is not acceptable.
 - .3 Exposed track soffit: Steel, integral to track, and pre-painted off-white.
 - .4 Carriers: One all-steel trolley with steel-tired ball bearing wheels per panel (except hinged panels).
 - .5 Non-steel tires are not acceptable.

2.8 OPTIONS

- .1 Work Surfaces:
 - .1 Markerboard: White enamel on steel, bonded to the face of the panel with horizontal trim without exposed fasteners. Trim is not acceptable on vertical edges to provide uninterrupted work surface.
 - .2 Tackboard: Minimum 1/4-inch (6.35 mm) natural cork, covered with vinyl or fabric, with horizontal trim without exposed fasteners. Trim is not acceptable on vertical edges.
 - .3 Accessories/Options:
 - .1 Pocket Doors: Acousti-Seal Pocket Doors by Modernfold, Inc., with same construction, finish, and appearance as the adjacent panels.
 - .2 Finished end caps.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 General: Comply with ASTM E557, operable partition manufacturer's written installation instructions, Drawings and approved Shop Drawings.
- .2 Install operable partitions and accessories after other finishing operations, including painting, have been completed.

- .3 Match operable partitions by installing panels from marked packages in numbered sequence indicated on Shop Drawings.
- .4 Broken, cracked, chipped, deformed, or unmatched panels are not acceptable.

3.2 CLEANING AND PROTECTION

- .1 Clean partition surfaces upon completing installation of operable partitions to remove dust, dirt, adhesives, and other foreign materials according to manufacturer's written instructions.
- .2 Provide final protection and maintain conditions in a manner acceptable to the manufacturer and installer that insure operable partitions are without damage or deterioration at time of Substantial Completion.

3.3 ADJUSTING

- .1 Adjust operable partitions to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and other moving parts.

3.4 EXAMINATION

- .1 Examine flooring, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable partitions. Proceed with installation only after unsatisfactory conditions have been corrected.

3.5 DEMONSTRATION

- .1 Demonstrate proper operation and maintenance procedures to Owner's representative.
- .2 Provide Operation and Maintenance Manual to Owner's representative.

END OF SECTION

DIVISION 11

EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Equipment and installation of audio video equipment, sound systems, speakers, assisted listening devices, wiring, controls, and programming.
- .2 Integration with lighting and other building systems.

1.2 OVERVIEW OF SYSTEMS

- .1 A completely new audio visual system is to be installed in the Visitor's Theatre. A podium will be located on stage and will house the audio visual control and processing equipment. AV equipment will consist of speakers (wall mounted and ceiling mounted), wired and wireless microphones, assistive listening devices, ceiling mounted video projection system, Crestron control system with touch panel located at the podium and information desk, Western Digital media player and guest CPU devices.
- .2 Design objective is to establish a user friendly system that will be operated by a variety of technical and non-technical Park staff for general theatre presentations and general meeting presentations. A design emphasis has been placed on a system that will have very low operating and maintenance cost and be fully expandable to accommodate future technologies as required.

1.3 RELATED SECTIONS

- .1 Division 26 – Electrical.

1.4 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.
- .2 Submit data sheet for each piece of equipment to be provided in duplicate.
- .3 Provide operation and maintenance data for inclusion within Operation and Maintenance Manuals specified in Section 01 78 23 Operating and Maintenance Manuals.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Construction Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

- .3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Separate for reuse and recycling and place in designated containers Steel Metal Plastic waste in accordance with Waste Management Plan.
- .5 Place materials defined as hazardous or toxic in designated containers.

PART 2 PRODUCTS

2.1 INTENT

- .1 The intent of this section is to provide a functional description of the audio visual requirements and required specifications for the Visitor Center Theatre and Workshop area. A manufacturer and model has been identified for each room; an approved equal will be considered at the discretion of the Department Representative or designate.

2.2 AUDIO SYSTEMS

- .1 Loudspeakers
 - .1 Provide two (2) Tannoy DVS 8 two-way, 300W compact loudspeaker systems each complete with adjustable wall bracket. Both bracket and loudspeakers shall be finished in black. Loudspeakers shall be mounted on either side of projection surface at stage left and stage right. Speakers shall provide program audio to the room.
 - .2 Provide eight (8) Tannoy CVS 6, 70V ceiling loudspeakers complete with steel back can and mounting rings. Loudspeakers shall be finished in black. Speakers shall be mounted in the ceilings – six (6) speakers for the Theatre space and two (2) for the Workshop space.
- .2 Audio Processors
 - .1 Provide one (1) Biamp TesiraForte T1 Audio Mixing Processor, complete with 12 input, 8 output. Inputs shall support 12-mono microphone or line level balanced or unbalanced, with 8-inputs supporting phantom power. Outputs shall support 8-mono line level outputs. The digital audio processor shall permit RS-232 control of parameters and settings. DSP software shall support but not limited to, mixers, equalizers, filters, dynamics/gain controls, signal routers and delays, signal metering and diagnostics. Adjustments may be made during commission, to customer's satisfaction.

- .3 Audio Amplifiers
 - .1 Provide one (1) Lab Gruppen model ES8:2, two channel, 400 watt per channel @ 8 ohm power amplifier. Audio amplifier to be Class D ripple suppression with convection cooled fan less operation. Amplifier to be mounted in AV equipment rack to power left / right program audio loudspeakers in the Theatre space adjacent to projected image.
 - .2 Provide one (1) Lab Gruppen model ES4:2, two channel, 200 watt per channel @ 70 volt power amplifier. Audio amplifier to be Class D ripple suppression with convection cooled fan less operation. Amplifier to be mounted in AV equipment rack to power audio ceiling speakers in the Theatre space and audio ceiling speakers in Workshop space.

- .4 Microphones
 - .1 Provide one (1) Shure MX418/SEC 18" Podium gooseneck condenser microphone with shock mount flange, 10" bottom-exit cable snap-fit foam windscreen, in-line preamp.
 - .2 Provide two (2) Shure SLX124/85/SM58 wireless combo system with SLX4 diversity receiver, SLX1 body-pack transmitter with cardioid lavalier microphone, and SLX2/SM58 handheld transmitter with SM58 microphone. Microphones shall be used in the Theatre space.

2.3 VIDEO SYSTEMS

- .1 Video Projectors
 - .1 Provide one (1) Sony VPLFHZ700 LCD projector. The projector shall supply a minimum of 7000 ANSI lumens of brightness with a 5000:1 contrast ratio. The projector shall have native 1920 x 1080 display resolution and support HDTV formats via HDMI and DVI connectors. The projector shall operate with a noise level no greater than 30dBA. The projector shall be rated for 24/7 continuous operation and shall have a 3 year warranty for heavy duty and continuously run applications. The projector shall use a laser light source 3LCD optical system providing 20,000 hours of maintenance free operation. The projector shall be supplied with a long throw 3:3-6:1 lens. Provide all necessary mounting brackets and hardware/accessories to allow the projector to be ceiling mounted. The projector shall be operated by the control system via RS-232 protocol to provide complete control.

- .2 Provide two (2) spare projector bulb for the DHD775E projector.
 - .3 Provide one (1) Chief projector mounting system consisting of: one (1) RPA specific bracket for the VPLFHZ700 LCD projector, model CMA-100 ceiling plate, extendable column, and cable management adapters as required. The mounting system will be installed in the Theatre room.
 - .4 Projection surface will be prepared by General Contractor and painted with Sherwin-Williams Duration Satin Extra White paint suitable for projection.
 - .5 Projection surface area will be roughly 2700mm H x 4500mm W.
- .2 Video Processing
- .1 Provide one (1) Crestron DMPS-3-300 scaling presentation switcher with output resolution of 1920 x 1080p.
 - .1 The switcher must have two (2) built in twisted pair receivers, and one (1) built in twisted pair transmitter.
 - .2 The switchers built in twisted pair transmitters and receivers must support a maximum transmission distance of 330 feet (100 meters) at all compatible resolutions.
 - .3 The switcher must when be controlled via contact closure and controlled via front panel buttons.
The switcher must support bidirectional RS-232 control for peripheral device control.
 - .4 The switcher must provide remote powering for remote twisted pair transmitters and receivers.
 - .5 The switcher must support EDID and HDCP transmission with DDC channels actively buffered allowing continuous communication between source and display.

2.4 CENTRAL CONTROL SYSTEM

- .1 Central Control.
 - .1 Provide one (1) Crestron DMPS-3-300 processor for the Theatre area. Processors will be configured to control the following equipment:
 - .1 Audio Mixers/DSP Processors.
 - .2 LCD projector.
 - .3 AV switchers.
 - .4 Video/Audio sources.
 - .5 Room combining/dividing.
 - .6 Audio Amplifier.
 - .7 Lighting Control.
 - .8 Possibly drape control.

- .2 Touch Panel
 - .1 Provide one (1) Crestron TSW1052 tabletop style 10” widescreen color touch panel, in black textured finish. The panel shall be equipped with 1280 x 800 display resolution and automatic brightness control, as well as built-in USB port for direct program upload. The touch panel will be installed in the podium in the Theatre, with customized GUI to control the AV equipment.
 - .2 Provide a second Crestron TSW1052 tabletop style 10” widescreen color touch panel to be located at the information desk for remote show start / stop.
 - .3 Provide a custom graphic user interface that is intuitive to use, rich in functionality and reflects the “natural” feeling of the Visitors Centre. GUI samples are to be provided to and approved by owner prior to installation.
 - .4 All Crestron software programming used to complete this project will remain the sole property of Parks Canada Pt. Pelee National Park including all source code.
 - .5 No proprietary modules are to be used that require licensing.
 - .6 No files are to be password protected or encrypted.

2.5 EQUIPMENT RACK - Podium

- .1 Furniture Podium
 - .1 Provide one (1) Exact Furniture PM550 Podium. Podium to include locking keyboard drawer, locking doors on both presenter and audience side and 10 RU rack rails, cable cubby for guest VGA and HDMI sources. Careful attention should be given to venting/cooling provisions to ensure proper thermal airflow management is adhered to.
 - .2 Provide one Middle Atlantic UPS-S1000R UPS back up power with 120VAC surge protection and EMI filtering. Mount unit in back of AV equipment rack. Connect power distribution strip previously specified to output of unit.
- .2 AV Floor Box
 - .1 General Contractor will provide and install one (1) Wiremold Evolution Series EFB8S floor box for AV connectivity at the podium location.
 - .2 Wiremold EFB8S is an 8-Gang series floor box has been developed specifically with the A/V industry in mind. With 3 1/2" - 3 7/8" [89mm x 98mm] of wiring capacity behind each device plate, these boxes will accept devices from leading A/V manufacturers including Extron and Crestron.

2.6 LED DISPLAYS

- .1 Provide one (1) Sharp 70" interactive LED TV, model PNL703BC to display video and computer sources. Panel shall have native pixel resolution of 1920 x 1080 and must have built-in speakers. LED must have minimum of one HDMI input, and the serial port shall support RS-232 protocols. LED display will be attached to Mobile Stand to be used in Workshop space for overflow.
- .2 Provide one (1) ChiefMounts mobile stand to hold the Sharp display. The unit will be complete with locking latch mechanism and cable management adapters as required. The cart shall support VESA mounting hole pattern in 100 mm increments.

2.7 ASSISTIVE LISTENING SYSTEM

- .1 Transmitter
 - .1 Provide two (2) Listen Technologies model LT800 transmitter complete with LA-201 power supply, LA-326 universal rack mount kit and LA-122 universal remote antenna. Transmitter will be located in the AV equipment rack.
- .2 Receiver
 - .1 Provide eight (8) Listen Technologies model LR300 series portable digital FM receivers complete with LA-362 rechargeable NiCad batteries, and LA-161 single ear bud.
- .3 Accessories
 - .1 Provide four (4) Listen Technologies model LA-166 neck loop for use with hearing aids.
 - .2 Provide one (1) Listen Technologies model LA-311 charging case for sixteen (16) FM receivers.
 - .3 Provide ten (10) LA-163 ear bud replacement package of twenty (20).

2.8 AV FLOOR BOX

- .1 General Contractor will provide and install one Wiremold Evolution Series EFB8S floor box for AV connectivity at the podium location.

2.9 LIGHTING CONTROL

- .1 General Contractor will provide and install one (1) Lutron Grafik Eye scene based light control system with adjustable preset. Grafik Eye will be sized with appropriate number of zones and scenes as per electrical lighting design. Electrical and light design will provide for appropriate spotlight to illuminate the podium location. Grafik Eye will include an Ethernet and RS232 control interface for AV recall of established lighting scenes.
- .2 Theatrical Gobo Spot Lights are being considered to project scene imagery onto the stage back drop when presentations are not running. The Gobo spotlights will have a custom artwork provided by Pt. Pelee National Park to Gobo-Artwork as an electronic file (.bmp, tif, psd, eps) Theatrical Gobo lights are to be controlled via wall switches –location TBD.

PART 3 EXECUTION

3.1 CLEANING

- .1 Remove manufacturer's protective packaging materials and commercial labeling.
- .2 Clean all surfaces of equipment and ensure wiring is neatly bundled and secured.

3.2 TRAINING

- .1 Provide qualified personnel to demonstrate the complete operation of all systems to Department Representative or designates and provide clear operating procedures that can be provided to guests or staff unfamiliar with the systems.

END OF SECTION

DIVISION 12
FURNISHINGS

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 This section describes requirements for room darkening roller shades with manual operators.

1.2 PRODUCT DATA

- .1 For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, operating instructions, and typical wiring diagrams including integration of motor controllers with building management system, audiovisual and lighting control systems as applicable.

1.3 SHOP DRAWINGS

- .1 Show location and extent of roller shades. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other work, operational clearances, and relationship to adjoining work.

1.4 COORDINATION DRAWINGS

- .1 Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - .1 Ceiling suspension system members and attachment to building structure.
 - .2 Ceiling-mounted or penetrating items including light fixtures, air outlets and inlets, speakers, sprinklers, recessed shades, and special moldings at walls, column penetrations, and other junctures of acoustical ceilings with adjoining construction.
 - .3 Shade mounting assembly and attachment.
 - .4 Size and location of access to shade operator, chain locations, and adjustable components.

1.5 SAMPLES

- .1 Samples for Initial Selection: For each colored component of each type of shade indicated.
 - .1 Include similar Samples of accessories involving color selection.
- .2 Samples for Verification:
 - .1 Complete, full-size operating unit not less than 400 mm wide for each type of roller shade indicated.

- .2 For each finish product specified, one complete set of shade components, unassembled, demonstrating compliance with specified requirements. Shadecloth sample and aluminum finish sample as selected. Mark face of material to indicate interior faces.
- .3 For the following products:
 - .1 Shade Material: Not less than 76 mm square, with specified treatments applied. Mark face of material.
 - .2 Window Treatment Schedule: For roller shades.

1.6 PRODUCT CERTIFICATES

- .1 For each type of roller shade, signed by product manufacturer.

1.7 MAINTENANCE DATA

- .1 For roller shades to include in maintenance manuals. Include the following:
 - .1 Methods for maintaining roller shades and finishes.
 - .2 Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
 - .3 Operating hardware.
 - .4 Motorized shade operator.

1.8 QUALITY ASSURANCE

- .1 Manufacturer Qualifications: Obtain roller shades through one source from a single manufacturer with a minimum of twenty years experience in manufacturing products comparable to those specified in this section.
- .2 Fire-Test-Response Characteristics: Provide roller shade band materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
- .3 Flame-Resistance Ratings: Passes NFPA 701-99 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.
- .4 Product Standard: Provide roller shades complying with WCMA A 100.1.
- .5 Electrical Components: NFPA Article 100 listed and labeled by either UL or ETL or other testing agency acceptable to authorities having jurisdiction, marked for intended use, and tested as a system. Individual testing of components will not be acceptable in lieu of system testing.
- .6 Shade cloth to “pass” indoor air quality / VOC testing as per ASTM D 5116-97 ASTM D 6670-01, USEPA-ETV (U.S. Environmental Protection Agency’s Environmental Technology Verification Protocol).

- .7 Shade Cloth: Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC9644, ATCC9645.
- .8 Shade Cloth to be constructed of a woven screen material consisting of yarns comprised of extruded vinyl coated Polyester core yarn as a composite Thermoplastic shade cloth that shall be sealed at the edges, assuring binding the core yarn to the coating at the cut edge to assure a sealed edge to substantially minimize raveling. Screen cloths to have inert core yarns: i.e. Fiberglass yarns shall not be acceptable.
- .9 Use only injection-molded Delrin engineered plastics by Dupont for all plastic components of shade hardware. Styrene based, PVC, or glass reinforced polyester thermo polymer plastics are not acceptable.

1.9 DELIVERY, STORAGE AND HANDLING

- .1 Protect on site stored or installed absorptive material from moisture damage.
- .2 Store extra materials required for maintenance, where directed by Departmental Representative or designate.

1.10 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials in accordance with Special Provisions of the contract.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Separate for recycling and place in designated containers waste in accordance with Waste Reduction Workplan.
- .4 Place materials defined as hazardous or toxic in designated containers.
- .5 Handle and dispose of hazardous materials in accordance with Regional and Municipal regulations.
- .6 Fold up metal and plastic banding, flatten and place in designated area for recycling.

1.11 ENVIRONMENTAL REQUIREMENTS

- .1 Environmental Limitations: Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

- .2 Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed unit's operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.12 EXTRA MATERIALS

- .1 Provide acoustical units amounting to minimum 1 full shade in original product packaging and protection, clearly identified as to installed rooms or locations.
- .2 Ensure extra materials are from same production run as installed materials.
- .3 Clearly identify type of acoustic unit, including colour and texture.
- .4 Deliver to Departmental Representative or designate upon completion of the work of this section.

1.13 WARRANTY

- .1 Roller Shade Hardware, Chain and Shadecloth; Manufacturer's standard fit-for-use, including normal wear & tear,, non-depreciating, Limited Lifetime twenty-five year warranty. Warranty to transfer to owner upon completion of installation.
- .2 Roller Shade Motors and Motor Control Systems: Manufacturer's standard non-depreciating eight-year warranty.

1.14 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Special Provisions of the contract.
- .2 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative or designate.
- .3 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .4 Dispose of packaging material in appropriate on-site bin for recycling in accordance with site Waste Reduction Work plan.

PART 2 PRODUCTS

2.1 ROLLER SHADES

- .1 Basis-of-Design Product: Subject to compliance with requirements, provide products indicated in Drawings or a comparable product by one of the following:
 - .1 MechoShade Systems, Inc (MechoShade), as basis of design, performance and warranties, or equal.
- .2 Room Darkening Shades: Provide room darkening (black-out) window shades designed to eliminate all visible light gaps when shades are fully closed.
- .3 Shade Band Material: The selection of density and color of sunscreen shade cloth shall be based on the relationship with the specified glass, in accordance with the specific project requirements for reducing heat loads and glare.
 - .1 Fabric Width: As per manufacturer's standard.
 - .2 Pattern: As per manufacturer's standard.
 - .3 Colors: As per manufacturer's standard.
 - .4 Material Openness Factor: As per manufacturer's recommendation for specified glass type and applicable conditions.
 - .5 Bottom Hem: Fabric wrapped and electronically sealed at ends. Sewn hems and open hem pockets are not acceptable.
- .4 Rollers: Extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a "snap-on" snap-off" spline mounting, without having to remove shade roller from shade brackets. Mounting spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets.
- .5 Provide shade hardware system that allows multi-banded shades to be capable of smooth operation when the axis is offset a maximum of 6 degrees on each side of the plane perpendicular to the radial line of the curve, for a 12 degrees total offset.
- .6 Direction of Roll: Reverse or regular roll, as required. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all manual shade drive end brackets. Universal offset shall be adjustable for future change.
- .7 Mounting Brackets: Provide shade hardware constructed of minimum 3.18 mm thick plated steel or heavier as required to support 150 percent of the full weight of each shade.

- .1 Bracket shall be fully integrated with all accessories, including, but not limited to: fascia, room darkening side / sill channels, center supports and connectors for multi-banded shades.
- .2 Drive sprocket and brake assembly shall rotate and be supported on a welded 9.525 mm steel pin.
- .3 The brake shall be an over - running clutch design which disengages to 90 percent during the raising and lowering of a shade. The brake shall withstand a pull force of 22 kg in the stopped position.
- .4 The braking mechanism shall be applied to an oil-impregnated hub on to which the brake system is mounted. The assembly shall be permanently lubricated. Products that require externally applied lubrication and or not permanently lubricated are not acceptable. The entire assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.
- .8 Drive Chain: #10 qualified stainless steel chain rated to 41 kg minimum breaking strength. Nickel plated steel chain shall not be accepted.
- .9 Roller Shade Pocket for recessed mounting in acoustical tile, or drywall ceilings.
 - .1 Provide either extruded aluminum and or formed steel shade pocket, sized to accommodate roller shades, with exposed extruded removable closure panel to provide access to shades.
 - .2 For open return air plenum, provide "Vented Pocket" such that there will be a minimum of four 1 inch (25.4 mm) diameter holes per foot allowing the solar gain to flow above the ceiling line.
 - .3 Provide pocket end caps where required.
- .10 Fascia:
 - .1 Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners. Fascia shall be able to be installed across two or more shade bands in one piece. Fascia shall fully conceal brackets, shade roller and fabric on the tube. Provide bracket / fascia end caps where mounting conditions expose outside of roller shade brackets. Notching of Fascia for manual chain shall not be acceptable.
 - .1 Color: Selected from manufacturer's standard colors.
- .11 Manual Operation: Chain locations to be on right hand side of user.

2.2 ROLLER SHADE FABRICATION

- .1 Fabricate units to completely fill existing openings from head to sill and jamb-to-jamb, unless specifically indicated otherwise. Fabricate shadecloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shadecloth to roll true and straight without shifting sideways more than 1/8 inch (3.18 mm) in either direction per 8 feet (2438 mm) of shade height due to warp distortion or weave design.
- .2 Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting roller, and operating hardware and for hardware position and shade mounting method indicated.
- .3 Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.
- .4 Color-Coated Finish: For metal components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.
- .5 Colors of Metal and Plastic Components Exposed to View: As selected by Architect from manufacturer's full range, unless otherwise indicated.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance.
 - .1 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

- .1 Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions. Allow clearances for window operation hardware.
- .2 Installer shall train LAWA's maintenance personnel to adjust, operate and maintain roller shade systems.

3.3 ADJUSTING

- .1 Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- .1 Clean roller shade surfaces after installation, according to manufacturer's written instructions.
- .2 Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- .3 Replace damaged roller shades that cannot be repaired, in a manner approved by LAWA, before time of Substantial Completion.

3.5 DEMONSTRATION

- .1 Engage a factory-authorized service representative to train LAWA's maintenance personnel to adjust, operate, and maintain roller shades.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Materials and components for folding tables and seating.

1.2 RELATED SECTIONS

- .1 Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.
- .2 Section 01 74 19 – Construction Waste Management and Disposal.
- .3 Section 01 78 23 – Operating and Maintenance Data.

1.3 REFERENCES

- .1 American National Standards Institute (ANSI).
 - .1 ANSI A208.1, Standard for Particleboard.
- .2 American National Standards Institute (ANSI)/Business and International Furniture Manufacturers Association (BIFMA) International.
 - .1 ANSI/BIFMA X5.1, American National Standard for Office Furnishings, General Purpose Office Chairs - Tests.
 - .2 ANSI/BIFMA X5.6, American National Standard for Office Furnishings - Panel Systems.
- .3 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM C297, Standard Test Method for Flatwise Tensile Strength of Sandwich Connections.
- .4 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB 44.227, Freestanding Office Desk Products and Components.
- .5 Underwriters' Laboratories Canada (ULC).
 - .1 CAN/ULC-S102-[1988(R2000)], Standard Method of Test for Surfaces Burning Characteristics of Building Materials and Assemblies.
- .6 Underwriters' Laboratories (UL).
 - .1 UL 1286, Standard for Office Furnishings.

1.4 SUBMITTALS

- .1 Supply part numbers of furniture to allow for replacement of worn or damaged furniture parts.
- .2 Supply instructions detailing procedures for repairing or replacing worn furniture parts.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Construction Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site for recycling in accordance with Waste Management Plan.
- .4 Dispose of unused finish and adhesive materials at official hazardous material collections site approved by Departmental Representative or designate.
- .5 Do not dispose of unused finish and adhesive materials into sewer system, into streams, lakes, onto ground or in other locations where it will pose health or environmental hazard.

1.6 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for fixed audience seating for incorporation into manual specified in Section 01 78 23 – Operating and Maintenance Data.

1.7 WARRANTY

- .1 Provide written assurance that replacement parts will be available for minimum of 5 years following discontinuation of product manufacture.
- .2 Ensure warranties provide for repair rather than replacement.

1.1 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver materials in manufacturer's unopened packaging.
- .2 Handle furniture during installation to prevent damage. Replace any items damaged during installation.

PART 2 PRODUCTS

2.1 STACKABLE FOLDING TABLES

- .1 1600 mm x 800 mm Plenar2 Vario folding table (PN 02574) as manufactured by Dauphin HumanDesign Company.

2.2 STACKABLE FOLDING CHAIRS

- .1 Stacking cantilever chair, Plenar2 (PN 24860 003) as manufactured by Dauphin HumanDesign Company.

2.3 FREESTANDING STORAGE UNITS

- .1 Storage units to CAN/CGSB-44.227, 3048 mm high x 908 mm wide x 610 mm deep, with locking hinged doors.
- .2 Locks: to CAN/CGSB-44.227, supply key-activated locks for doors.
 - .1 Provide 2 keys per lock.
 - .2 Lock to have adequate clearance to permit user to operate lock.
 - .3 Locking mechanism: Key-activated locks require key to activate locking mechanism.

2.4 FABRICATION

- .1 Manufacture furniture to allow for dismantling and replacing of worn or defective components and recycling options following first use.
 - .1 Fabricate furniture to allow for remanufacturing or refurbishing of furniture following first use.
 - .2 Seal exposed surfaces of particleboard constructed with ureaformaldehyde adhesives to contain formaldehyde emissions.

PART 3 EXECUTION

3.1 NOT USED

- .1 Not used.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Auditorium fixed audience seating with the following:
 - .1 Upholstered chairs.
 - .2 Self-rising seat mechanisms.
 - .3 Fixed standard mounting.

1.2 RELATED SECTIONS

- .1 Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.
- .2 Section 01 74 19 – Construction Waste Management and Disposal.
- .3 Section 01 78 23 – Operating and Maintenance Data.

1.3 REFERENCES

- .1 American Standard Test Materials (ASTM):
 - .1 ASTM C 423 – Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 - .2 ASTM E 795 – Standard Practices for Mounting Test Specimens During Sound Absorption Tests.
 - .3 ASTM F 851: Test Method for Self-Rising Seat Mechanisms.
- .2 American National Standards Institute (ANSI)/Business and Institutional Furniture Manufacturers Association (BIFMA):
 - .1 ANSI A208.2 – Medium Density Fiberboard (MDF) for Interior Applications.
 - .2 ANSI/BIFMA X5.1 2002 – Office Furnishings - General-Purpose Office.
 - .3 ANSI/BIFMA X5.4-2005 – Office Furnishings – Lounge Seating.
- .3 Code of Federal Regulations:
 - .1 16 CFR 1610.61 – Clarification of Flammability Standard for Clothing Textiles (CS 191 53).
 - .2 Hardwood Plywood and Veneer Association (HPVA):
 - .3 HPVA HP-1 – Hardwood and Decorative Plywood.
 - .4 National Electrical Manufacturers Association (NEMA):
 - .5 NEMA LD 3 – High Pressure Decorative Laminates.
- .4 National Fire Protection Association:
 - .1 NFPA 70 – National Electrical Code (NEC).

- .5 Underwriters' Laboratories, Inc. (UL) and Underwriters' Laboratories of Canada (ULC):
 - .1 Requirements for listing and labeling of products.

1.4 SUBMITTALS

- .1 Product Data: Provide for all products furnished under this Section. Include dimensions and profiles, electrical connections, wood and metal finishes, and details of construction.
- .2 Shop Drawings: Include plans, elevations, sections and details. Show overall plan of fixed seating including aisle spacing and seating layout. Include row to row spacing, row lettering, and chair numbering sequence. Show floor plan and details of NBC compliance in plan and section. Show method of attachment including anchors and other devices.
 - .1 Show fabric selection.
- .3 Samples for Initial Selection
 - .1 Fabric choices.
- .4 Samples for Verification: Provide manufacturer's samples of the following:
 - .1 Exposed metal component finishes.

1.5 INFORMATIONAL SUBMITTALS

- .1 Product Certificates: Provide manufacturer's certification of flame-retardant treatment (if required).
- .2 Cleaning and Maintenance Information: Provide instructions for cleaning, adjusting, repairing, and replacing fixed audience seating.
- .3 Warranty: Copy of manufacturer's warranty.

1.6 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for fixed audience seating for incorporation into manual specified in Section 01 78 23 – Operating and Maintenance Data.

1.7 QUALITY ASSURANCE

- .1 Source Limitations: Obtain fixed audience seating and accessories from single source from single manufacturer.
- .2 Fire-Test-Response Compliance:
 - .1 Fabric: Class 1 according to DOC CS 191 and 16 CFR 1610.61, tested according to California Technical Bulletin 117.
 - .2 Cushioning: California Technical Bulletin 117.

- .3 Specifier: Typically delete below; retain where required by authorities having jurisdiction. Below is an option available from Wenger. Consult Wenger representative.
- .3 Regulatory Requirements: Provide fixed audience seating to comply with accessibility requirements, including with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC/ANSI A117.1.
- .4 Mockups: Build mockups to set standards for fabrication. Show fabric selection and metal finishes selections and aesthetic effect.
 - .1 Configuration: A typical two-seat unit with aisle and row seat.
 - .2 Approved mockups will be returned to the manufacturer upon request, and may become part of Project if in as-manufactured condition at time of Substantial Completion.
- .5 Field Dimensioning: After approval of submittals and mockup but prior to fabrication, confirm dimensions of fixed audience seating space, including features that will affect installation. Confirm location of electrical rough-in.

1.8 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver materials in manufacturer's unopened packaging.
- .2 Handle fixed audience seating during installation to prevent damage. Replace any seating damaged during installation.

1.9 PROJECT CONDITIONS

- .1 Environmental Limitations: Do not deliver or install seating until spaces are fully enclosed and wet work is complete and dry, overhead work is complete, and temporary or permanent HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels for the remainder of the construction period.
- .2 Where fixed audience seating is anchored to new concrete, allow for curing of concrete before seating is delivered.

1.10 COORDINATION

- .1 Coordinate with details of fixed audience seating with affected work of other sections. Communicate special requirements of fixed audience seating attachment to floor and connection to electrical service.
- .2 Coordinate locations of electrical junction boxes.

1.11 WARRANTY

- .1 Special Warranty: Manufacturer's written warranty indicating manufacturer's intent to repair or replace components of audience seating that fail in materials or workmanship.
 - .1 Failures include, but are not limited to, the following:
 - .2 Fracturing or breaking of unit components which results from normal wear and tear and normal use other than vandalism.
 - .3 Delamination or other failures of glue bond of components.
 - .4 Warping of components not resulting from leaks, flooding, or other uncontrolled moisture or humidity.
- .2 Damage from deliberate destruction and vandalism is excluded.
- .3 Warranty Period for fixed audience seating: Five years from date of Substantial Completion.

1.12 EXTRA MATERIALS

- .1 Furnish the following extra materials from the same manufacturing run as the original products that match products installed. Package with protective coating and identified with product labels.
 - .1 Full-size units of the following seating components equal to 5 percent of amount installed for each type and finish installed, but no fewer than [two] units:
 - .1 Arm standards (both center and end standards).
 - .2 Wooden seat back and cushion.
 - .3 Seat bottom.

1.13 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Construction Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site for recycling in accordance with Waste Management Plan.
- .4 Dispose of unused finish and adhesive materials at official hazardous material collections site approved by Departmental Representative or designate.
- .5 Do not dispose of unused finish and adhesive materials into sewer system, into streams, lakes, onto ground or in other locations where it will pose health or environmental hazard.

PART 2 PRODUCTS

2.1 BASIS OF DESIGN

- .1 Fixed Audience Seating is based upon products of the following manufacturer. Provide basis of design product.
 - .1 Figueras International Seating; Email: info@figueras.com; Website: www.figueras.com.

2.2 FIXED AUDIENCE SEATING

- .1 Fixed Audience Seating: Audience seating with steel-supported wood core standards with matching polyester resin wood grain on all exposed surfaces, supported by floor-level HVAC supply pedestal, upholstered back and seat with foam cushions, hardwood plywood seat back, acoustically-perforated hardwood plywood seat bottom, and beech hardwood arm rest, and self-lifting seats with acoustically-dampened lift mechanism.
- .2 Basis of Design: 128 CARMEN.
 - .1 Plywood board with a 13 mm-thick beech veneer backrest with double curve. Ergonomic curve seat of plywood board with a 13 mm-thick beech veneer.
 - .2 The backrest padding maximum thickness of 4cm of open-cell polyurethane foam mounted on a wooden backboard.
 - .3 ATS System fire barrier incorporated between the foam and upholstery.
 - .4 The chair is mounted on a central pedestal consisting of a steel tube column, a circular base for anchoring it to the floor and a central bridge. The seat adapts to the specific slope of the room through the base of the pedestal.
 - .5 Aisle sides composed of a curved steel tube running along the outer edge of the medium-density fibreboard panel, which is fully covered in beech veneer and varnished. Varnished solid beech armrest fixed to top of tube.
 - .6 The intermediate side seams formed by curved steel tubing frame and the solid beech armrests.

2.3 FABRICATION

- .1 Fabricate floor standards to fit slope of floor so that standards are plumb and maintain chairs at the required relationship to the vertical.
- .2 Upholstery: Fabricate upholstered chairs with fabric free of creases and wrinkles. Install warp and woof of fabric and pattern in consistent direction.

2.4 FINISHES

- .1 Baked Enamel Powder-Coat Finish: Immediately after cleaning and pretreating, electrostatically apply manufacturer's standard, baked-polymer, thermosetting powder finish.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Examine substrates with Installer to verify conditions meet requirements for seating installation.
- .2 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- .1 General: Install seating units level, plumb, true; and with pitch of seating as indicated on the shop drawings.
- .2 Install seating units with mounting standards aligned from the last to first row as indicated. Vary seat [widths] [spacing] [both width and spacing] to optimize spectator sight lines.
- .3 Install rows with smooth curvature.
- .4 Adjust seating so that operating hardware works smoothly and quietly.
- .5 Install wiring ready for final connections. Align wiring connections with rough-in installation.

3.3 ADJUSTING AND CLEANING

- .1 Adjust hardware and automatic lifters.
- .2 Clean and vacuum seating standards and fabrics.
- .3 Touch up marred surfaces. Replace seating units that are not acceptable to Departmental Representative or designate.

END OF SECTION

DIVISION 21
MECHANICAL

PART 1 GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Thermal insulation for piping and piping accessories in commercial type applications.

1.2 REFERENCES

- .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ASHRAE Standard 90.1-01, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA co-sponsored; ANSI approved; Continuous Maintenance Standard).
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM B209M-04, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate Metric.
 - .2 ASTM C335-04, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
 - .3 ASTM C411-04, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - .4 ASTM C449/C449M-00, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - .5 ASTM C533-2004, Calcium Silicate Block and Pipe Thermal Insulation.
 - .6 ASTM C547-2003, Mineral Fiber Pipe Insulation.
 - .7 ASTM C795-03, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
 - .8 ASTM C921-03a, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- .3 Canadian General Standards Board (CGSB)
 - .1 CGSB 51-GP-52Ma-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
 - .2 CAN/CGSB-51.53-95, Poly (Vinyl Chloride) Jacketing Sheet, for Insulated Pipes, Vessels and Round Ducts.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

- .5 Manufacturer's Trade Associations
 - .1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (Revised 2004).

1.3 DEFINITIONS

- .1 For purposes of this section:
 - .1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.
 - .2 "EXPOSED" - will mean "not concealed" as specified.
- .2 TIAC ss:
 - .1 CRF: Code Rectangular Finish.
 - .2 CPF: Code Piping Finish.

1.4 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

1.5 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, qualified to standards member of TIAC.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 30 - Safety Requirements.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .2 Storage and Protection:
 - .1 Protect from weather, construction traffic.
 - .2 Protect against damage.

- .3 Store at temperatures and conditions required by manufacturer.
- .3 Waste Management and Disposal:
 - .1 Place excess or unused insulation and insulation accessory materials in designated containers.
 - .2 Divert unused metal materials from landfill to metal recycling facility approved by Department representative or designate.
 - .3 Dispose of unused adhesive material at official hazardous material collections site approved by Department representative or designate.

PART 2 PRODUCTS

2.1 FIRE AND SMOKE RATING

- .1 In accordance with CAN/ULC-S102.
 - .1 Maximum flame spread rating: 25.
 - .2 Maximum smoke developed rating: 50.

2.2 INSULATION

Cover domestic hot and cold water piping with Glass fibre dual temperature insulation with factory applied fire resistant glass fibre reinforced kraft tape and aluminum foil, vapor barrier and all service jacket. Insulation thicknesses as follows:

<u>Pipe Size</u>	<u>Insulation Thickness</u>
up to 4"	1"

2.3 INSULATION SECUREMENT

- .1 Tape: self-adhesive, aluminum, reinforced, 2 in (50 mm) wide minimum.
- .2 Contact adhesive: quick setting.
- .3 Canvas adhesive: washable.
- .4 Tie wire: 1/16 in (1.5 mm) diameter stainless steel.
- .5 Bands: stainless steel, 3/4" (19 mm) wide, 0.02 in (0.5 mm) thick.

2.4 JACKETS

- .1 Polyvinyl Chloride (PVC):
 - .1 One-piece moulded type and sheet to CAN/CGSB-51.53 with pre-formed shapes as required.
 - .2 Thickness: 0.03 in (0.76 mm).
 - .3 Fastenings:
 - .1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
 - .2 Tacks.
 - .3 Pressure sensitive vinyl tape of matching colour.

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 TIAC National Standards.
- .2 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Install hangers, supports outside vapour retarder jacket.
- .3 Supports, Hangers:
 - .1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.
- .4 Thickness of insulation as listed in following table.
 - .1 Run-outs to individual units and equipment not exceeding 13 ft. (4000 mm) long.
Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

3.3

Application	Temp degrees F (C)	TIAC code	Pipe sizes (NPS) and insulation thickness inches (mm)					
			Run out	to 1	1 1/4 to 2	2 1/2 to 4	5 to 6	8 & over
Domestic HWS		A-1	1 in (25)	1 in (25)	1 in (25)	1 1/2" (38)	1 1/2" (38)	1 1/2" (38)
Domestic CWS		A-3	1 in (25)	1 in (25)	1 in (25)	1 in (25)	1 in (25)	1 in (25)
Refrigerant hot gas liquid suction	40 - 55 (4 - 13)	A-6	1 in (25)	1 in (25)	1 in (25)	1 in (25)	1 in (25)	1 in (25)

.1 Finishes:

- .1 Exposed indoors: PVC jacket.
- .2 Exposed in mechanical rooms: PVC jacket.
- .3 Concealed, indoors: canvas on valves, fittings. No further finish.
- .4 Use vapour retarder jacket on TIAC code A-3 insulation compatible with insulation.
- .5 Installation: to appropriate TIAC code CRF/1 through CPF/5.

3.4 CLEANING

- .1 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

DIVISION 22

PLUMBING

PART 1 GENERAL

1.1 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.
- .2 Shop drawings to show:
 - .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 Manufacturer to certify current model production.
 - .3 Certification of compliance to applicable codes.
- .4 All dimensions and performance data shall be shown in Imperial units (SI Metric is optional).
- .5 Closeout Submittals:
 - .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 23 – Operating and Maintenance Data.
 - .2 Operation and maintenance manual approved by, and final copies deposited with Department representative or designate before final inspection.
 - .3 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 Colour coding chart.
 - .4 Maintenance data to include: Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .1 Data to include schedules of tasks, frequency, tools required and task time.
 - .5 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.
 - .6 Approvals:
 - .1 Submit 2 copies of draft Operation and Maintenance Manual to Department representative or designate for approval. Submission

- of individual data will not be accepted unless directed by Department representative or designate.
- .2 Make changes as required and re-submit as directed by Department representative or designate.
 - .7 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
 - .8 Site records:
 - .1 Department representative or designate 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.
 - .9 As-built drawings:
 - .1 Prior to start of any testing HVAC and plumbing; 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 Department representative or designate 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.

1.2 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 – Quality Control.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29 – Health and Safety Requirements.

1.3 MAINTENANCE

- .1 Provide one set of special tools if required to service equipment as recommended by manufacturers.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling.

PART 2 PRODUCTS

PART 3 EXECUTION

3.1 PAINTING REPAIRS AND RESTORATION

- .1 Prime and touch up marred finished paintwork to match original.
- .2 Restore to new condition, finishes which have been damaged.

3.2 CLEANING

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

3.3 FIELD QUALITY CONTROL

- .1 Site Tests: conduct following tests in accordance with Section 01 45 00 – Quality Control and submit report as described in PART 1 – SUBMITTALS.
 - .1 Test ductwork for leakage.
 - .2 Test hydrostatically potable water piping.
 - .3 Test sanitary drains and vents per the OBC.
 - .4 Test hydrostatically heating water piping.
- .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.

3.4 DEMONSTRATION

- .1 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.

- .2 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

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 SECTION INCLUDES

- .1 Materials and installation for copper domestic water service used in the following:
 - .1 Copper incoming domestic water service, up to NPS 2 1/2.
 - .2 Hard drawn copper domestic hot and cold water services inside building.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME).
 - .1 ANSI/ASME B16.15-02, Cast Bronze Threaded Fittings, Classes 125 and 250.
 - .2 ANSI/ASME B16.18-01, Cast Copper Alloy Solder Joint Pressure Fittings.
 - .3 ANSI/ASME B16.22-01, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 - .4 ANSI/ASME B16.24-01, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500 and 2500.
- .2 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM B88M-03, Standard Specification for Seamless Copper Water Tube (Metric).
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .4 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).
 - .1 MSS-SP-67-02, Butterfly Valves.
 - .2 MSS-SP-70-98, Cast Iron Gate Valves, Flanged and Threaded Ends.
 - .3 MSS-SP-71-97, Cast Iron Swing Check Valves, Flanged and Threaded Ends.
 - .4 MSS-SP-80-03, Bronze Gate, Globe, Angle and Check Valves.

1.3 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.
- .2 Submit product data for following: valves.
- .3 Submit WHMIS MSDS – Material Safety Data Sheets in accordance with Section 02 61 33 – Hazardous Materials.

1.4 HEALTH AND SAFETY

- .1 Do construction occupational health and safety in accordance with Section 01 35 29 – Health and Safety Requirements.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Place materials defined as hazardous or toxic in designated containers.
- .4 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 PRODUCTS

2.1 PIPING

- .1 Domestic hot, cold and recirculation systems, within building.
 - .1 Above ground: copper tube, hard drawn, type L: to ASTM B88M.
 - .2 Buried or embedded: copper tube, soft annealed, type K: to ASTM B88M, in long lengths and with no buried joints.

2.2 FITTINGS

- .1 Bronze pipe flanges and flanged fittings, Class 150 and 300: to ANSI/ASME B16.24.
- .2 Cast bronze threaded fittings, Class 125 and 250: to ANSI/ASME B16.15.
- .3 Cast copper, solder type: to ANSI/ASME B16.18.
- .4 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.

2.3 JOINTS

- .1 Rubber gaskets, latex-free 1/16 in (1.6 mm) thick: to AWWA C111.
- .2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.
- .3 Solder: 95/5 tin copper alloy.
- .4 Teflon tape: for threaded joints.

- .5 Dielectric connections between dissimilar metals: dielectric fitting to ASTM F492, complete with thermoplastic liner.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install in accordance with Ontario Plumbing Code and local authority having jurisdiction.
- .2 Assemble piping using fittings manufactured to ANSI standards.
- .3 Install CWS piping below and away from HWS and HWC and other hot piping so as to maintain temperature of cold water as low as possible.
- .4 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

3.2 PRESSURE TESTS

- .1 Pressure tests per Ontario Plumbing Code. Test pressure: greater of 1 times maximum system operating pressure or 145 psi (1000 kPa).

3.3 PRE-START-UP INSPECTIONS

- .1 Systems to be complete, prior to flushing, testing and start-up.
- .2 Verify that system can be completely drained.
- .3 Ensure that pressure booster systems are operating properly.
- .4 Ensure that air chambers, expansion compensators are installed properly.

3.4 DISINFECTION

- .1 Flush out including all outlets for at least 2 hours, disinfect and rinse system to requirements of authority having jurisdiction.
- .2 Upon completion, provide laboratory test reports on water quality for Department representative or designate approval.

3.5 START-UP

- .1 Timing: Start up after:
 - .1 Pressure tests have been completed.
 - .2 Disinfection procedures have been completed.
 - .3 Certificate of completion has been issued.
 - .4 Water treatment systems operational.

- .2 Provide continuous supervision during start-up.
- .3 Start-up procedures:
 - .1 Establish circulation and ensure that air is eliminated.
 - .2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.
 - .3 Monitor piping HWS and HWC piping systems for freedom of movement, pipe expansion as designed.
 - .4 Check control, limit, and safety devices for normal and safe operation.
- .4 Rectify start-up deficiencies.

3.6 PERFORMANCE VERIFICATION

- .1 Timing:
 - .1 After pressure and leakage tests and disinfection completed, and certificate of completion has been issued by authority having jurisdiction.
- .2 Procedures:
 - .1 Verify that flow rate and pressure meet Design Criteria.
 - .2 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.
 - .3 Sterilize HWS and HWC systems for Legionella control.
 - .4 Verify performance of temperature controls.
 - .5 Verify compliance with safety and health requirements.
 - .6 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor or re-charge air chambers. Repeat for outlets and flush valves.
 - .7 Confirm water quality consistent with supply standards, verifying that no residuals remain as a result of flushing and/or cleaning.
- .3 Reports:
 - .1 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 The installation of drainage waste and venting piping – plastic.

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM D2235-[01], Specification for Solvent Cement for Acrylonitrille-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
 - .2 ASTM D2564-[02], Specification for Solvent Cements for Poly(Vinyl-Chloride) (PVC) Plastic Piping Systems.
- .2 Canadian Standards Association (CSA International).
 - .1 CSA-Series B1800-[02], Plastic Nonpressure Pipe Compendium.
 - .2 CSA-B181.2-[02], PVC Drain, Waste and Vent Pipe and Pipe Fittings.
 - .3 CSA-B182.1-[02], Plastic Drain and Sewer Pipe and Pipe Fittings.

1.3 DELIVERY STORAGE AND DISPOSAL

- .1 Waste Management and Disposal:
 - .1 Separate and recycle waste materials.

PART 2 PRODUCTS

2.1 PIPING AND FITTINGS

- .1 For buried and or above ground DWV piping to:
 - .1 CSA-B181.1.
 - .2 CSA-B181.2.
 - .3 CSA-B182.1.

2.2 JOINTS

- .1 Solvent weld for PVC: to ASTM D2564.
- .2 Solvent weld for ABS: to ASTM D2235.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install in accordance with Ontario Plumbing Code.

3.2 TESTING

- .1 Pressure test buried systems before backfilling.
- .2 Hydraulically test to verify grades and freedom from obstructions.

3.3 PERFORMANCE VERIFICATION

- .1 Cleanouts:
 - .1 Ensure accessible and that access doors are correctly located.
 - .2 Open, cover with linseed oil and re-seal.
 - .3 Verify cleanout rods can probe as far as the next cleanout, at least.
- .2 Test to ensure traps are fully and permanently primed.
- .3 Storm water drainage:
 - .1 Verify domes are secure.
 - .2 Ensure weirs are correctly sized and installed correctly.
 - .3 Verify provisions for movement of roof system.
- .4 Ensure fixtures are properly anchored, connected to system and effectively vented.
- .5 Affix applicable label (storm, sanitary, vent, pump discharge etc.) c/w directional arrows every floor or 4.5 m (whichever is less).

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 The supply and installation of Plumbing Fixtures and Trim.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International).
 - .1 CAN/CSA-B45 Series-02, Plumbing Fixtures.
 - .2 CAN/CSA-B125-01, Plumbing Fittings.

1.3 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 23 - Submittal Procedures for Shop Drawings, Product Data and Samples.
 - .1 Submit shop drawings and product data in accordance with Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.
 - .1 Indicate, for all fixtures and trim:
 - .2 Dimensions, construction details, roughing-in dimensions.
- .2 Closeout Submittals:
 - .1 Include:
 - .1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.
 - .2 Details of operation, servicing, maintenance.
 - .3 List of recommended spare parts.

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY STORAGE AND DISPOSAL

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling.
 - .2 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
 - .3 Fold up metal and plastic banding, flatten and place in designated area for recycling.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

- .1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.
- .2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.
- .3 Exposed plumbing brass to be chrome plated.
- .4 Number, locations: architectural drawings to govern.
- .5 Fixtures in any one location to be product of one manufacturer and of same type.
- .6 Trim in any one location to be product of one manufacturer and of same type.
- .7 Stainless Steel Sink.

- Countertop Mount Sink.
- Single lever faucet, 5.7 LPM (1.5 GPM) aerator outlet.
- Point of use mechanical water mixing valve, integral checks.
- Polished brass Faucet Supplies.
- Provide P-Trap.
- Provide tee, adaptors and flex. Copper tubing to suit installation.
- Provide tempered water to hot side of faucet.
- Provide basin rim sealant.

Approved Manufacturers:

Franke Commercial LBD1308P-1/1
American Standard
Kindred "Steel Queen"

- .9 Fixture piping:
 - .1 Hot and cold water supplies to fixtures:
 - .1 Chrome plated rigid supply pipes with screwdriver lavatory and handwheel water closet stop, reducers, escutcheon.
- .10 Sewage Pump
 - Drain pump shall be rated at 1/3 hp 120 volts, single phase, 60 Hz. 3450 RPM. The unit shall produce 3 G.P.M. at 15 ft of feet of total dynamic head.
 - The drain pump shall be capable of handling effluent with 3/8" solid handling capability. The drain pump shall have a shut-off head of 21 feet.
 - The pump shall be controlled with a piggy back style on/off float switch.

- The motor housing shall be constructed of a deep finned powder coated aluminum. The motor housing shall be oil filled to dissipate heat. Air filled motors shall not be considered equal since they do not properly dissipate heat from the motor. All mating parts shall be machined and sealed with a Buna-N o-ring. All fasteners exposed to the liquid shall be stainless steel. The motor shall be protected on the top side with sealed cord entry plate with molded pins to conduct electricity eliminating the ability of water to enter internally through the cord. The motor shall be protected on the lower side with an engineered double lip seal with stainless steel springs. The tank shall be made of polypropylene.
- Single phase motors shall be oil filled, permanent split capacitor, class B insulated, NEMA B design, rated for continuous duty. At maximum load the winding temperature shall not exceed 130 degrees C unsubmerged.

Approved manufacturers:
Liberty Pumps 404 series
Superior Pumps
Armstrong pumps

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Mounting heights:
 - .1 Standard: to comply with manufacturer's recommendations and barrier free design requirements unless otherwise indicated or specified.

3.2 ADJUSTING

- .1 Conform to water conservation requirements specified this section.
- .2 Adjustments:
 - .1 Adjust water flow rate to design flow rates.
 - .2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.
- .3 Checks:
 - .1 Aerators: operation, cleanliness.

END OF SECTION

DIVISION 23

**HEATING, VENTILATION AND AIR
CONDITIONING (HVAC)**

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 Department Representative or designate at least 40 days before commencing TAB work.
- .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.
 - .2 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems-1998.
 - .3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing-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 and confirm in writing to Engineer adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.
- .2 Review specified standards and report to Engineer 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 Engineer for verification of TAB reports.

1.9 START OF TAB

- .1 Notify Owner and Department Representative or designate 7 days prior to start of TAB.
- .2 Start TAB when building is essentially completed, including:
 - .1 Installation of ceilings, doors, windows, other construction affecting TAB.
 - .2 Application of weatherstripping, sealing, and caulking.
 - .3 Pressure, leakage, other tests specified elsewhere Division 23.
 - .4 Provisions for TAB installed and operational.
- .5 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:
 - Filters in place, clean.
 - Duct systems clean.
 - Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.
 - Correct fan rotation.
 - Fire, smoke, volume control dampers installed and open.
 - Coil fins combed, clean.
 - Access doors, installed, closed.
 - Outlets installed, volume control dampers open.
 - .3 Liquid systems:
 - Flushed, filled, vented.
 - Correct pump rotation.
 - Strainers in place, baskets clean.
 - Isolating and balancing valves installed, open.
 - Calibrated balancing valves installed, at factory settings.
 - 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%.

1.11 ACCURACY TOLERANCES

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

1.12 INSTRUMENTS

- .1 In final report, submit to Department Representative or designate 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 Department Representative or designate with final report.

1.13 SUBMITTALS

- .1 Submit, prior to commencement of TAB:
- .2 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.14 TAB REPORT

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

1.15 VERIFICATION

- .1 Reported results subject to verification by Department Representative or designate.
- .2 Provide personnel and instrumentation to verify up to 20% of reported results.
- .3 Number and location of verified results as directed by Department Representative or designate.
- .4 Pay costs to repeat TAB as required to satisfaction of Department Representative or designate.

1.16 SETTINGS

- .1 After TAB is completed to satisfaction of Department Representative or designate, 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.

1.17 COMPLETION OF TAB

- .1 TAB considered complete when final TAB Report received and approved by Department Representative or designate.

1.18 AIR SYSTEMS

- .1 Standard: TAB to most stringent of this section.
- .2 Do TAB of following systems, equipment, components, controls:
 - .1 HVAC systems that are upgraded.
 - .2 Any HVAC systems affected by the upgrades.
- .3 Qualifications: personnel performing TAB current member in good standing of AABC or NEBB qualified to standards of AABC or NEBB.
- .4 Quality assurance: perform TAB under direction of supervisor qualified to standards of AABC or NEBB.
- .5 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.
- .6 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.
- .7 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

1.19 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.
- .2 Building pressure conditions:
 - .1 TAB procedures:
Balance ventilation systems by wing with corridor and suite doors closed, and HVACr system operating at rated capacity. Net makeup air and exhaust air per wing should be roughly equal when balancing exhaust.
- .3 Zone pressure differences:
 - .1 Adjust HVAC systems, equipment, controls to establish specified air pressure differentials, with systems in every possible combinations of normal operating modes.

- .4 Smoke management systems:
 - .1 Test for proper operation of all smoke and fire dampers, sensors, installed as component parts of air systems specified Division 23.
- .5 Measurement of noise from equipment specified in Division 23.
 - .1 Standard: ANSI S 12.2.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ANSI/ASHRAE/IESNA 90.1-01, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.
- .2 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C335-95, Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
 - .2 ASTM C449/C449M-00, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - .3 ASTM C547-00, Specification for Mineral Fiber Pipe Insulation.
 - .4 ASTM C553-00, Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 - .5 ASTM C612-00a, Specification for Mineral Fiber Block and Board Thermal Insulation.
- .3 Canadian General Standards Board (CGSB)
 - .1 CGSB 51-GP-52Ma-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
- .4 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (R1999).
- .5 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-M88 (R2000), Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC-S701-01, Thermal Insulation Polyotrene, Boards and Pipe Covering.

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" – will mean "not concealed" as defined herein.
 - .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 SHOP DRAWINGS

- .1 Submit for approval manufacturer's catalogue literature related to installation, fabrication for duct jointing recommendations.

1.4 MANUFACTURERS' INSTRUCTIONS

- .1 Submit manufacturer's installation instructions in accordance with Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data, and Samples.
- .2 Installation instructions to include procedures used, and installation standards achieved.

1.5 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.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .2 Protect from weather and construction traffic.
- .3 Protect against damage from any source.
- .4 Store at temperatures and conditions recommended by manufacturer.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling.
 - .2 Collect and separate paper, plastic, polystyrene, corrugated cardboard, and packaging material in appropriate on-site bins for recycling in accordance with Waste Reduction Workplan.
 - .3 Divert unused metal materials from landfill to metal recycling facility approved by Consultant.
 - .4 Divert unused adhesive material from landfill to official hazardous material collections site approved by Consultant.
 - .5 Do not dispose of unused adhesive materials into sewer systems, into lakes, streams, onto ground or in other locations where it will pose health or environmental hazard.

PART 2 PRODUCTS

2.1 FIRE AND SMOKE RATING

- .1 In accordance with 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 75° F (24° C) mean temperature when tested in accordance with ASTM C335.
- .3 TIAC Code C-1: Rigid mineral fibre board to ASTM C612, without factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this Section).

2.3 JACKETS

- .1 Canvas:
 - .1 220 gm/m² cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
- .2 Lagging adhesive: Compatible with insulation.

2.4 ACCESSORIES

- .1 Vapour retarder lap adhesive:
 - .1 Water based, fire retardant type, compatible with insulation.
- .2 Indoor Vapour Retarder Finish:
 - .1 Vinyl emulsion type acrylic, compatible with insulation.
- .3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C449.
- .4 ULC Listed Canvas Jacket:
 - .1 220 gm/m² cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
- .5 Tape: self-adhesive, aluminum, plain reinforced, 3 in (75 mm) wide minimum.
- .6 Contact adhesive: quick-setting.
- .7 Canvas adhesive: washable.
- .8 Tie wire: 0.06 in (1.5 mm) stainless steel.
- .9 Banding: ¾" (19 mm) wide, 0.02 in (0.5 mm) thick stainless steel.

- .10 Facing: 25 mm galvanized steel hexagonal wire mesh stitched on one face of insulation.
- .11 Fasteners: 3/16" (4 mm) diameter pins with 1.4 in (35 mm) square clips, length to suit thickness of insulation.

PART 3 EXECUTION

3.1 PRE-INSTALLATION REQUIREMENTS

- .1 Pressure testing of ductwork systems complete, witnessed and certified.
- .2 Surfaces clean, dry, free from foreign material.

3.2 INSTALLATION

- .1 Install in accordance with TIAC National Standards.
- .2 Apply materials in accordance with manufacturers instructions and as indicated.
- .3 Use two layers with staggered joints when required nominal thickness exceeds 75 mm.
- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Hangers, supports to be outside vapour retarder jacket.
- .5 Fasteners: At 12 in (300 mm) oc in horizontal and vertical directions, minimum two rows each side.

3.3 DUCTWORK INSULATION SCHEDULE

- .1 Insulation types and thicknesses: Conform to following table:

	TIAC Code	Vapour Retarder	Thickness inch (mm)
Rectangular/round warm air ducts	C-1	no	1 inch (25)
Outside air ducts to mixing plenums/outdoor units	C-1	yes	1 inch (25)
Mixing plenums	C-1	yes	1 inch (25)
Exhaust duct behind high humid spaces (washrooms etc.) at least 3 m	C-1	no	1 inch (25)

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for piping, valves and fittings for gas fired equipment.

1.2 REFERENCES

- .1 American Society of Mechanical Engineers (ASME)
 - .1 ASME B16.5-03, Pipe Flanges and Flanged Fittings.
 - .2 ASME B16.18-01, Cast Copper Alloy Solder Joint Pressure Fittings.
 - .3 ASME B16.22-01, Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.
 - .4 ASME B18.2.1-96, Square and Hex Bolts and Screws Inch Series.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A47/A47M-99(2004), Standard Specification for Ferritic Malleable Iron Castings.
 - .2 ASTM A53/A53M-04, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
 - .3 ASTM B75M-99, Standard Specification for Seamless Copper Tube Metric.
 - .4 ASTM B837-01, Standard Specification for Seamless Copper Tube for Natural Gas and Liquefied Petroleum (LP) Gas Fuel Distribution Systems.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA W47.1-03, Certification of Companies for Fusion Welding of Steel.
- .4 Canadian Standards Association (CSA)/Canadian Gas Association (CGA)
 - .1 CAN/CSA B149.1HB-00, Natural Gas and Propane Installation Code Handbook.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

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

- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet for piping, fittings and equipment.
 - .2 Indicate on manufacturers catalogue literature following: valves.
- .3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Instructions: submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

- .1 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - .2 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan (WMP).
 - .3 Separate for reuse and recycling and place in designated containers Steel Metal Plastic waste in accordance with Waste Management Plan (WMP).
 - .4 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative Engineer Consultant.

PART 2 PRODUCTS

2.1 PIPE

- .1 Steel pipe: to ASTM A53/A53M, Schedule 40, seamless as follows:
 - .1 NPS 1/2 to 2, screwed.
 - .2 NPS 2 1/2 and over, plain end.
- .2 Copper tube: to ASTM B837.

2.2 JOINTING MATERIAL

- .1 Screwed fittings: pulverized lead paste.
- .2 Welded fittings: to CSA W47.1.

.3 Flange gaskets: nonmetallic flat.

.4 Brazing: to ASTM B837.

2.3 FITTINGS

.1 Steel pipe fittings, screwed, flanged or welded:

.1 Malleable iron: screwed, banded, Class 150.

.2 Steel pipe flanges and flanged fittings: to ASME B16.5.

.3 Welding: butt-welding fittings.

.4 Unions: malleable iron, brass to iron, ground seat, to ASTM A47/A47M.

.5 Bolts and nuts: to ASME B18.2.1.

.6 Nipples: schedule 40, to ASTM A53/A53M.

.2 Copper pipe fittings, screwed, flanged or soldered:

.1 Cast copper fittings: to ASME B16.18.

.2 Wrought copper fittings: to ASME B16.22.

2.4 VALVES

.1 Provincial Code approved, lubricated plug type.

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 PIPING

.1 Install in accordance with CAN/CSA B149.1.

.2 Install drip points:

.1 At low points in piping system.

.2 At connections to equipment.

3.3 VALVES

.1 Install valves with stems upright or horizontal unless otherwise approved by Consultant.

.2 Install valves at branch take-offs to isolate pieces of equipment, and as indicated.

3.4 FIELD QUALITY CONTROL

- .1 Site Tests/Inspection:
 - .1 Test system in accordance with CAN/CSA B149.1.
- .2 Manufacturer's Field Services:
 - .1 Have manufacturer of products supplied under this Section review work involved in handling, installation/application, and protection and cleaning of its products, and submit written reports, in acceptable format, to verify compliance of work with Contract.
 - .2 Provide manufacturer's field services, consisting of product use recommendations and periodic site visits for inspection of product installation, in accordance with manufacturer's instructions.
 - .3 Schedule site visits to review work at stages listed:
 - .1 After delivery and storage of products, and when preparatory work on which work of this Section depends is complete, but before installation begins.
 - .2 Twice during progress of work at 25% and 60% complete.
 - .3 Upon completion of work, after cleaning is carried out.
- .3 Obtain reports within 3 days of review and submit immediately to Engineer.

3.5 ADJUSTING

- .1 Purging: purge after pressure test in accordance with CAN/CSA B149.1.
- .2 Pre-Start-Up Inspections:
 - .1 Check vents from regulators, control valves, terminate outside building in approved location, protected against blockage, damage.
 - .2 Check gas trains, entire installation is approved by authority having jurisdiction.

3.6 CLEANING

- .1 Cleaning: in accordance with CAN/CSA B149.1 and in accordance with manufacturer's recommendations.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation of low-pressure metallic ductwork, joints and accessories.

1.2 REFERENCES

- .1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).
- .2 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM A480/A480M-03c, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
 - .2 ASTM A635/A635M-02, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot Rolled.
 - .3 ASTM A653/A653M-03, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- .3 Department of Justice Canada (Jus).
 - .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .5 National Fire Protection Association (NFPA).
 - .1 NFPA 90A-02, Standard for the Installation of Air Conditioning and Ventilating Systems.
- .6 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
 - .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2nd Edition 1995 and Addendum No. 1, 1997.
 - .2 SMACNA HVAC Air Duct Leakage Test Manual, 1985, 1st Edition.

1.3 SUBMITTALS

- .1 Submit shop drawings and product data in accordance with Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.

- .2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 61 33 – Hazardous Materials for the following:
 - .1 Sealants.
 - .2 Tape.
 - .3 Proprietary Joints.

1.4 QUALITY ASSURANCE

- .1 Certification of Ratings:
 - .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.
- .2 Health and Safety Requirements: work to performed in accordance with Section 01 35 29 – Health and Safety Requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Protect on site stored or installed absorptive material from moisture damage.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling.
 - .2 Collect and separate paper, plastic, polystyrene, corrugated cardboard and packaging material in appropriate on-site bins for recycling in accordance with Waste Reduction Workplan.
 - .3 Separate for reuse and recycling and place in designated containers Steel Metal Plastic waste in accordance with Waste Reduction Workplan.
 - .4 Place materials defined as hazardous or toxic in designated containers.
 - .5 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.
 - .6 Fold up metal and plastic banding, flatten and place in designated area for recycling.

PART 2 PRODUCTS

2.1 SEAL CLASSIFICATION

- .1 Classification as follows:

Maximum Pressure (Pa)	SMACNA Seal Class
2 in w.c. (500)	C
1 in w.c. (250)	C
½” w.c. (125)	C
½” w.c. (125)	Unsealed

- .2 Seal classification:
 - .1 Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant.
 - .2 Class B: longitudinal seams, transverse joints and connections made airtight with sealant or combination thereof.
 - .3 Class C: transverse joints and connections made air tight with gaskets sealant or combination thereof. Longitudinal seams unsealed.
 - .4 Unsealed seams and joints.

2.2 SEALANT

- .1 Sealant: oil resistant, water borne, polymer type flame resistant duct sealant. Temperature range of minus -22°F (30°C) to plus 200°F (93°C).

2.3 DUCT LEAKAGE

- .1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

2.4 FITTINGS

- .1 Fabrication: to SMACNA.
- .2 Radiused elbows.
 - .1 Rectangular: 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 16 in (400 mm): with single double thickness turning vanes.
 - .2 Over 16 in (400 mm): with double thickness turning vanes.
- .4 Branches:
 - .1 Rectangular main and branch: with radius on branch 1.5 times width of duct 45 degrees entry on branch.
 - .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.

- .6 Offsets:
 - .1 Full radiused elbows.
- .7 The balancing dampers to be manufactures as per SMACNA. Fabricate from same material as duct but one sheet metal thickness heavier, with appropriate stiffening. Rod configuration to prevent end from entering duct.
- .8 Obstruction deflectors: maintain full cross-sectional area.
 - .1 Maximum included angles: as for transitions.

2.5 FIRE STOPPING

- .1 Retaining angles around duct, on both sides of fire separation.
- .2 Fire stopping material and installation must not distort duct.

2.6 GALVANIZED STEEL

- .1 Lock forming quality: to ASTM A653/A653M, zinc coating.
- .2 Thickness, fabrication and reinforcement: to SMACNA.
- .3 Joints: to SMACNA or proprietary manufactured duct joint. Proprietary manufactured flanged duct joint to be considered to be a class A seal.

2.7 HANGERS AND SUPPORTS

- .1 Hangers and Supports: in accordance with Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment.
 - .1 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 Hanger configuration: to ASHRAE and SMACNA.
 - .3 Hangers: black steel angle with black steel rods to ASHRAE and SMACNA following table:

Duct Size inch (mm)	Angle Size inch (mm)	Rod Size inch (mm)
up to 30" (750)	1" x 1" x 1/8" (25 x 25 x 3)	1/4" (6)
31" to 40" (751 to 1050)	1 1/2" x 1 1/2" x 1/8" (40 x 40 x 3)	1/4" (6)
41" to 59" (1051 to 1500)	1 1/2" x 1 1/2" x 1/8" (40 x 40 x 3)	3/8" (10)
- .4 Upper hanger attachments:
 - .1 For concrete: manufactured concrete inserts.
 - .2 For steel joist: manufactured joist clamp steel plate washer. Avoid eccentric loading of OWSJ.
 - .3 For steel beams: manufactured beam clamps.

PART 3 EXECUTION

3.1 GENERAL

- .1 Do work in accordance with NFPA 90B, ASHRAE, SMACNA as indicated.
- .2 Do not break continuity of insulation vapour barrier with hangers or rods.
 - .1 Insulate strap hangers 4 in (100 mm) beyond insulated duct Ensure diffuser is fully seated.
- .3 Support risers in accordance with SMACNA as indicated.
- .4 Install breakaway joints in ductwork on sides of fire separation.
- .5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.
- .6 Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining. Duct sizes shown on drawings are air path sizes.

3.2 HANGERS

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

Duct Size	Spacing
inch (mm)	feet (mm)
59 in to (1500)	10 ft. (3000)
60 in (1501) and over	8 ft. (2500)

3.3 WATERTIGHT DUCT

- .1 Provide watertight duct for:
 - .1 Fresh air intake.
- .2 Form bottom of horizontal duct without longitudinal seams.
 - .1 Seal other joints with duct sealer.

3.4 SEALING AND TAPING

- .1 Apply sealant to outside of joint to manufacturer's 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.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Balancing dampers for mechanical forced air ventilation and air conditioning systems.

1.2 REFERENCES

- .1 Sheet Metal and Air Conditioning National Association (SMACNA)
 - .1 SMACNA HVAC Duct Construction Standards, Metal and Flexible-1985.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 23 - Submittal Procedures for Shop Drawings, Product Data and Samples. Include product characteristics, performance criteria, and limitations.
Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 23 - Submittal Procedures for Shop Drawings, Product Data and Samples.
- .2 Quality assurance submittals: submit following in accordance with Section 01 33 23 - Submittal Procedures for Shop Drawings, Product Data, and Samples.
 - .1 Instructions: submit three copies manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

- .1 Health and Safety Requirements:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29 - 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 – Material and Equipment.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Construction Waste Management and Disposal.
 - .2 Collect and separate paper, plastic, polystyrene, corrugated cardboard and packaging material in appropriate on-site bins for recycling in accordance with Waste Reduction Workplan.

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 Double thickness construction.
- .3 Control rod with locking device and position indicator.
- .4 Rod configuration to prevent end from entering duct.
- .5 Pivot: piano hinge.
- .6 Folded leading edge.

2.3 SINGLE BLADE DAMPERS

- .1 Fabricate from same material as duct, but one sheet metal thickness heavier. V-groove stiffened.
- .2 Size and configuration to recommendations of SMACNA, except maximum height 100 mm as indicated.
- .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.

2.4 MULTI-BLADED DAMPERS

- .1 Factory manufactured of material compatible with duct.
- .2 Opposed blade: configuration, metal thickness and construction to recommendations of SMACNA.
- .3 Maximum blade height: 4 in (100 mm) as indicated.
- .4 Bearings: self-lubricating nylon.
- .5 Linkage: shaft extension with locking quadrant.
- .6 Channel frame of same material as adjacent duct, complete with angle stop.
- .7 Maximum leakage: 8 CFM (40 l/s per sq. metre) @ 4 in w.c. (1 kPa) pressure differential.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install where indicated.
- .2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
- .3 Locate balancing dampers in each branch duct, for supply, return and exhaust systems.
- .4 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 Engineer.

3.3 FIELD QUALITY CONTROL

- .1 Tests:
 - .1 Tests to cover period of not less than days and demonstrate that system is functioning as specified.

3.4 CLEANING

- .1 Proceed in accordance with Section 01 74 16 - Cleaning and Site Maintenance.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Variable volume boxes, and by pass boxes.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI/AMCA 210-[1999], Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
 - .2 ANSI/NFPA 90A-[2002], Standard for the Installation of Air Conditioning and Ventilating Systems.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 International Organization of Standardization (ISO)
 - .1 ISO 3741-[2001], Acoustics-Determination of Sound Power Levels of Noise Sources Using Sound Pressure - Precision Methods for Reverberation Rooms.
- .4 Underwriter's Laboratories (UL)
 - .1 UL 181-[2003], Factory-Made Air Ducts and Air Connectors.

1.3 SYSTEM DESCRIPTION

- .1 Performance Requirements:
 - .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from certified ADC (Air Diffusion Council) testing agency signifying adherence to codes and standards.

1.4 SUBMITTALS

- .1 Product Data:
 - .1 Test data: to ANSI/AMCA 210.
 - .1 Submit published test data on DIN (Direct Internal Noise), in accordance with ISO 3741 made by independent testing agency for 0, 2.5 and 6 m/s branch velocity or inlet velocity.
 - .2 Sound power level with minimum inlet pressure of 0.25 kPa in accordance with ISO 3741 for 2nd through 7th octave band, also made by independent testing agency.

- .3 Pressure loss through silencer shall not exceed 60% of inlet velocity pressure maximum.
- .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section [01 33 00 - Submittal Procedures].
 - .2 Indicate the following:
 - .1 Capacity.
 - .2 Pressure drop.
 - .3 Noise rating.
 - .4 Leakage.

1.5 QUALITY ASSURANCE

- .1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section [01 35 30 - Health and Safety Requirements].

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

1.7 MAINTENANCE

- .1 Extra Materials:
 - .1 Furnish list of individual manufacturer's recommended spare parts for equipment include:
 - .1 Bearings and seals.
 - .2 Addresses of suppliers.
 - .3 List of specialized tools necessary for adjusting, repairing or replacing.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

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

2.2 VARIABLE VOLUME BOXES

- .1 The unit casing is comprised of 22 gauge galvanized steel. Outlet connection is slip and drive. Agency Listing - The unit is UL and Canadian UL listed as a room air terminal unit. All terminal units to be AHRI 880 - 98 certified.

- .2 The air inlet connection is an 18 gauge galvanized steel cylinder sized to fit standard round duct. A multiple point, averaging flow sensing ring is provided with balancing taps for measuring within +/- 5% of unit cataloged airflow. An airflow versus pressure differential calibration chart is provided. The damper blade is constructed of a closed cell foam seal mechanically locked between two 22 gauge galvanized steel disks. The damper blade assembly is connected through a composite nylon stub axle to a cast zinc shaft supported by self lubricating bearings. The shaft is cast with a damper position indicator. The valve assembly includes a mechanical stop to prevent over stroking. At 4.0" w.g. air.
- .3 The microprocessor based terminal unit controller provides accurate, pressure independent control through the use of a proportional integral control algorithm and direct digital control technology. The controller monitors zone temperature set points, zone temperature and its rate of change, and valve airflow using a differential pressure signal. Additionally, the controller can monitor CO2 concentration via appropriate sensors. The controller is provided in an enclosure with 7/8" knockouts for remote control wiring.
- .4 Actuator has a constant drive rate independent of load, a rated torque of 35 in-lb, a 90-second drive time and is non-spring return. Travel is terminated by end stops at fully opened and closed positions. An integral magnetic clutch eliminates motor stall when Trane controls are not provided. An integral 3 screw terminal is provided for field wiring.

2.3 VARIABLE AIR VOLUME BYPASS BOXES

- .1 Cylinder - Rolled and seam welded 18 gauge galvanized steel. The discharge end is roll crimped to fit standard round ductwork. Damper - A 22 gauge (18 gauge on size 08) galvanized steel damper blade sets against a single rolled bead in the cylinder with a factory provided integral 24 VAC electric actuator. The damper actuator is a synchronous motor driven actuator with a three-wire connection terminal strip and is factory installed. This non-spring return actuator has a 53 lb-in [6 N.m] running torque, and a 1 minute, 90.00 Deg travel time. The 1/2" coupler fits over the round shaft of the damper. The actuator requires 2.5 VA at the nominal 24 VAC, 50/60 Hz.
- .2 Bypass damper control is accomplished by a communicating sensor/bypass control assembly that includes a Unit Control Module. Terminal unit to be CSA certified.
- .3 Sizes and capacity: as indicated in the 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 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 FIELD QUALITY CONTROL

3.4 CLEANING

- .1 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Supply, return and exhaust grilles and registers, diffusers and linear grilles, for commercial and residential use.

1.2 SYSTEM DESCRIPTION

- .1 Performance Requirements:
 - .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

1.3 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheets.
 - .2 Indicate following:
 - .1 Capacity.
 - .2 Throw and terminal velocity.
 - .3 Noise criteria.
 - .4 Pressure drop.
 - .5 Neck velocity.

1.4 QUALITY ASSURANCE

- .1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling.

1.6 MAINTENANCE

- .1 Extra Materials:
 - .1 Include:
 - .1 Keys for volume control adjustment.
 - .2 Keys for air flow pattern adjustment.

PART 2 PRODUCTS

2.1 GENERAL

- .1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity [as indicated in the drawings.
- .2 Frames:
 - .1 Full perimeter gaskets.
 - .2 Plaster frames where set into plaster or gypsum board and as specified.
 - .3 Concealed fasteners.
- .3 Concealed manual volume control damper operators.
- .4 Colour: as directed by Engineer.

2.2 MANUFACTURED UNITS

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

2.3 RETURN AND EXHAUST GRILLES AND REGISTERS

- .1 General: Louvered return grills, aluminum construction, opposed blade damper, 0 deg deflection.
- .2 Aluminum, 19 mm blade spacing, single 0 degrees deflection, horizontal face bars. Finish: white powder coated finish (except ceiling of Theatre which are to be black) . Model: Price 610 ZDAL or Department Representative or designate approved equivalent.

2.4 DIFFUSERS

- .1 General: volume control dampers with flow straightening devices and blank-off quadrants and gaskets.
- .2 Aluminum, square three cone ceiling diffusers include adjustable pattern controllers to provide horizontal or vertical air pattern. Model: Price ASCDA series or Department Representative or designate approved equivalent.

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 manufacturers instructions.
- .2 Install with flat head screws in countersunk holes where fastenings are visible.
- .3 Bolt grilles, registers and diffusers, in place, in gymnasium and similar game rooms.

3.3 CLEANING

- .1 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for self-contained single zone, gas, electric, packaged rooftop HVAC units.
- .2 Related Sections:
 - .1 Section 01 33 23 - Submittal Procedures.
 - .2 Section 01 35 29 - Health and Safety Requirements.
 - .3 Section 01 78 23 – Operating and Maintenance Data.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/Air Conditioning and Refrigeration Institute (ARI)
 - .1 ANSI/ARI 210/240-03, Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
 - .2 ARI 270-95, Sound Rating of Outdoor Unitary Equipment.
- .2 ANSI/UL 1995 B-1998, Standard for Heating and Cooling Equipment.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA B52-99, Mechanical Refrigeration Code.
 - .2 CSA C22.1 HB-02, Canadian Electrical Code Handbook.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 National Fire Protection Association
 - .1 NFPA 90A-02, Standard for the Installation of Air Conditioning and Ventilating Systems.

1.3 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 23 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet for packaged rooftop HVAC units.

- .3 Shop Drawings:
 - .1 Submit shop drawings to indicate project layout and dimensions; indicate:
 - .1 Equipment, piping, and connections, together with valves, strainers, control assemblies, thermostatic controls, auxiliaries and hardware, and recommended ancillaries which are mounted, wired and piped ready for final connection to building system, its size and recommended bypass connections.
 - .2 Piping, valves, fitting shipped loose showing final location in assembly.
 - .3 Control equipment shipped loose, showing final location in assembly.
 - .4 Dimensions, internal and external construction details, recommended method of installation with proposed structural steel support, mounting curb details, sizes and location of mounting bolt holes; include mass distribution drawings showing point loads.
 - .5 Detailed composite wiring diagrams for control systems showing factory installed wiring and equipment on packaged equipment or required for controlling devices of ancillaries, accessories, controllers.
 - .6 Details of vibration isolation.
 - .7 Estimate of sound levels to be expected across individual octave bands in dB referred to A rating.
 - .8 Type of refrigerant used.
 - .4 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
 - .5 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .6 Instructions: submit manufacturer's installation instructions.
 - .7 Manufacturer's Field Reports: manufacturer's field reports specified.
 - .8 Closeout submittals: submit maintenance and engineering data for incorporation into manual and include data as follows:
 - .1 Indicate: brief description of unit, indexed, with details of function, operation, control, and service for components.
 - .2 Provide for units, manufacturer's name, type, year, number of units, and capacity.

1.4 QUALITY ASSURANCE

- .1 Pre-Installation Meeting:
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - .2 Collect and separate for disposal of packaging material.
 - .3 Handle and dispose of hazardous materials in accordance with Regional and Municipal regulations.

1.6 WARRANTY

- .1 12 months warranty period prescribed in subsection GC 32.1 of General Conditions "C" is extended to 24 months.
- .2 Contractor hereby warrants that packaged rooftop HVAC units and refrigeration compressors will function and operate in accordance with CCDC 2 GC 24, but for 60 months.

PART 2 PRODUCTS

2.1 GENERAL

- .1 Roof mounted, designed for outdoor rooftop application, weatherproof cabinet, self-contained single zone unit with gas and DX refrigeration and bear label of CSA, CGA, and ULC. Fan performance shall be AHRI certified. Complete unit shall be ETL Canada Listed.
- .2 Units to consist of cabinet and frame, supply fan, heat exchanger, burner with integral induced draft fan, air filter, refrigerant cooling coil, compressor, condenser coil and fans, motorized outside air damper, return damper, motorized exhaust damper.
- .3 Prefabricated roof curb to conform to requirements of National Roofing Contractors Association (NRCA), minimum height 450 mm.

2.2 SOUND PERFORMANCE

- .1 The unit sound power levels shall not exceed those indicated in the table below:

Sound Power (db)								
Frequency (Hz)	63	125	250	500	1000	2000	4000	8000
Inlet	72	70	78	73	75	69	64	58
Discharge	72	73	81	78	81	75	72	66
Radiated	85	85	81	78	76	71	64	57

2.3 UNIT- GENERAL

- .1 The units shall be convertible airflow. The operating range shall be between 115°F and 0°F in cooling as standard from the factory for units with microprocessor controls. Cooling performance shall be rated in accordance with ARI testing procedures. All units shall be factory assembled, internally wired, fully charged with environmentally friendly refrigerant, and 100 percent run tested to check cooling operation, fan and blower rotation, and control sequence before leaving the factory. Wiring internal to the unit shall be colored and numbered for simplified identification. Units shall be cULus listed and labeled, classified in accordance for Central Cooling Air Conditioners.
- .2 Testing shall include final balancing of the supply and exhaust fan assemblies, a refrigeration circuit run test, a unit control system operations checkout, test and adjustment of the gas furnace, a unit refrigerant leak test and a final unit inspection.
- .3 Panels and access doors shall be constructed as a 1-inch (25-mm) nominal thick, thermal broke double wall assembly, injected with foam insulation for an R-value of not less than R-7.
- .4 Unit casing shall be constructed of zinc coated, heavy gauge, galvanized steel. Exterior surfaces shall be cleaned, phosphatized, and finished with a weather-resistant baked enamel finish. Unit's surface shall be tested 750 hours in a salt spray test in compliance with ASTM B117. Cabinet construction shall allow for all maintenance on one side of the unit. Service panels shall have lifting handles and be removed and reinstalled by removing two fasteners while providing a water and air tight seal. All exposed vertical panels and top covers in the indoor air section shall be insulated with a cleanable foil-faced, fire-retardant permanent, odorless glass fiber material. The base of the unit shall be insulated with 1/8 inch, foil-faced, closed-cell insulation. All insulation edges shall be either captured or sealed. The unit's base pan shall have no penetrations within the perimeter of the curb other than the raised 1 1/8 inch high downflow supply/return openings to provide an added water integrity precaution, if the condensate drain

backs up. The base of the unit shall have provisions for forklift and crane lifting, with forklift capabilities on three sides of the unit.

2.4 FANS

- .1 Supply and exhaust fans shall be single width, single inlet centrifugal Airfoil type. The fan wheel shall be Class II construction with aluminum fan blades that are continuously welded to the hub plate and end rim. Fans shall be direct drive to eliminate all belt maintenance issues.
- .2 Fan assemblies shall be statically and dynamically balanced for quiet operation. Provide slide out rails for servicing and maintenance of the fan.
- .3 The fan motor shall be a totally enclosed EC motor that is speed controlled by the rooftop unit controller. Motor safeties shall include thermal overload protection and phase failure protection. Motors shall be premium efficiency.

2.5 AIR FILTERS

- .1 2" prefilter rack and a 4 inch final filter rack.
- .2 Prefilter shall be 30% efficient and final filters shall be 85% efficient,

2.6 OTHER

- .1 Refrigeration to conform to CSA B52 and ANSI/UL 1995 requirements.
- .2 Compressor/Condenser Section:

The unit shall have multiple scroll compressors. One of the compressors shall be inverter driven and the unit controller must control the speed of the compressor to maintain the discharge air temperature.

The refrigeration circuit shall have both low and high pressure safety switches. Temperature sensors shall be provided for measuring suction and discharge temperature of the refrigerant.

Refrigerant circuit shall have a bypass valve between the suction and discharge refrigerant lines for compressor startup under low head pressure conditions. When there is a call for mechanical cooling the bypass valve shall open to equalizing the suction and discharge pressures. When pressures are equalized the bypass valve shall close and the compressor shall be allowed to start.

Each circuit shall be dehydrated and factory charged with Refrigerant 410A and oil.

Outdoor coils shall have seamless copper tubes, mechanically bonded to aluminum plate-type fins. The fins shall have full drawn collars to completely cover the tubes. A sub-cooling coil shall be an integral part of the main outdoor air coil.

Fan motors shall be ECM type. The rooftop controller shall proportionally control the speed of the condenser fan motors to maintain the head pressure of the refrigerant

circuit within acceptable limits. Mechanical cooling shall be provided to 25° F. Motor safeties shall include thermal overload protection and phase failure protection.

The condenser fan shall be dynamically designed for low noise generation with low tip speeds. Fan blade shall be of a composite material.

.3 Evaporator:

Rated to ANSI/ARI 210/240. Internally finned, 5/16" copper tubes mechanically bonded to a configured aluminum plate fin shall be provided. The evaporator coil and condenser coil shall be leak tested to 600 psig. The assembled unit shall be leak tested to 465 psig. The condenser coil shall be designed for ease of cleaning. A stainless steel removable, reversible, double-sloped condensate drain pan with through the base condensate drain shall be provided.

.4 Controls:

Unit shall be completely factory-wired with necessary controls and contactor pressure lugs or terminal block for power wiring. Unit shall provide an external location for mounting a fused disconnect device. A microprocessor controls shall be provided. Microprocessor controls provide for all 24V control functions. The resident control algorithms shall make all heating, cooling, and/or ventilating decisions in response to electronic signals from sensors measuring indoor and outdoor temperatures. The control algorithm shall maintain accurate temperature control, minimizes drift from set point, and provide building thermal comfort. A centralized microprocessor shall provide anti-short cycle timing and time delay between compressors to provide a higher level of machine protection. A 24-volt electromechanical control circuit shall include control transformer and contactor. The 24V transformer shall be sized to adequately power with the AHV and three VAV boxes.

.6 Gas Heating Section:

The rooftop unit shall include a natural gas heating section consisting of a tubular design with in-shot gas burners. The heat exchanger tubes shall be constructed of stainless steel.

The heat exchanger shall be complete with furnace controller and control valve capable of 10:1 modulating control.

The module shall have an induced draft fan that will maintain a negative pressure in the heat exchanger tubes for the removal of the flue gases. An airflow safety switch shall prevent the heating module from turning on in the event of no airflow in the flue chamber.

Gas heat sections shall include two flame roll-out safety protection switches and a high temperature limit switch that will shut the gas valve off upon detection of improper burner manifold operation.

2.7 ECONOMIZER

- .1 Unit shall be provided with an outdoor air economizer section. The economizer shall include outdoor, return, and exhaust air dampers. The outdoor air hood shall be factory installed and constructed from galvanized steel finished with the same durable paint finish as the main unit. The hood shall include moisture eliminator filters to drain water away from the entering air stream
- .2 The economizer operation shall be fully integral to the mechanical cooling and allow up to 100% of mechanical cooling if needed to maintain the cooling discharge air temperature. The outside and return air dampers shall be sized to handle 100% of the supply air volume. The dampers shall be opposed blade design. Damper blades shall be gasketed with side seals to provide an air leakage rate of 4 cfm / square foot of damper area at 1" differential pressure per ASHRAE 90.1 Energy Standard.
- .3 A barometric exhaust damper shall be provided to exhaust air out of the back of the unit. A bird screen shall prevent infiltration of rain and foreign materials. Exhaust damper blades shall be lined with vinyl gasketing on contact edges.
- .4 Control of the dampers shall be by a factory installed direct coupled actuator. Damper actuator shall be of the modulating, spring return type. Dry bulb temperature controls shall be provided to sense the outdoor air temperature to determine if outdoor air is suitable for "free" cooling. If outdoor air is suitable for "free" cooling, the outdoor air dampers shall modulate in response to the unit's temperature control system.

2.8 CONTROLLER

- .1 Provide remote readout panel and controller for the Rooftop unit, VAV and bypass boxes.
- .2 The controller shall measure deviations from zone temperature and set points over time, and shall select levels of heating or cooling in response to zone thermal

requirements. The controller will control the outdoor air based on a demand control ventilation strategy. The controller also monitors the system air temperature to determine capacity staging and to ensure that high and low temperature limits are not violated.

- .3 The system temperature control shall include zone and communications data collected from field terminal units and shared with the microprocessor mounted on the HVAC unit.
- .4 The controller also controls static air pressure through analog control with a high pressure limit lockout. The controller shall also be capable of disabling outdoor air ventilation during periods of unoccupied control, as an energy saving measure.

2.9 ELECTRICAL

- .1 Each unit shall be wired and tested at the factory before shipment. Wiring shall comply with CSA standards. All wiring shall be number coded per the electrical wiring diagrams. All electrical components shall be labeled according to the electrical diagram and be CSA recognized.
- .2 A terminal block shall be provided for the main power connection and a terminal board shall be provided for the low voltage control wiring. Knockouts shall be provided in the bottom of the main control panel for field wiring entrance. Branch short circuit protection, 115-volt control circuit transformer and fuse, system switches, and a high temperature sensor shall also be provided with the unit.
- .3 Each compressor and condenser fan motor shall be furnished with contactors and internal thermal overload protection. Supply fan motors shall be supplied with external overload protection.
- .4 Provide a disconnect switch to cut power to the entire unit before the control panel door can be opened.

2.10 ELECTRIC MOTORS

- .1 Unless otherwise specified, motors shall conform to EEMAC Standard MG1, applicable IEEE Standards, and applicable CSA C222 Standards.
- .2 Single Phase Motors: Unless otherwise specified, motors smaller than ½ HP shall be 115 volt, continuous duty capacitor start type with an EEMAC 48 or 56 frame size, solid base, heavy-gauge steel shell with solid die-cast endshields, dynamically balanced die-cast rotor, integral automatic reset thermal overload protection, Class “B” insulation, and a 115 service factor at 40oC ambient temperature.
- .3 Three Phase Motors: Unless otherwise specified, motors ½ HP and larger shall be totally enclosed, fan cooled, 575V, 3 phase, T-frame, squirrel cage continuous

duty induction motors, EEMAC Design “B” for normal starting torque or Design “C” for high starting torque as required by the application, each complete with Class “B” insulation, a 115 service factor at 40oC ambient temperature, regreasable open ball bearings with grease fittings to permit relubrication without dismantling the motor, a cast iron frame with cast iron feet where required, case iron end bracket and precision machined bearing fit, and balanced carbon steel shaft assembly with die-cast aluminum rotor windings.

- .4 Motor Efficiency: The efficiency of single phase motors to 1 HP shall be in accordance with CAN/CSA-C747 The efficiency of all three phase motors 1 HP and larger shall be equal to or exceed the July 1/92 Ontario Hydro Motor Efficiency Levels in accordance with CSA C39 or IEEE 1123
- .5 Two Speed Single Wind Motors: The motor(s) for two-speed cooling tower(s) shall be as specified above but two-speed single winding type.

2.11 VARIABLE FREQUENCY DRIVES

- .1 Variable frequency drives, each approved and suitable for installation on the scheduled motors. Ensure that drives and motors are approved by respective manufacturers as compatible.
- .2 Quality Assurance :The VFD manufacturing facility shall be ISO 9001 certified. The VFD shall be Canadian UL listed and CSA listed.
- .3 Output Filter: Supply an output dv/dt filter (LRC filter) to protect motor insulation.
- .4 Supply a main fused disconnect switch or contactor to supply power to the VFD..
- .5 Adjustable Frequency Drives:
 - .1 The adjustable frequency drive shall be a pulse width modulated (PWM) AC to AC converter utilizing the latest isolated gate bipolar transistor (IGBT) technology.
 - .2 All VFDs regardless of HP rating are to be of the same VFD model. I/O and control circuit boards as well as keypads must be identical and interchangeable regardless of HP rating.
 - .3 VFD Ratings: The VFD shall be rated to operate from 3 phase power at 600 volts +/-15% and 48 to 63 Hz. The VFD to be of a robust construction utilizing premium rated power devices and to operate continuously without failure when connected to a 3 phase supply line between 510 vac to 690 vac.
 - .4 Output voltage and current ratings shall match the adjustable frequency operating requirements of standard 3ph, 60Hz, NEMA design B inverter-duty motors. The overload current capacity for variable torque overload

- capacity shall be 110% of rated current for 1 minute out of 10 minutes and 150% for 2 seconds out of 15 seconds with an instantaneous overcurrent trip at 350% or higher. Output frequency shall be adjustable between 0 and 60 Hz.
- .5 The VFD shall provide full torque at any frequency from 5 Hz to base speed.
- .6 Control Functions and Adjustments :
- .1 Start-up data entries shall include motor nameplate power, speed, voltage, frequency and current.
- .2 Start/Stop control functions shall include 2 or 3 wire start/stop, coast/ramp stop selections, flux braking and optional dynamic braking. An automatic reset function shall execute up to 5 attempts to restart after individually selected overcurrent, overvoltage, undervoltage and signal loss fault conditions. The automatic reset trial and delay times shall be individually adjustable.
- .3 Accel/Decel control functions shall include ramp time adjustments with linear and 3 s-curve ramp selections.
- .7 Speed control functions shall include:
- .1 Adjustable min/max speed (frequency limits in scalar mode);
- .2 Selection of preset speed settings or external speed control;
- .3 Two analog inputs shall be programmable to form a reference by addition, subtraction, multiplication, minimum selection or maximum selection.
- .8 Output control functions shall include:
- .1 Current and torque limit adjustments to limit the maximum VFD output current and the maximum torque produced by the motor. These limits shall govern the inner loop torque regulator to provide tight conformance with the limits with minimum overshoot;
- .9 Static and Dynamic Performance
- .1 Open loop static speed regulation shall be 01% to 03% (10% of motor slip). Dynamic speed accuracy shall be 4%-sec. or better open loop.
- .10 Operator Control Panel
- .1 Each VFD shall be equipped with a front mounted plug-in operator control panel consisting of a 4 line by 20 character backlit alphanumeric display and a keypad with keys for Run/Stop, Local/Remote, Increase/Decrease, menu navigation and parameter select/save. All parameter names, fault messages, warnings and other information shall be displayed in complete words or standard abbreviations to allow the user to understand what is being displayed without the use of a manual or cross reference table:

- .2 The control panel shall include a feature for uploading parameter settings to control panel memory and downloading from the control panel to the same VFD or to another VFD.
- .3 The control panel shall be programmable in English.
- .11 Control interface inputs and outputs shall include:
 - .1 Three analog inputs, one 0 - 10V and two 4 - 20mA, all independently programmable.
 - .2 Six discrete inputs, all independently programmable. Inputs shall be designed for 'dry contact' inputs used with either an internal or external 24 VDC source.
 - .3 Two analog outputs providing 4 to -20mA signals. Outputs shall be independently programmable to provide signals proportional to at least output function selections including output speed, frequency, voltage, current and power.
 - .4 Three form C relay contact outputs, all independently programmable. Relay contacts shall be rated to switch 8A at 24 VDC or 250 VAC. Function selections shall include indications that the drive is ready, running, reversed and at set speed.
- .12 Protective Functions
 - .1 For each programmed warning and fault protection function, the keypad shall display a message in complete words or standard abbreviations. The 5 most recent fault messages and times shall be stored in the drive's fault history.
 - .2 The VFD shall provide electronic motor overload protection qualified per UL508C.
 - .3 Protection shall be provided for AC line or DC bus overvoltage at 130% of max rated or under voltage at 65% of min rated and input phase loss.

2.12 CAPACITY

- .1 As indicated in the drawing schedules.

2.13 ACCESSORIES

- .1 Provide a roof curb designed to match the AHV down flow supply and return with support and a water-tight installation. The curb shall be designed to be connected to field fabricated supply and return ductwork. The curb shall be shipped knocked down for field assembly and shall include wood nailer strips.
- .2 Provide a duct mounted carbon dioxide (CO₂) sensor to be shipped loose for field installation.
- .3 Economizer with barometric relief.

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 as per manufacturers' instructions on roof curbs provided by manufacturer.
- .2 Manufacturer to certify installation, supervise start-up and commission unit.
- .3 Run drain line from cooling coil condensate drain pan to discharge over roof drain. Include condensate drain trap in compliance with manufacturer specifications.

3.3 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
 - .1 Have manufacturer of products supplied under this Section review work involved in handling, installation/application, protection and cleaning of its products, and submit written reports, in acceptable format, to verify compliance of work with Contract.
 - .2 Provide manufacturer's field services, consisting of product use recommendations and periodic site visits for inspection of product installation, in accordance with manufacturer's instructions.
 - .3 Schedule site visits to review work at stages listed:
 - .1 After delivery and storage of products, and when preparatory work on which work of this Section depends is complete, but before installation begins.
 - .2 Upon completion of work, after cleaning is carried out.
- .2 Obtain reports within 3 days of review and submit immediately to the Department representative or designate.
- .3 Performance Verification:
 - .1 Rooftop Air Handling Units:
 - .1 Set zone mixing dampers for full cooling.
 - .2 Set outside air and return air dampers for minimum outside air.
 - .3 Set face and bypass dampers so face dampers are fully open and bypass dampers are fully closed.
 - .4 Check for smooth, vibration less correct rotation of supply fan impeller.

- .5 Measure supply fan capacity.
- .6 Adjust impeller speed as necessary and repeat measurement of fan capacity.
- .7 Measure pressure drop each component of air handling unit.
- .8 Set outside air and return air dampers for the % of outside air required by design and repeat measurements of fan capacity.
- .9 Reduce differences between fan capacity at minimum and maximum outside air less than 5%.
- .10 Set face and bypass dampers to full bypass and repeat measurement of fan capacity.
- .11 Reduce difference between fan capacity with F&BPD fully closed to bypass and fully open to bypass to less than 5%.
- .12 Reduce difference between fan capacity at full cooling and fan capacity at full heating to less than 5%.
- .13 OAD: verify for proper stroking, interlock with RAD.
- .14 Measure DBT, WBT of SA, RA, EA.
- .15 Measure air cooled condenser discharge DBT.
- .16 Measure flow rates (minimum and maximum) of SA, RA, EA, relief air.
- .17 Simulate maximum cooling load and measure refrigerant hot gas and suction temperatures and pressures.
- .18 Use smoke test to verify no short-circuiting of EA, relief air to outside air intake or to condenser intake.
- .19 Simulate maximum heating load and:
 - .1 Verify temperature rise across heat exchanger.
 - .2 Perform flue gas analysis. Adjust for peak efficiency.
 - .3 Verify combustion air flow to heat exchanger.
 - .4 Simulate minimum heating load and repeat measurements.
- .20 Measure radiated and discharge sound power levels under maximum heating demand and under maximum cooling demand with compressors running.
- .21 Verify operating control strategies, including:
 - .1 Heat exchanger operating and high limit.
 - .2 Early morning warm-up cycle.
 - .3 Freeze protection.
 - .4 Economizer cycle operation, temperature of change-over.
 - .5 Alarms.
 - .6 Voltage drop across thermostat wiring.
 - .7 Operation of remote panel including pilot lights, failure modes.

- .22 Set zone mixing dampers for full heating and repeat measurements.
- .23 Measure leakage past zone mixing dampers by taking temperature measurements. Reduce leakage to less than 5%.
- .24 Measure return fan capacity.
- .25 Power exhaust.
- .26 Check capacity of heating unit.
- .27 Measure DX refrigeration system performance and compare with manufacturer specifications.
- .28 Refer to other sections of these specifications for PV procedures for other components.
- .2 Verify accessibility, serviceability of components including motorized dampers, filters coils, fans, motors, operators, humidifiers, sensors, electrical disconnects.
- .3 Verify accessibility, clean ability, drainage of drain pans for coils, humidifiers.

3.4 CLEANING

- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

3.5 REFER TO CLOSE OUT SECTION 01 78 23 FOR ODM REQUIREMENTS

END OF SECTION

DIVISION 26
ELECTRICAL

PART 1 GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-12, Canadian Electrical Code, Part 1 (25th Edition), Safety Standard for Electrical Installations.
 - .2 CAN3-C235-83, Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
- .2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC)
 - .1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.
- .3 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
 - .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.
- .4 Ontario Electrical Safety Code.

1.2 DEFINITIONS

- .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

1.3 DESIGN REQUIREMENTS

- .1 Operating voltages: to CAN3-C235.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
 - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 Language operating requirements: provide identification nameplates and labels for control items in English.

1.4 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittals.
- .2 Product Data: submit WHMIS MSDS in accordance with Section 02 61 33 - Hazardous Materials.

- .3 Single line electrical diagrams shall be in glazed frames and locate in:
 - .1 Electrical distribution system in main electrical rooms and
 - .2 Electrical power generation and distribution systems in power plant rooms.

- .4 Shop drawings:
 - .1 Submit drawings and where required stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.
 - .3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
 - .4 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.
 - .5 Submit one copy of drawings and product data to Consultant.
 - .6 If changes are required, notify Consultant of these changes before they are made.

- .5 Quality Control: in accordance with Section 01 45 00 - Quality Control.
 - .1 Provide CSA certified equipment and material. Where CSA certified equipment and material is not available, submit such equipment and material to inspection authorities for special approval before delivery to site.
 - .2 Submit test results of installed electrical systems and instrumentation.
 - .3 Permits and fees: in accordance with General Conditions of contract.
 - .4 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
 - .5 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Consultant.

- .6 Manufacturer's Field Reports: submit to Consultant manufacturer's written report, within 5 days of review, verifying compliance of Work and electrical system and instrumentation testing , as described in PART 3 - FIELD QUALITY CONTROL.

1.5 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Qualifications: electrical Work to be carried out by qualified, licensed electricians or apprentices in accordance with authorities having jurisdiction and as per the conditions of Provincial Act respecting manpower vocational training and qualification.
 - .1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.
- .3 Site Meetings:
 - .1 Site Meetings: as part of Manufacturer's Field 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 Upon completion of Work, after cleaning is carried out.
- .4 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 30 - Health & Safety Requirements.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Material Delivery Schedule: provide Engineer Consultant with schedule within 2 weeks after award of Contract.
- .2 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

1.7 SYSTEM STARTUP

- .1 Instruct Departmental Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.
- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant will aspects of its care and operation.

1.8 OPERATING INSTRUCTIONS

- .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
- .2 Operating instructions to include following:
 - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
 - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
 - .3 Safety precautions.
 - .4 Procedures to be followed in event of equipment failure.
 - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
- .3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.
- .4 Post instructions where directed.
- .5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
- .6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- .1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from inspection authorities before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.
- .3 Factory assemble control panels and component assemblies.

2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

- .1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.

- .2 Control wiring and conduit: in accordance with Section 26 29 03 - Control Devices except for conduit, wiring and connections below 50 V which are related to control systems specified in mechanical sections and as shown on mechanical drawings.

2.3 WARNING SIGNS

- .1 Warning Signs: in accordance with requirements of authority having jurisdiction or inspection authorities or Departmental Representative and Consultant.
- .2 Decal signs, minimum size 175 x 250 mm.

2.4 WIRING TERMINATIONS

- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.5 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates and labels as follows:
 - .1 Nameplates: lamicoid 3 mm matt white finish face, black core, lettering accurately aligned and engraved into core mechanically attached with self tapping screws.
 - .2 Sizes as follows:

NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

- .2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.
- .3 Wording on nameplates and labels to be approved by Departmental Representative and Consultant prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per nameplate and label.
- .5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .6 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

- .7 Terminal cabinets and pull boxes: indicate system and voltage.
- .8 Transformers: indicate capacity, primary and secondary voltages.

2.6 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, numbered coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour coding: to CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

2.7 CONDUIT AND CABLE IDENTIFICATION

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 5 m intervals.
- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow

2.8 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
 - .1 Paint outdoor electrical equipment light gray to EEMAC 2Y-1.
 - .2 Paint indoor switchgear and distribution enclosures light gray to EEMAC 2Y-1 or ASA-61.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CSA C22.3 No.1 and No. 7 except where specified otherwise.

3.2 NAMEPLATES AND LABELS

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.3 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete.
 - .1 Sleeves through concrete: plastic, sized for free passage of conduit, and protruding 50 mm.
- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.4 LOCATION OF OUTLETS

- .1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
- .2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.
- .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.
- .4 Locate light switches on latch side of doors.

3.5 MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation. Install electrical equipment at following heights unless indicated otherwise.
 - .1 Local switches: 1400 mm.
 - .2 Wall receptacles:
 - .1 General: 450 mm.
 - .2 Above top of continuous baseboard heater: 200 mm.
 - .3 Above top of counters or counter splash backs: 175 mm.
 - .4 In mechanical rooms: 1400 mm.
 - .3 Panelboards: as required by Code or as indicated.
 - .4 Telephone and data/computer outlets: 450 mm or as indicated.
 - .5 Wall mounted telephone and interphone outlets: 1500 mm.
 - .6 Fire alarm stations: 1500 mm.
 - .7 Fire alarm bells: 2100 mm.

3.6 FIELD QUALITY CONTROL

- .1 The scope of the work under this item shall include all devices and equipment supplied and installed under this contract including contractor purchased equipment and equipment pre-purchased by the Owner or supplied by others.
- .2 The Contractor shall engage the services of a recognized independent testing firm for the purposes of protective device testing and inspections. The testing firm shall be experienced with this type of project and selection is subject to the approval of the Owner.

Included are visual and mechanical testing of all equipment to insure that the equipment has been installed per the manufacturer's specifications, the meggering and high-potential testing of cables and equipment, any adjustments to the equipment in the field application of the final relay settings and testing of all relays during commissioning.

- .3 Load Balance:
 - .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
 - .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
 - .3 Provide upon completion of work, load balance report as directed in PART 1 - SUBMITTALS: phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.
- .4 Conduct following tests in accordance with Section 01 45 00 - Quality Control. Testing shall include all contractor purchased equipment, Owner Pre-purchased equipment or equipment supplied by others as part of this work.
 - .1 Power generation and distribution systems including phasing, voltage, grounding and load balancing.
 - .2 Circuits originating from branch distribution panels.
 - .3 Lighting and its control.
 - .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
 - .5 Systems: fire alarm system and communications.
 - .6 Insulation resistance testing:
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
 - .3 Check resistance to ground before energizing.
 - .4 Check potential difference between ground and neutral. Potential difference between ground and neutral shall not exceed 2V.
- .5 The testing firm shall maintain written records of all tests, calibrations and settings and upon completion of the project, assemble and certify final test reports. Submit six (6) copies of all test reports to the consultant.
- .6 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.
- .7 Carry out tests in presence of Departmental Representative or Engineer.
- .8 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

-
- .9 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.

3.7 CLEANING

- .1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 CSA C22.2 No .0.3-01 R2005, Test Methods for Electrical Wires and Cables.
- .2 CAN/CSA-C22.2 No. 131-M89 (R2004), Type TECK 90 Cable.

1.2 PRODUCT DATA

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

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 – Construction Demolition Waste Management and Disposal.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .3 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 PRODUCTS

2.1 BUILDING WIRES

- .1 Conductors: stranded for 10 AWG and larger. Minimum size: 14 AWG.
- .2 Copper conductors: size as indicated, with 600 V insulation of chemically cross-linked thermosetting polyethylene material rated T90, RW 90 or RWU 90.
- .3 Use T90 or RW90 for building installations in above ground applications.
- .4 Use RWU90 for grade slab in embedded conduits systems or for underground installations.

2.2 TECK CABLE

- .1 Cable: to CAN/CSA-C22.2 No. 131.
- .2 Conductors:
 - .1 Grounding conductor: copper.
 - .2 Circuit conductors: copper, size as indicated.

- .3 Insulation:
 - .1 Chemically cross-linked thermosetting polyethylene rated type RW90, 600 V.
- .4 Inner jacket: polyvinyl chloride material.
- .5 Armour: interlocking galvanized steel.
- .6 Overall covering: polyvinyl chloride material.
- .7 Fastenings:
 - .1 One hole steel straps to secure surface cables 50 mm and smaller.
Two hole steel straps for cables larger than 50 mm.
 - .2 Channel type supports for two or more cables at 300 mm centers.
 - .3 Threaded rods: 6 mm dia. to support suspended channels.
- .8 Connectors:
 - .1 Watertight, approved for TECK cable.
 - .2 Explosion proof for hazardous locations, approved for TECK cable.

2.3 ARMoured CABLES

- .1 Conductors: insulated, copper, size as indicated.
- .2 Type: AC90.
- .3 Armour: interlocking type fabricated from galvanized steel strip.

2.4 CONTROL CABLES

- .1 Low energy 300 V control cable: stranded annealed copper conductors sized as indicated, with PVC insulation type polyethylene insulation with shielding of metallized tapes over each pair and over all conductors and overall covering of PVC jackets interlocked armour of flat galvanized steel.
- .2 600 V type: stranded annealed copper conductors, sizes as indicated with cross-linked polyethylene type RW90 (x-link).

PART 3 EXECUTION

3.1 INSTALLATION OF BUILDING WIRES

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

3.2 INSTALLATION OF TECK CABLE 0 -1000 V

- .1 Install cables.
 - .1 Group cables wherever possible on channels.
 - .2 In cabletrays in accordance with Section 26 05 36.

3.3 INSTALLATION OF ARMOURED CABLES

- .1 Group cables wherever possible.

3.4 INSTALLATION OF CONTROL CABLES

- .1 Install control cables in conduit or underground ducts.
- .2 Ground control cable shield at one end only.

END OF SECTION

PART 1 GENERAL

1.1 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data for cabinets in accordance with Section 01 33 00 – Submittals.

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 – Construction Demolition Waste Management and Disposal, and with the Waste Reduction Workplan.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .3 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 PRODUCTS

2.1 SPLITTERS

- .1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.
- .2 Main and branch lugs or connection bars to match required size and number of incoming and outgoing conductors as indicated.
- .3 At least three spare terminals on each set of lugs in splitters less than 400 A.

2.2 JUNCTION AND PULL BOXES

- .1 Junction and pull shall be of the mild steel or PVC and size as indicated on the drawing.
- .2 Welded construction with screw-on flat covers for surface mounting.
- .3 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

2.3 CABINETS

- .1 Type E: sheet steel, hinged door and return flange overlapping sides, handle, lock and catch, for surface mounting.
- .2 Type T: sheet steel cabinet, with hinged door, latch, lock, two keys, containing sheet steel backboard for surface mounting.

PART 3 EXECUTION

3.1 SPLITTER INSTALLATION

- .1 Install splitters and mount plumb, true and square to the building lines.
- .2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Mount cabinets with top not higher than 2 m above finished floor.
- .3 Install terminal block as indicated in Type T cabinets.
- .4 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.

3.3 IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Install size 2 identification labels indicating system name and/or voltage and phase.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 CSA C22.1-2012, Canadian Electrical Code, Part 1.

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 – Construction Demolition Waste Management and Disposal, and with the Waste Reduction Workplan.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

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 for special devices.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 OUTLET BOXES

- .1 Stainless steel or PVC single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
- .2 Stainless steel or PVC utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.
- .3 102 mm square or octagonal outlet boxes for lighting fixture outlets.
- .4 102 mm square outlet boxes with extension and plaster rings for flush mounting devices in finished plaster tile walls.

2.3 MASONRY BOXES

- .1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.

2.4 CONCRETE BOXES

- .1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.5 FLOOR BOXES

- .1 Concrete tight electro-galvanized sheet steel floor boxes with adjustable finishing rings to suit floor finish with brass brushed aluminum faceplate. Device mounting plate to accommodate short or long ear duplex single receptacles. Minimum depth: 28 mm for receptacles; 73 mm for communication equipment.
- .2 Adjustable, watertight, concrete tight, cast floor boxes with openings drilled and tapped for 12 mm and 19 mm conduit. Minimum size: 73 mm deep.

2.6 CONDUIT BOXES

- .1 Cast FS boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle.

2.7 OUTLET BOXES FOR NON-METALLIC SHEATHED CABLE

- .1 Electro-galvanized, sectional, screw ganging steel boxes, minimum size 76 x 50 x 63 mm with two double clamps to take non-metallic sheathed cables.

2.8 FITTINGS - GENERAL

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.
- .5 Stainless steel or PVC in process areas or outdoors.

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. Reducing washers are not allowed.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA C22.2 No. 18-98 (R2003), Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware.
 - .2 CSA C22.2 No. 45-M1981 (R2003), Rigid Metal Conduit.
 - .3 CSA C22.2 No. 56-2004, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .4 CSA C22.2 No. 83-M1985 (R2003), Electrical Metallic Tubing.
 - .5 CSA C22.2 No. 211.2-2006, Rigid PVC (Unplasticized) Conduit.
 - .6 CAN/CSA C22.2 No. 227.3-2005, Flexible Non-metallic Tubing.

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 – Construction Demolition Waste Management and Disposal, and with the Waste Reduction Workplan.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .4 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

PART 2 PRODUCTS

2.1 CONDUITS

- .1 Rigid metal conduit: to CSA C22.2 No. 45, hot dipped galvanized steel threaded at both ends.
- .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.
- .4 Rigid PVC conduit: to CSA C22.2 No. 211.1. Use Schedule 40 for duct banks, reinforce concrete and direct buried installation.
- .5 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.
- .6 Flexible PVC conduit: to CAN/CSA-C22.2 No. 227.3.

2.2 CONDUIT FASTENINGS

- .1 One hole steel or PVC straps to secure surface conduits 50 mm and smaller. 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 1.5 m oc.
- .4 Threaded rods, 6 mm dia. to support suspended channels.

2.3 CONDUIT FITTINGS

- .1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.
- .2 Factory "ells" where 90E bends are required for 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT. Set-screws are not acceptable.
- .4 Use explosion proof flexible connection for connection to explosion proof motors.
- .5 Install conduit sealing fittings in hazardous areas. Fill with compound.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 200 mm linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection in all directions.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 FISH CORD

- .1 Polypropylene.

PART 3 EXECUTION

3.1 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 mechanical and electrical service rooms.

- .3 Use rigid hot dipped galvanized steel threaded conduit except where specified otherwise.
- .4 Use epoxy coated conduit in corrosive areas.
- .5 Use electrical metallic tubing (EMT) above 2.4 m not subject to mechanical injury.
- .6 Use rigid PVC conduit underground.
- .7 Use flexible metal conduit for connection to motors in dry areas.
- .8 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.
- .9 Use explosion proof flexible connection for connection to explosion proof motors.
- .10 Install conduit sealing fittings in hazardous areas. Fill with compound.
- .11 Minimum conduit size for lighting and power circuits: 19 mm.
- .12 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .13 Mechanically bend steel conduit over 19 mm dia.
- .14 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .15 Install fish cord in empty conduits.
- .16 Run 2 - 25 mm spare conduits up to ceiling space and 2 - 25 mm spare conduits down to ceiling space from each flush panel. Terminate these conduits in 152 x 152 x 102 mm junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in surface type box.
- .17 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- .18 Dry conduits out before installing wire.

3.2 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 or surface 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.

3.3 CONCEALED CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.
- .3 Do not install conduits in terrazzo or concrete toppings.

3.4 CONDUITS IN CAST-IN-PLACE CONCRETE

- .1 Locate to suit reinforcing steel. Install in centre one third of slab.
- .2 Protect conduits from damage where they stub out of concrete.
- .3 Install sleeves where conduits pass through slab or wall.
- .4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed. Use cold mastic between sleeve and conduit.
- .5 Do not place conduits in slabs in which slab thickness is less than 4 times conduit diameter.
- .6 Encase conduits completely in concrete with minimum 25 mm concrete cover.
- .7 Organize conduits in slab to minimize cross-overs.

3.5 CONDUITS IN CAST-IN-PLACE SLABS ON GRADE

- .1 Run conduits 25 mm and larger below slab and encased in 75 mm concrete envelope. Provide 50 mm of sand over concrete envelope below floor slab.

3.6 CONDUITS UNDERGROUND

- .1 Slope conduits to provide drainage.
- .2 Waterproof joints (PVC excepted) with heavy coat of bituminous paint.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for low voltage control system designed to provide remote switching of lighting loads by use of:
 - .1 Low voltage momentary contact switches.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 35 30 - Health & Safety Requirements.
- .3 Section 01 74 21 – Construction Demolition Waste Management and Disposal.
- .4 Section 26 05 00 - Common Work Results For Electrical.

1.3 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedure. Include product characteristics, performance criteria, and limitations.
- .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedure.
 - .2 Shop drawings: submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada as required.
- .3 Closeout Submittals:
 - .1 Submit maintenance data in accordance with Section 01 78 00 - Closeout Submittals.
- .4 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Test reports:
 - .1 Submit certified test reports indicating compliance 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.
- .4 Manufacturer's Field Reports: manufacturer's field reports specified.

1.4 QUALITY ASSURANCE

- .1 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with
 - .2 Section 01 35 30 - 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: Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Control system: by one manufacturer and assembled from compatible components.

2.2 LIGHTING CONTROL SYSTEM

- .1 Provide and install a Lutron Grafik Eye QS scene based light control system with adjustable presets.
- .2 Grafik Eye system will be sized with the appropriate number of zones and scenes to comply with the lighting design.
- .3 Provide an Ethernet and RS-232 control interface for AV recall of established lighting scenes.
- .4 Vendor shall co-ordinate with the Department Representative or designate to determine final requirements.

- .5 Provide and install all materials, accessories, programming and adjustments for a complete installation.

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 Locate and install equipment in accordance with manufacturer's recommendations and as indicated.

3.3 FIELD QUALITY CONTROL

- .1 Site Tests:
 - .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - for Electrical.
 - .2 Actuate control units in presence of Departmental Representative to demonstrate lighting systems are controlled as designated.
 - .3 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. 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.
 - .2 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.4 CLEANING

- .1 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Materials and installation for standard and custom breaker type panelboards.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 74 21 – Construction Demolition Waste Management and Disposal.
- .3 Section 26 05 00 – Common Work Results For Electrical.
- .4 Section 26 28 21 – Moulded Case Circuit Breakers.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2No.29-M1989 (R2004), Panelboards and enclosed Panelboards.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Department Representative or designate.

PART 2 PRODUCTS

2.1 PANELBOARDS

- .1 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.
 - .1 Service Entrance Rated as required.
 - .2 Install circuit breakers in panelboards before shipment.
 - .3 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- .2 120/250 V panel boards: bus and breakers rated for 10 kA (symmetrical) interrupting capacity or as indicated.
- .3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.
- .4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .5 Two keys for each panelboard and key panelboards alike.
- .6 Copper bus with neutral of same ampere rating as mains.
- .7 Mains: suitable for bolt-on breakers.
- .8 Trim with concealed front bolts and hinges.
- .9 Trim and door finish: baked grey enamel.

2.2 BREAKERS

- .1 Breakers: to Section 26 28 21 - Moulded Case Circuit Breakers.
- .2 Breakers with thermal tripping in panelboards except as indicated otherwise.
- .3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.
- .4 Lock-on devices for 10% of 15 to 30 A breakers installed as indicated. Turn over unused lock-on devices to Department Representative or designate.
- .5 Lock-on devices for fire alarm, exit and night light circuits.

2.3 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.

- .2 Nameplate for each panelboard size 4 engraved.
- .3 Nameplate for each circuit in distribution panelboards size 2 engraved.
- .4 Complete circuit directory with typewritten legend showing location and load of each circuit.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.
- .2 Install surface mounted panelboards on plywood backboards. Where practical, group panelboards on common backboard.
- .3 Mount panelboards to height specified in Section 26 05 00 – Common Work Results for Electrical or as indicated.
- .4 Connect loads to circuits.
- .5 Connect neutral conductors to common neutral bus with respective neutral identified.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Switches, receptacles, wiring devices, cover plates and their installation.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 26 05 00 – Common Work Results For Electrical.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-C22.2 No.42-99 (R2004), General Use Receptacles, Attachment Plugs and Similar Devices.
 - .2 CSA-C22.2 No.42.1-00 (R2004), Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
 - .3 CSA-C22.2 No.55-M1986 (R2004), Special Use Switches.
 - .4 CSA-C22.2 No.111-00 (R2005), General-Use Snap Switches (Bi-national standard, with UL 20, twelfth edition).

1.4 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 – Submittal Procedures.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 – Construction Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Department Representative or designate.

PART 2 PRODUCTS

2.1 SWITCHES

- .1 15 or 20 A, 120 V, single pole, double pole, three-way, four-way switches to: CSA-C22.2 No.55 and CSA-C22.2 No.111.

- .2 Manually-operated general purpose ac switches with following features:
 - .1 Terminal holes approved for No. 10 AWG wire.
 - .2 Silver alloy contacts.
 - .3 Urea or melamine moulding for parts subject to carbon tracking.
 - .4 Suitable for back and side wiring.
 - .5 Ivory toggle.
- .3 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.
- .4 Switches of one manufacturer throughout project.

2.2 RECEPTACLES

- .1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground or 5-20R, 125V, 20A, to: CSA-C22.2 No.42 with following features:
 - .1 Ivory urea moulded housing.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Break-off links for use as split receptacles.
 - .4 Eight back wired entrances, four side wiring screws.
 - .5 Triple wipe contacts and rivetted grounding contacts.
- .2 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground with following features:
 - .1 Ivory urea moulded housing.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Four back wired entrances, 2 side wiring screws.
- .3 Other receptacles with ampacity and voltage as indicated.
- .4 Receptacles of one manufacturer throughout project.

2.3 COVER PLATES

- .1 Cover plates for wiring devices to: CSA-C22.2 No.42.1.
- .2 Cover plates from one manufacturer throughout project.
- .3 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
- .4 Stainless steel, vertically brushed, 1 mm thick cover plates for wiring devices mounted in flush-mounted outlet box.
- .5 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.
- .6 Weatherproof double lift spring-loaded clear, in-use cover plates, complete with gaskets for duplex receptacles as indicated.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 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 in accordance with Section 26 05 01 - Common Work Results - Electrical as indicated.

- .2 Receptacles:
 - .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
 - .2 Mount receptacles at height in accordance with Section 26 05 01 - Common Work Results - Electrical as indicated.
 - .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.

- .3 Cover plates:
 - .1 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
 - .2 Install suitable common cover plates where wiring devices are grouped.
 - .3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Materials for moulded-case circuit breakers, circuit breakers, and ground-fault circuit-interrupters.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 74 21 – Construction Demolition Waste Management and Disposal.
- .3 Section 26 24 02 – Service Entrance Board.
- .4 Section 26 24 19 – Motor Control Centers.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International).
 - .1 CSA-C22.2 No. 5-02, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Include time-current characteristic curves for breakers.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction Demolition Waste Management and Disposal.
- .2 Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.

PART 2 PRODUCTS

2.1 BREAKERS GENERAL

- .1 Moulded-case circuit breakers, Circuit breakers, and Ground-fault circuit-interrupters: to CSA C22.2 No. 5.
- .2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.

- .3 Common-trip breakers: with single handle for multi-pole applications.
- .4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.
 - .1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.
- .5 Circuit breakers with interchangeable trips as indicated.
- .6 Circuit breakers to have minimum 10KA for lighting panel boards.

2.2 THERMAL MAGNETIC BREAKERS DESIGN A

- .1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install circuit breakers.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Materials and installation for fused and non-fused disconnect switches.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 35 30 – Health & Safety Requirements.
- .3 Section 01 74 21 – Construction Demolition Waste Management and Disposal.
- .4 Section 26 05 00 – Common Work Results For Electrical.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International).
 - .1 CAN/CSA C22.2 No.4-04), Enclosed Switches.
 - .2 CSA C22.2 No.39-M89 (R2003), Fuseholder Assemblies.

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 01330 – Submittal Procedures.

1.5 HEALTH AND SAFETY

- .1 Do construction occupational health and safety in accordance with Section 01 35 30 - Health & Safety Requirements.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.
- .4 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 PRODUCTS

2.1 DISCONNECT SWITCHES

- .1 Fusible, non-fusible, and horsepower rated disconnect switch in CSA Enclosure 12, 3R or 4X, to CAN/CSA C22.2 No.4 size as indicated.
- .2 Provision for padlocking in off switch position by three locks.
- .3 Mechanically interlocked door to prevent opening when handle in ON position.
- .4 Fuses: size as indicated, in accordance with Section 26 28 14 - Fuses - Low Voltage.
- .5 Fuseholders: to CSA C22.2 No.39 suitable without adaptors, for type and size of fuse indicated.
- .6 Quick-make, quick-break action.
- .7 ON-OFF switch position indication on switch enclosure cover.
- .8 Provide auxiliary contacts were required. Refer to schematics.

2.2 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Indicate name of load controlled on size 4 nameplate.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install disconnect switches complete with fuses if applicable.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Contract Administration.
- .3 Photometric data to include: VCP Table and spacing criterion.

PART 2 PRODUCTS

2.1 LAMPS

- .1 Supply all fixtures with lamps as indicated in the fixture schedule.

2.2 LUMINAIRES

- .1 Luminaires in accordance with fixture schedule on Drawings.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Locate and install luminaires as indicated.

3.2 WIRING

- .1 Connect luminaires to lighting circuits as indicated.

3.3 LUMINAIRE SUPPORTS

- .1 For suspended ceiling installations support luminaires independently of ceiling.

3.4 LUMINAIRE ALIGNMENT

- .1 Align luminaires mounted in continuous rows to form straight uninterrupted line.
- .2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

DIVISION 28

ELECTRONIC SAFETY AND SECURITY

PART 1 GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for fire alarm systems.
 - .2 Manual alarm stations.
 - .3 Automatic alarm initiating devices.
 - .4 Audible signal devices.
 - .5 End-of-line devices.
 - .6 Visual alarm signal devices.
 - .7 Ancillary devices.

1.2 REFERENCES

- .1 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-S524, Standard for the Installation of Fire Alarm Systems.
 - .2 CAN/ULC-S525, Audible Signal Device for Fire Alarm Systems.
 - .3 CAN/ULC-S526, Visual Signal Devices for Fire Alarm Systems.
 - .4 CAN/ULC-S528, Manual Pull Stations for Fire Alarm Systems.
 - .5 CAN/ULC-S529, Smoke Detectors for Fire Alarm Systems.
 - .6 CAN/ULC-S531, Standard for Smoke Alarms.

1.3 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittals.
 - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittals.
- .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittals.
- .3 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittals.
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .2 Instructions: submit manufacturer's installation instructions.

- .3 Manufacturer's Field Reports: manufacturer's field reports specified.

- .4 Closeout Submittals:
 - .1 Submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 – Close-Out Submittals in accordance with ANSI/NFPA 20.
 - .2 Authority of Jurisdiction will delegate authority for review and approval of submittals required by this Section.
 - .3 Submit to Authority of Jurisdiction 2 sets of approved submittals and drawings immediately after approval but no later than 15 working days to prior to final inspection.
 - .4 Submit following:
 - .1 Manufacturer's Data for:
 - .1 Manual pull stations.
 - .2 Open-area smoke detectors.
 - .3 Alarm horns.
 - .4 Visible appliances.
 - .5 Wiring.
 - .6 Conduit.
 - .7 Outlet boxes.
 - .8 Fittings for conduit and outlet boxes.
 - .9 Mark data which describe more than one type of item to indicate which type will be provided.
 - .10 Submit 1 original for each item and clear, legible, first-generation photocopies for remainder of specified copies.
 - .2 System wiring diagrams:
 - .1 Submit complete wiring diagrams of system showing points of connection and terminals used for electrical connections in the system.
 - .2 Show modules, relays, switches and lamps in control panel.
 - .3 Design data: Power Calculations:
 - .1 Submit design calculations to substantiate that battery capacity exceeds supervisory and alarm power requirements.
 - .2 Show comparison of detector power requirements per zone versus control panel smoke detector power output per zone in both standby and alarm modes.
 - .3 Show comparison of notification appliance circuit alarm power requirements with rated circuit power output.

- .4 Schedules:
 - .1 Conductor wire marker schedule.
- .5 Test Reports:
 - .1 Open-area 2-wire smoke detectors.
 - .2 Preliminary testing:
 - .1 Final acceptance testing.
 - .2 Submit for inspections and tests specified under Field Quality Control.

1.4 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: company or person specializing in fire alarm system installations documented experience.
- .2 Provide services of representative or technician from manufacturer of system, experienced in installation and operation of type of system being provided, to supervise installation, adjustment, preliminary testing, and final testing of system and to provide instruction to project personnel.
- .3 Extra Materials:
 - .1 Provide maintenance materials in accordance with Section 01 78 00 – Close-Out Submittals.
 - .2 Include:
 - .1 2 spare glass rods for manual pull box stations if applicable.
- .4 Maintenance Service:
 - .1 Provide one year's free maintenance with two inspections by manufacturer during warranty period. Inspection tests to conform to CAN/ULC-S536. Submit inspection report to Department Representative or delegate.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with Section 01610 - Basic Product Requirements.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01355 - Waste Management and Disposal.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Equipment and devices: ULC listed and labelled and supplied by single manufacturer.
- .2 Audible signal devices: to CAN/ULC-S525.
- .3 Visual signal devices: to CAN/ULC-S526.
- .4 Manual pull stations: to CAN/ULC-S528.
- .5 Smoke detectors: to CAN/ULC-S529.
- .6 Smoke alarms: to CAN/ULC-S531.

2.2 SYSTEM OPERATION

- .1 Provide complete, electrically supervised, temporal common coded, manual and automatic, zoned, annunciated, fire alarm system.
- .2 Provide separate circuits from control panel to each zone of initiating devices. Transmission of signals from more than one zone over common circuit to control panel is prohibited.
- .3 Single stage operation. Operation to actuation following:
 - .1 Manual station.
 - .2 Smoke detector.
- .4 Actuation of single operation device to initiate following:
 - .1 Building evacuation alarm devices to operate continuously.
 - .2 Zone of alarm device to be indicated on control panel and remote annunciators.
 - .3 Air conditioning and ventilating fans to shut down or to function so as to provide required control of smoke movement.
 - .4 Operations to remain in alarm mode (except alarm notification appliances if manually silenced) until system is manually restored to normal.

2.3 CONTROL PANEL

- .1 Add new devices to existing control panel.

2.4 MANUAL ALARM STATIONS

- .1 Provide non-coded double action type with mechanical reset features.
 - .1 Non-coded single pole normally open contact for single stage.

- .2 General alarm key switch for two stage system.
- .2 Stations: surface mounted and interior type as indicated.
 - .1 For surface mounting provide station manufacturer's approved back box.
 - .2 Back box finish to match station finish.
- .3 Equip each station with terminal strip with contacts of proper number and type to perform functions required.
- .4 Stations: type not subject to operation by jarring or vibration.
 - .1 Break-glass-front stations are not permitted; pull-lever break-rod type is acceptable provided presence of rod is not required to reset station.
- .5 Station colour: red.
- .6 Provide station with visible indication of operation.
- .7 Restoration to require use of key.
 - .1 Keys: identical throughout system for stations and control panel(s).
- .8 Mount stations with operating lever not more than 1.2 m above finished floor.
- .9 Where weatherproof stations are required, provide stations with cast metal, weatherproof housings with hinged access doors.
 - .1 Finish housings with red enamel paint and provide permanently affixed engraved English signage indicating "FIRE ALARM" with white letters of 19 mm high.

2.5 AUTOMATIC ALARM INITIATING DEVICES

- .1 Open-Area Smoke Detectors: provide detectors designed for detection of abnormal smoke densities by ionization or photoelectric principle.
 - .1 Detectors: 4-wire or 2-wire type.
 - .2 Provide necessary control and power modules required for operation integral with control panel.
 - .3 Detectors and associated modules: compatible with control panel and suitable for use in supervised circuit.
 - .4 Malfunction of electrical circuits to detector or its control or power units to result in operation of system trouble signals.
 - .5 Equip each detector with visible indicator lamp that will flash when detector is in normal standby mode and glow continuously when detector is activated.

- .6 Provide remote indicator lamps for each detector that is located above suspended ceilings.
- .7 Each detector: plug-in type with tab-lock or twist-lock, quick disconnect head and separate base in which detector base contains screw terminals for making wiring connections.
- .8 Detector head: removable from its base without disconnecting wires. Removal of detector head from its base to cause activation of system trouble signals.
- .9 Screen each detector to prevent entrance of insects into detection chamber(s).
- .2 4-Wire Smoke Detectors: detector circuits 4-wire type capable of transmitting detector operating power over conductors separate from initiating circuit.
 - .1 Provide separate, power circuit for each smoke detection initiating circuit (zone).
 - .2 Failure of power circuit to be indicated as trouble condition on corresponding initiating circuit.
- .3 2-Wire Smoke Detectors: detector circuits of 2-wire type capable of transmitting detector operating power over initiating circuit are permitted, provided detectors used are approved by control panel manufacturer for use with control panel provided and are ULC listed as being compatible with control panel.
 - .1 Total number of detectors on any detection circuit: not exceed 80 % of maximum number of detectors allowed by control panel manufacturer for that circuit. Provide additional zones if required to meet this requirement.
- .4 Ionization Detectors: multiple chamber type responsive to both invisible and visible particles of combustion.
 - .1 Detectors: not susceptible to operation by changes in relative humidity.
- .5 Photoelectric Detectors: operate on light scattering principle using LED light source.
 - .1 Detector: respond to both flaming and smoldering fires.
- .6 Locate detectors in accordance with their listing by ULC and the requirements of NFPA 72, except provide at least 2 detectors in rooms of 54 square meters or larger in area.
- .7 Mount detectors at underside of ceiling or deck above unless otherwise indicated.

- .1 For mounting heights greater than 3 m above floor level, reduce actual detector linear spacing from listed spacing as required by NFPA 72.
- .2 For heights greater than 9 m space detectors no farther apart than 34% of their listed spacing.
- .8 Temperature rating of detectors: in accordance with NFPA 72.
- .9 Locate detectors minimum 300 mm to lighting fixtures and not closer than 600 mm to air supply or return diffuser.
- .10 Ensure detectors, located in areas subject to moisture or exterior atmospheric conditions or hazardous locations as defined by NFPA 70, are approved for such locations.
- .11 Provide detectors with terminal screw type connections.
- .12 Removal of detector head from its base to cause activation of system trouble signals if detectors are provided with separable heads and bases.

2.6 ALARM INITIATING DEVICE SPACING AND LOCATION

- .1 Detector spacing and location: in accordance drawings.
- .2 Locate detectors minimum 0.9 m from air discharge or return grille, and not closer than 300 mm to lighting fixtures.
- .3 In areas without finished ceilings, mount detectors at underside of deck above unless otherwise indicated.

2.7 AUDIBLE SIGNAL DEVICES

- .1 Audible device(s):
 - .1 Mini-horns: surface flush mounting, red colour.
- .2 Do not exceed 80 percent of listed rating in amperes of notification appliance circuit. Provide additional circuits above those shown if required to meet this requirement.
- .3 Audible devices shall be compatible with existing fire alarm system.
- .4 Finish appliances in red enamel.
- .5 For surface mounting provide appliance manufacturer's approved back box. Back box finish to match appliance finish.

2.8 END-OF-LINE DEVICES

- .1 End-of-line devices to control supervisory current in alarm circuits and signalling circuits, sized to ensure correct supervisory current for each

circuit. Open, short or ground fault in any circuit will alter supervisory current in that circuit, producing audible and visible alarm at main control panel and remotely as indicated.

2.9 VISUAL ALARM SIGNAL DEVICES

- .1 Surface or Flush-mounted assembly of stroboscopic type suitable for use in electrically supervised circuit and powered from notification appliance circuits.
- .2 Appliances: minimum of 75 or 110 candela measured as approved by ULC, but not less than effective intensity required by National Building Code of Canada for appliance spacing and location shown.
- .3 Protect lamps with thermoplastic lens and labelled "FIRE" in letters at least 12 mm high.
- .4 Provide visible appliances within 300 mm of each audible appliance as indicated.
- .5 Visible appliances may be part of audio-visual assembly, where more than two appliances are located in same room or corridor.

2.10 CONDUIT

- .1 Rigid Steel Conduit:
 - .1 Zinc-Coated.

2.11 WIRING

- .1 Wire for 120 V circuits: No. 12 AWG minimum solid copper conductor.
Wire for low voltage DC circuits: No. 14 AWG minimum solid copper conductor.
- .2 Wire to remote annunciators: No. 18 AWG minimum solid copper conductor.
- .3 Wire for connection to base telegraphic alarm loop: No. 10 or 12 AWG minimum solid copper conductor.
- .4 Insulation 90 degrees C minimum with nylon jacket.
- .5 Colour code wiring.

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 systems in accordance with CAN/ULC-S524.
- .2 Modify main control panel as required to connect new devices.
- .3 Locate and install manual alarm stations and connect to alarm circuit wiring.
- .4 Locate and install detectors and connect to alarm circuit wiring. Do not mount detectors within 1 m of air outlets. Maintain at least 600 mm radius clear space on ceiling, below and around detectors. Locate duct type detectors in straight portions of ducts.
- .5 Connect alarm circuits to main control panel.
- .6 Locate and install signal horns and visual signal devices and connect to signalling circuits.
- .7 Connect signalling circuits to main control panel.
- .8 Install end-of-line devices.

3.3 FIELD QUALITY CONTROL

- .1 Site Tests:
 - .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - for Electrical and CAN/ULC-S537.
 - .2 Fire alarm system:
 - .1 Test each device and alarm circuit to ensure manual stations, thermal and smoke detectors sprinkler system transmit alarm to control panel and actuate general alarm.
 - .2 Check annunciator panels to ensure zones are shown correctly.
 - .3 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of system.
 - .4 Class A circuits.
 - .1 Test each conductor on circuits for capability of providing alarm signal on each side of single open-circuit fault condition imposed near midmost point of circuit. Reset control unit after each alarm

- function and correct imposed fault after completion of each test.
- .2 Test each conductor on circuits for capability of providing alarm signal during ground-fault condition imposed near midmost point of circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.
- .5 Class B circuits.
 - .1 Test each conductor on circuits for capability of providing alarm signal on line side of single open-circuit fault condition imposed at electrically most remote device on circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.
 - .2 Test each conductor on circuits for capability of providing alarm signal during ground-fault condition imposed at electrically most remote device on circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.
- .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 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

DIVISION 31
EARTHWORK

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- .1 General Conditions, Information for Tenderers and Special Provisions shall govern the work of this section.

1.2 DESCRIPTION

- .1 Work Included: Excavation, transport of materials, supply and fill placement and disposal of unsuitable materials as required for the installation of paving, curb, water feature and other site elements as indicated on contract drawings.

1.3 RELATED SECTIONS

- .1 Section 30 00 01 Pond Water Feature.

1.4 DEFINITIONS

- .1 Unclassified Excavation: excavation of deposits of whatever character encountered in work including miscellaneous structures located above or below ground.

1.5 PROTECTION OF EXISTING FEATURES

- .1 Existing buried utilities and structures:
 - .1 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .2 Prior to commencing any excavation work, notify owner and applicable authorities establish location and state of use of buried utilities and structures. Clearly mark such locations to prevent disturbance during work.
 - .3 Confirm locations of buried utilities by careful test excavations.
 - .4 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered. Obtain direction of Department Representative or Designate before moving or otherwise disturbing utilities or structures.
- .2 Surface Features: Protect surface features which may be affected by work from damage while work is in progress and repair damage resulting from work.

- .3 Shore and brace excavations in accordance with the Occupational Health and Safety Act, 2013 and Regulations for Construction Projects, latest amendments, and applicable local regulations.

1.6 SUBMITTALS

- .1 Source of Materials: At least two weeks prior to commencing work, submit to the Department Representative or Designate for review a list of proposed source of fill and backfill materials.
- .2 Material Tests: Include with the list of material sources three copies of gradation analysis and a moisture density relation analysis for granular backfill materials.
- .3 Disposal Site: inform Department Representative or Designate of the location of disposal site at least one week prior to disposal.

PART 2 PRODUCTS

2.1 FILL MATERIALS

- .1 General Fill: Clean native or imported soil material, non-clay, free of roots and other foreign object and materials, free of rock greater than 75 mm and suitable for compaction. Native material must be approved by Contract Administrator prior to use.

2.2 OTHER MATERIAL

- .1 All other materials not specifically described but required for a complete and proper installation, shall be selected by the Contractor subject to the review of the Owner.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

- .1 Inspection: Inspect the existing work of all other trades on which the work of this Section is dependent, and verify that all such work is complete to the extent that the excavation or backfill may commence.
- .2 Site Preparation: Remove obstructions from surfaces to be excavated within limits indicated.

3.2 EXCAVATION

- .1 Excavate to lines, grades, elevations and dimensions indicated. Remove any obstructions.

- .2 Temporarily stock pile any dry excavated native fill, to be later used as General Fill, if required, at a safe place selected and maintained by contractor.
- .3 Dispose of surplus and unsuitable excavated material or debris off site at the landfill site approved by the Department Representative or Designate no additional cost to the contract.
- .4 Remove unsuitable material from excavation bottom to extent and depth directed by Department Representative or Designate.
- .5 Where required due to unauthorized over-excavation, correct as directed by Department Representative or Designate at own cost.
- .6 Hand trim, make firm and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

3.3 FILL PLACEMENT

- .1 Do not place, spread or compact any backfill materials during unfavourable weather.
- .2 Do not commence any backfill operation without adequate compaction equipment on site.
- .3 Do not proceed with backfilling operations until Department Representative or Designate has inspected and approved installations.
- .4 Areas to be backfilled to be free from debris and water.
- .5 Do not use backfill material which is frozen or contains ice, snow or debris.
- .6 Place fill in 300 mm loose layers, unless specified otherwise on the contract drawings.
- .7 Roll each layer with vibratory roller to 98% Standard Proctor Density, unless specifies otherwise on contract drawings.

3.4 SITE GRADING

- .1 Perform all rough and finish grading and backfilling required to achieve the finished elevations indicated on the drawings.
- .2 Make up and correct any settlement.
- .3 Grade as required to eliminate any standing water on graded areas.

3.5 CLEAN UP

- .1 Upon completion, remove all material and debris and dispose of it outside the site limits in a disposal area approved by the Department Representative or Designate.
- .2 Leave the site in a neat and orderly condition, acceptable to the Department Representative or Designate.

3.6 QUALITY CONTROL

- .1 The Contractor is responsible for carrying out all grade checks required to ensure that horizontal and vertical grading tolerances are met.
- .2 The Owner may conduct grade checks to verify horizontal and vertical grading tolerances.
- .3 Where the finished grade or cross-section does not meet the acceptance criteria, the grade surface shall be brought to grade within the specified tolerances.

END OF SECTION

DIVISION 32

EXTERIOR IMPROVEMENTS

PART 1 GENERAL

1.1 SCOPE

- .1 This specification covers the installation of a pond water feature for aesthetic and educational purposes.
- .2 The design calls for a consistent depth, simple rectangular pond that is flexible due to its unstructured internal volume allowing for various vegetation planting and habitat structures.
- .3 A combination precast stone wall with armourstone coping will provide a stable vertical edge in unknown soil conditions.
- .4 The pond will feature cobble bottom, sediment skimmer and a recirculating feature stone.

1.2 MEASUREMENT FOR PAYMENT

- .1 Payment will be on a lump sum basis for the complete installation of all proposed components.

PART 2 PRODUCTS

2.0 MATERIALS AND EQUIPMENT

List of Water Feature Components		
ITEM	COMPONENT / MATERIAL	DESCRIPTION
1	Non-woven geotextile protection liners	Supply and install geotextile under liner and between liner and wall stone, armourstone and cobbles. Leave no EPDM liner exposed.
2	40mil EPDM liner	Supply and install liner over geotextile and undisturbed native soils. Prepare subsurface drainage with tile drains and connect to relief sump.
3	Sidewall surface skimmer	Supply and install surface skimmer by Aquascape or equivalent.

4	Submersible pump	Supply Tsurumi 50PU2.4 (72gpm) pump and install as part of the skimmer assembly.
5	Waterfall feature stone	Supply and install feature stone to match armourstone. Core drill a vertical 50mm (2") diameter hole with 250mm dissipation bowl at outlet (top) and horizontal cut-out for 37.5mm (1.5") supply pipe at base of stone.
6	Pipe, hose, fittings and appurtenances	Supply and install and rigid pipe, flex hose, fittings and valves.
7	Armourstone/ Sienastone Pond Wall	Supply and install ledgerrock armourstone in random lengths. Final coping course over sienastone.
8	Beach pebbles and cobbles	Supply and install various roundstones as liner cover and habitat structures.
10	Relief sump culvert and drain tile	Provide subsurface perforated drainage tile below liner and connect to 450mm diameter corrugated ABS culvert. Install vertically near pond and GFI electrical supply.

2.1 INFORMATION SOURCES FOR POND PRODUCTS AND SUPPLIES:

- Aquascape Ontario (800) 973-9733
9295 Colbourne Street, Chatham N7M 5J4
www.aquascapeontario.com
- Jackson Pond Management, (877) 766-3833
74004-260 Guelph Street, Georgetown L7G 4B0
www.jacksonpond.com

PART 3 EXECUTION

3.1 OPERATIONAL CONSTRAINTS

- .1 Existing trees within 10m of building will be identified and confirmed for removal by the Department Representative or designate prior to construction.

- .2 Maximum depth of excavation is to an elevation above that of normal water table. Water levels fluctuate on a seasonal basis generally between Elev. 00.0 in the spring to 00.0 in the winter. Summer normal water level is approx. 00.0m. The pond bottom elevation should be 00.0m when completed. (Actual elevations to be confirmed prior to tender).

3.2 SOILS AND TOPOGRAPHY

- .1 The Owner will make available to the successful bidder digital files of the design drawings.
- .2 The contractor is responsible to confirm by survey all proposed layout and elevations of water feature and path system prior to construction.
- .3 The contractor will undertake a minimum of three test pits (locations to be determined) to determine drainage potential of soils and structural integrity of proposed pond wall excavation.
- .4 Contractor will confirm with the Contract Administrator the specified contours and depths of all excavations.

3.3 CONSTRUCTION

- .1 The Contractor shall supply construction staging plan, traffic coordination plan, tree protection/silt and erosion control plan to the Department Representative or designate for approval prior to construction.
- .2 It is expected that the spoils from excavation will be assigned to a stockpile within 1km of the work site.
- .3 The layout of the plaza paving pattern must be approved by the Department Representative or designate before proceeding with concrete pour.
- .4 The layout for the pond shall include all locations of mechanical equipment, supply (water/electrical) routes and circulation piping.

- .5 The Contractor must have the layout approved by the Department Representative or designate before proceeding with installation.
- .6 Contractor to provide as-built drawing of finished pond.
- .7 The excavation of the pond may reveal a high water table and some adjustments of depth and drainage network may be required.
- .8 The Contractor will confirm with Department Representative or designate what minimum water depths for vegetation and habitat features are required.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Supply all labour, materials and equipment to design, supply and install a new shade structure as shown on the drawings.

1.2 SUBMITTALS

- .1 Submit shop drawings for shade structure including foundations.
- .2 Submit two samples of PVC membrane shading material for selection by Department Representative or Designate from standard range of colour choices.

1.3 QUALIFICATIONS

- .1 Provide shop drawings designed and sealed by a professional engineer licensed to practice in the Province of Ontario for all elements of the shade structure including supports, connections, and foundations.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Concept is based on tensile PVC membrane components available at Shade Sails Canada.
- .2 Refer to drawings for description of intended design and materials.
- .3 Posts to be galvanized and set in concrete bases.
- .4 Cables and attachments to be stainless steel with swaged fittings and terminations.

PART 3 EXECUTION

3.1 CLEANING

- .1 Provide temporary protection against damage during shipping and installation to be kept in place until project completion.
- .2 Remove manufacturer's protective packaging materials and commercial labeling upon completion.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Supply all labour, materials and equipment to furnish and install either mass produced or custom manufactured site furnishings shown on the plans, on details and as specified in related sections, including:
 - .1 Removable steel bollards.
 - .2 Steel benches.
 - .3 Trash containers.
- .2 Where the site furnishings are to be installed with concrete footings, these footings shall be included in the scope and price for that piece of site furniture.
- .3 Supply sleeves, bolts, anchors, template etc. required by other trades, for building the units specified.

1.2 SUBMITTALS

- .1 Submit shop drawings in triplicate for each item with colour section cards where applicable.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Refer to product descriptions provided on drawings.

PART 3 EXECUTION

3.1 CLEANING

- .1 Provide temporary protection against damage during shipping and installation to be kept in place until project completion.
- .2 Remove manufacturer's protective packaging materials and commercial labeling upon completion.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL CONDITIONS

- .1 Information for Tenderers and Special Provisions shall govern work in this Section.

1.2 DESCRIPTION

- .1 Work Included: Supply and placement of armour stone in the plaza paving, walkway edges and pond water feature wall as indicated in Contract Drawings and specified herein.

1.3 RELATED WORK SPECIFIED ELSEWHERE

Excavation and Fill Placement.

1.4 SOURCE SAMPLING

- .1 Inform Contract Administrator of proposed sources of materials and provide access for review or sampling at least 1 week prior to commencing armourstone work.
- .2 Proposed source of materials to be approved by the Contract Administrator prior to commencing armourstone work.

PART 2 PRODUCTS

2.1 ROCK MATERIALS

- .1 0.5 to 1.0 tonne Armour Stone: Clean, hard, durable, quarry stone, free from cracks, seam or other defects which may impair durability. Individual stones shall have masses varying from 0.5 to 1.0 tonnes with at least 70% in excess of 0.5 tonnes. The least dimension of each stone shall not be less than 2/3 of greatest dimension. Relative Density 2.7, +/- 0.15.
- .3 Supply proof individual stones in case of dispute and dispose of all stones which do not conform to this classification.
- .4 The armourstone shall be angular or semi-angular and roughly cubical in shape. Stones used for stacked walls shall be of uniform height to create a uniform and regular surface. Contract Administrator's judgement in this matter will be final.

2.2 INSPECTION

- .1 Inspection of armourstone will be on an individual basis after placement. Give Contract Administrator timely notice of readiness for inspection of armourstones.
- .2 Each stone that does not meet requirements of this specification will be paint marked by Contract Administrator and shall be removed by the contractor and dispose of at his cost.

2.3 WEIGHING OF STONE

- .1 Weigh all new armourstone placed in the work at quarry on a scale approved and certified as correct by Department of Consumer and Corporate Affairs, Weights and Inspection Branch.
- .2 Weigh tickets will not be accepted by Contract Administrator for measurement purposes unless they are initialled by trucker and an Inspector appointed by Contract Administrator at time of delivery to site.
- .3 Contract Administrator reserves the right to place man in scale house.

PART 3 EXECUTION

3.1 PREPARATION

- .1 Remove existing debris and vegetation from bank as required to allow for placement of armour stone.
- .2 Ensure that back slope is properly excavated to allow for placement of armour stone. Allow Contract Administrator time to inspect and assist as required. Do not claim delay due to inspection.
- .3 Install geotextile as indicated on the Contract drawings.

3.2 PLACEMENT OF ARMOURSTONE IN WALL

- .1 Place stones individually in a stable position starting placement with the bottom stone and proceeding with the cap stone. Use Sienastone as base stone where directed by the Contract Administrator.
- .2 Each row shall be of uniform height. The number of rows of armourstones in the wall shall be as indicated on contract drawings.

- .3 Place stones at the specified alignment indicated on the Contract Drawings. Place armourstones individually by crane or a backhoe. Sort, fit and place each rock to ensure stability. Individual stones must be in full contact with adjacent stones. Crevices must be smaller than 12mm. The Contract Administrator's judgement in this matter is final.
- .4 Select with special care stones to be used as cap stones in the wall. Selection procedure should be ongoing throughout the construction process. Cap stones must have straight top front edge and regular shape. Obtain approval of the Contract Administrator for selected cap stones prior to placement.
- .5 Top elevation of each individual cap stone shall not vary more than 150 mm from specified elevation. The top elevation of any two adjacent stones shall not vary more than 100 mm. Cap armourstone elevation can be measured along any point of the top surface of the crest stone. In case of dispute the Contract Administrator's judgement will be final.
- .6 Remove, replace or reset any stone not approved by the Contract Administrator at own cost.

END OF SECTION

SCOPE

- .1 This special provision covers the requirements for planting trees and shrubs.

1.1 MATERIALS

Horticultural Topsoil and Soil Amendments

- .1 Horticultural topsoil shall be a fertile, friable, natural loam containing not less than 5% organic matter. After the addition of soil amendments, the organic matter content shall not exceed 30%. Topsoil shall be free of stones greater than 50 mm in diameter, subsoil, refuse or other extraneous material and be capable of sustaining healthy plant growth. Topsoil that is in a frozen or muddy condition shall not be used. Add mycorrhizae.

Fertilizer

- .1 Fertilizer used at the time of planting shall be in granular form, dry, free flowing, free of lumps and shall consist of triple super phosphate, with a minimum analysis of 20% phosphoric acid.
- .2 Fertilizer used during maintenance shall be dry, free flowing, free of lumps and water soluble, with an analysis of 20% nitrogen, 20% phosphoric acid and 20% potash.
- .3 All fertilizer shall be supplied in bags bearing the manufacturer's label indicating mass and analysis.

Plant Material

- .1 All plant material shall comply with the latest edition of the Guide Specification for Nursery Stock, prepared by the Canadian Nursery Trades Association/Landscape Canada.
- .2 All plant material shall be clearly identified by labels indicating species, size and supplier.
- .3 Plant material shall be structurally sound, well furnished with living foliage, normal colour, show adequate annual growth and formation of buds and be free from blight of any description.
- .4 Plant material shall not be collected or dug from native stands or established woodlots.

- .5 Container grown plant material shall have been grown in the same container for a minimum period of 6 months.
- .6 Plant material shall not be cut back from larger sizes to meet the material requirements.
- .7 The seed source of the specified plant material and the plant material itself shall be supplied from no more than one hardiness zone difference from the hardiness zones in this contract. Bare root plant material or cuttings shall not have broken bud.
- .8 Where balled and burlapped plant material is specified, the burlap, rope, and any tie materials shall be manufactured from natural organic fibres.
- .9 The Contractor is encouraged to supply and install "pot-in-pot" or container-grown nursery material wherever available to avoid fall planting of spring dug materials.

Water

- .1 Water shall be free from any contaminants which would adversely affect growth.

1.2 CONSTRUCTION

Operational Constraints

- .1 The Contractor shall use employees skilled in the various aspects of tree and shrub planting and maintenance, to the satisfaction of the Contract Administrator.
- .2 The locations of trees shall be staked out on the ground and the outlines of areas to be planted with shrubs shall be marked.
- .3 Excavation shall not commence prior to the Contract Administrator's inspection and approval of staking and outlining.

Supply and planting shall be performed within the time periods specified in Table 1.

TABLE 1 - TIME CONSTRAINTS FOR PLANTING

PLANT TYPE	
Spade Machine Transplant Field Grown Coniferous Trees	Frost free conditions to December 31
Balled and Burlapped Container Grown Deciduous Shrubs and Deciduous Trees	Frost free conditions
Balled and Burlapped Container Grown Coniferous Trees	Frost free conditions to October 31

1.3 SUPPLY AND PLANTING

Inspection of Plant Material

- .1 All plant material will be inspected by the Contract Administrator before final acceptance of the contract. Inspections will include all original and replacement material. Units of plant material which are unacceptable shall be rejected. Rejected plant material will be replaced by the Contractor at the earliest opportunity.
- .2 Plant material which does not meet the requirements of this specification, or which has severely "died back" and has regrown from a bud or shoot or has been damaged by rodents shall be rejected.
- .3 Plants shall be removed from the site within twenty-four hours of notification of rejection.

Bare Root Stock: Digging, Transportation and Storage

- .1 All bare root material shall be dug in accordance with the latest edition of the Guide Specification for Nursery Stock, prepared by the Canadian Nursery Trades Association/Landscape Canada.
- .2 Bare root material shall be moved while dormant with the major portion of the fibrous root system provided.
- .3 Roots shall be kept moist at all times.
- .4 Roots, trunks and branches of all trees and shrubs shall be protected from sun and wind while in transit and until planted.

- .5 Bare root material shall not be stored on the contract site unless properly "heeled in" and kept moist.

Excavation of Planting Pits

- .1 All planting pits shall be excavated and prepared as detailed on the contract drawings.

Planting

- .1 Plant material shall not be placed in the planting pit until all evidence of frost has left the ground site.
- .2 Prior to planting, topsoil mixture shall be placed in each planting pit and firmly tamped to the depth specified on the contract drawings.
- .3 All trees shall be planted so that their normal ground elevation is 50 mm above existing grade. All shrubs shall be planted so that their normal ground elevation is 25 mm above existing grade.
- .4 Plant material supplied in plastic containers shall have the containers carefully removed prior to planting. The rootball shall be slit vertically 3 times evenly around the circumference to a maximum depth of 13 mm.
- .5 Plant material supplied in fibre pots shall have the top two-thirds of the pot removed prior to planting.
- .6 Plant material supplied bare root shall be placed so that the roots lie in their natural position.
- .7 Plant material supplied balled and burlapped shall have the burlap, ropes, and ties removed from the top of the rootball by folding down at least 100 mm into the excavated pit. All synthetic materials shall be removed prior to planting.
- .8 Plant material supplied in wire baskets shall have the burlap, ropes and ties removed from the top of the rootball by folding down at least 100 mm into the excavated pit. The top 100 mm of the wire basket shall be removed from the entire circumference of the wire basket after placement of the plant material and prior to backfilling.
- .9 The planting pit shall be backfilled with the topsoil mixture in firmly tamped layers of 150 mm depth, taking care not to injure the root system. Air pockets shall not be allowed to form when backfilling. When the planting pit has been backfilled to ground level, the final backfill layer shall be applied to form a saucer-like berm of 100 mm height and maximum 150 mm width around each planting pit. The saucer-like berm may be formed from the excavated material. This berm will serve to retain water over the root area. If the pit is on a slope, the lower edge and sides shall be built up to catch and hold water.

Initial Watering

- .1 Initial watering of all plant material shall be completed immediately after planting. Sufficient water shall be applied to each plant to thoroughly soak the root zone.
- .2 Water shall be uniformly applied to each individual tree or shrub by two injection applications directly into the soil. Both injections shall be located at the outer edge of the planting pit area and shall penetrate the ground to a depth of 450 mm at the commencement of the watering operation. The second injection shall be located 180 degrees from the initial injection.

Pruning

- .1 Upon the completion of planting of each deciduous tree or shrub, pruning shall be carried out to remove dead broken or injured branches and to compensate for root loss resulting from transplanting. The natural shape or habit of the plant shall not be changed. Pruning shall be carried out according to size and species in accordance with accepted arboriculture practice.
- .2 In addition, shrubs shall be pruned by thinning out branches and foliage by approximately one third. This pruning shall include some branch removal from the shrub base as well as end tip pruning.
- .3 Coniferous trees shall be pruned only to remove dead, broken or injured branches.

Maintenance of Plant Material

- .1 All plant material shall be maintained in a healthy and growing state until accepted by the Contract Administrator.

Restoration and Clean-up

- .1 At the completion of planting operations, all areas disturbed or damaged from execution of this work shall be restored to their original condition, including, but not restricted to clean-up and regrading and seeding and mulching.

Quality Assurance

- .1 Upon delivery to the contract site, all plant material shall be inspected by the Contract Administrator to ensure compliance with this specification. Landscape work shall only be carried out in the presence of the Contract Administrator.

Replacement of Plant Material

- .1 Where replacement of plant material is required, compensation for all costs associated with replacement shall be deemed to be included in the contract price for this item. No additional payment will be made.

Basis for Payment

- .1 Payment at the contract price for this item shall be full compensation for all labour, equipment and materials required to perform the work described herein and as shown on the contract drawings. Measurement for payment will be per plant planted.

END OF SECTION
