



Environnement
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PESC BLOCK B SEDIMENT PREPARATION ROOM

AT

**PACIFIC ENVIRONMENTAL
SCIENCE CENTRE**

SPECIFICATIONS

**PACIFIC ENVIRONMENTAL SCIENCE CENTRE
2645 DOLLARTON HWY
NORTH VANCOUVER, B.C.**

PROJECT: PESC-028-J1258

PO:

DATE: JULY 29, 2015

ISSUED FOR TENDER

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1.0 GENERAL

1.1 CODES

- .1 Perform work in accordance with National Building Code for Canada 2010, Workers' Compensation Board of BC, and any other code of provincial or local application provided that in any case of conflict or discrepancy, the more stringent requirements shall apply.
- .2 Meet or exceed requirements of specified standards, codes and referenced documents.

1.2 DESCRIPTION OF WORK

- .1 Work under this Contract comprises, but is not limited to, the provision of all labour, materials, services and equipment necessary for the construction of the sediment preparation room at the Pacific Environmental Science Centre (PESC) – 2645 Dollarton Hwy, North Vancouver B.C. The work on this contract includes coordination and cooperation with other contractors and building personnel working on the site as fully described in the Tender Documents.

1.3 CONTRACT DOCUMENTS

- .1 Drawings and specifications are complementary, items shown or mentioned in one and not in the other are deemed to be included in the contract work.
- .2 Any questions that arise in relation to the design shall be brought to the attention of the Departmental Representative. Failure to comply with this procedure may necessitate amendments and other layout modifications are required to complete the Work, costs of which shall be solely the responsibility of the Contractor.
- .3 Study all documents, which describe, or are related to any operation before commencement of that operation. Report discrepancies discovered between existing conditions and documentation. Obtain ruling on required interpretation before commissioning work.
- .4 Any changes to the scope of work are to be confirmed in writing by the Departmental Representative and Contract value changes approved, prior to start of said work.
- .5 The cost of any additional work to the Departmental Representative shall be the actual cost of the work plus ten percent (10%) overhead and ten percent (10%) profit on the actual cost of the work.

1.4 TIME OF COMPLETION

- .1 Commence work immediately upon official notification of acceptance of offer and complete the project within twenty-two (22) weeks after contract award.

1.5 HOURS OF WORK

- .1 Work shall be carried out Monday to Friday from 07:30hrs to 17:30 hrs.
- .2 Shutdown, bypassing or isolating any parts effecting PESC shall be undertaken after hours, Monday through Friday from 17:30hrs to 06:00hrs and/or on weekends from 06:00hrs to 18:00hrs.
- .3 Lock-Out / Tag-Out (LOTO) work shall be completed off-hours Monday through Friday from 17:30hrs to 07:00hrs and and/or on weekends from 06:00hrs to 18:00hrs. All Internal & External LOTO permits will be required to commence work.
- .4 Live Work procedures will not be permitted on this site.
- .5 The Contractor shall not permit his personnel to work alone on this project when the following activities are undertaken:

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- .1 Work assessment determined that the potential health & safety risk is high;
 - .2 Work requiring entry into or work within a Confined Space;
 - .3 Work requiring Lock-Out / Tag-Out (LOTO);
 - .4 Work requiring use of fall arrest equipment;
 - .5 Work on scaffolding;
 - .6 Work requiring supplied air respirators or similar equipment;
 - .7 Hot Work and/or Hot Tap activities;
 - .8 Work involving cranes or hoisting;
 - .9 Work or work situations identified by the Departmental Representative.
- .6 Work affecting laboratory operations shall be carried out after normal hours as defined in 3.1 above. Any shut down of service effecting laboratory operations requires a minimum of 48 hours notice.

1.6 WORK SCHEDULE

- .1 Carry out work as follows:
 - .1 Within 10 working days after Contract award, submit Bar (GANTT) chart as per specification sections 01 32 16.07 Construction Progress Schedule Bar (GANTT) chart. Indicate the following:
 - .1 Submission of shop drawings, product data, MSDS sheets and samples.
 - .2 Commencement and completion of work of each section of the specifications or trades for each phase as outlined.
 - .3 Final completion date within the time period required by the Contract documents.
 - .2 Do not change approved Schedule without notifying Departmental Representative.
 - .3 Interim reviews of work progress based on work schedule will be conducted as decided by Departmental Representative and schedule updated by Contractor in conjunction with and to approval of Departmental Representative.

1.7 DIVISION OF SPECIFICATIONS

- .1 The specifications are subdivided in accordance with the current 6-digit National Master Specifications System.
- .2 A division may consist of the work of more than 1 subcontractor. Responsibility for determining which subcontractor provides the labour, material, equipment and services required to complete the work rests solely with the Contractor.
- .3 In the event of discrepancies or conflicts when interpreting the drawings and specifications, the specifications govern.

1.8 CODE, BYLAWS, STANDARDS

- .1 Perform work in accordance with the National Building Code of Canada (NBC) 2010, and other indicated Codes, Construction Standards and/or any other Code or Bylaw of local application.
- .2 Comply with applicable local bylaws, rules and regulations enforced at the location concerned.
- .3 Meet or exceed requirements of Contract documents, specified standards, codes and referenced documents.
- .4 In any case of conflict or discrepancy, the most stringent requirements shall apply.

1.9 DOCUMENTS REQUIRED

- .1 Maintain one copy each of the following at the job site:
 - .1 Contract drawings.
 - .2 Contract specifications.
 - .3 Addenda to Contract documents.
 - .4 Copy of work schedule.
 - .5 Reviewed shop drawings.
 - .6 Change orders.
 - .7 Other modifications to Contract.
 - .8 Field test reports.
 - .9 Reviewed samples.
 - .10 Manufacturer's installation and application instructions.
 - .11 One set of record drawings and specifications for "as-built" purposes.
 - .12 National Building Code of Canada 2010.
 - .13 Current construction standards of workmanship listed in technical Sections.
 - .14 Building Safety Plan.
 - .15 Building Permit
 - .16 Request for Information (RFI)
 - .17 Contemplated Change Notices
 - .18 WHMIS Documents
 - .19 Site Instructions
 - .20 Contractor's Health and Safety Plan, including map to nearest hospital.

1.10 REGULATORY REQUIREMENTS, FEES AND CERTIFICATES

- .1 Submit a completed Notice of Project Form to WorkSafeBC as required by the notification requirements under the Regulations for Construction Projects made pursuant to the WorkSafe BC. Provide copy to the Departmental Representative.

1.11 CONTRACTOR'S USE OF SITE

- .1 Use of site:
 - .1 Do not unreasonably encumber site, with material or equipment.
 - .2 Execute the work with the least possible interference or disturbance to the normal use of the exiting premises. Make arrangements with the Departmental Representative to facilitate the work as stated.
 - .3 Maintain existing services to the building and provide for personnel and vehicle access.
 - .4 Maintain a proper solid or chain link security fence c/w suitable locks around work and storage areas at all times.
 - .5 Where security is reduced by the work, provide temporary means to maintain security.
 - .6 Contractor to supply their own site trailer (if required) phone, fax, and storage box. No storage will be provided within the building. Accommodation will be made for limited on-site storage at the discretion of the Departmental Representative in area designated by the Departmental Representative.

1.12 EXAMINATION

- .1 Examine site and be familiar and conversant with existing conditions likely to affect work.

1.13 EXISTING SERVICES

- .1 Where Work involves breaking into or connecting to existing services, carry out work as directed by

Departmental Representative or the authority having jurisdiction.

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

1.14 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 Departmental Representative at least 48 hours prior to impending installation and obtain approval for actual location.
- .4 Submit field drawings or shop drawings to indicate the relative position of various services and equipment when required by the Departmental Representative and/or as specified.

1.15 CUTTING AND PATCHING

- .1 Cut existing surfaces as required to accommodate new work. Openings shall be neatly cut and dimensioned to fit electrical conduits, mechanical pipes and/or ductwork passing through the surfaces. Obtain the Departmental Representative's approval before cutting into structure. Cutting torches shall not be permitted.
- .2 Remove items as shown or specified.
- .3 Do not cut, bore, or sleeve 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.
- .6 Conceal pipes, ducts and wiring in raised floors, wall and ceiling construction of finished areas except where indicated otherwise.
- .7 Patch and make good surfaces cut, damaged or disturbed, to Departmental Representative's approval. Match existing material, colour, finish and texture.
- .8 Making good is defined as matching construction and finishing materials and the adjacent surfaces such that there is no visible difference between existing and new surfaces when viewed from 1.5 metres in ambient light, and includes painting the whole surface to the next change in plane.

1.16 SETTING OUT OF WORK

- 1 Assume full responsibility for and execute complete layout of work to locations, lines and elevations indicated.
- .2 Provide devices needed to lay out and construct work.
- .3 Supply such devices as templates required to facilitate Departmental Representative's inspection of work.

1.17 ACCEPTANCE OF SUBTRADES

- 1 Each trade shall examine surfaces prepared by others and job conditions which may affect his

work, and shall report defects to the General Contractor. Commencement of work shall imply acceptance of prepared work or substrate surfaces.

1.18 QUALITY OF WORK

- .1 Ensure that quality workmanship is performed through use of skilled tradesmen, under supervision of qualified journeyman.
- .2 The workmanship, erection methods and procedures to meet minimum standards set out in the National Building Code of Canada 2010 and Construction Standards as specified herein.
- .3 In cases of dispute, decisions as to standard or quality of work rest solely with the Departmental Representative, whose decision is final.

1.19 WORKS COORDINATION

- .1 Coordinate work of sub-trades:
 - .1 Designate one person to be responsible for review of contract documents and shop drawings and managing coordination of Work.
- .2 Convene meetings between subcontractors whose work interfaces and ensure awareness of areas and extent of interface required.
 - .1 Provide each subcontractor with complete plans and specifications for Contract, to assist them in planning and carrying out their respective work.
 - .2 Develop coordination drawings when required, illustrating potential interference between work of various trades and distribute to affected parties.
 - .1 Pay particularly close attention to overhead work above ceilings and within or near to building structural elements.
 - .2 Identify on coordination drawings, building elements, services lines, rough-in points and indicate location services entrance to site.
 - .3 Facilitate meeting and review coordination drawings. Ensure subcontractors agree and sign off on drawings.
 - .4 Publish minutes of each meeting.
 - .5 Plan and coordinate work in such a way to minimize quantity of service line offsets.
 - .6 Submit copy of coordination drawings and meeting minutes to Departmental Representative for information purposes.
- .3 Submit shop drawings and order of prefabricated equipment or rebuilt components only after coordination meeting for such items has taken place.
- .4 Work cooperation:
 - .1 Ensure cooperation between trades in order to facilitate general progress of Work and avoid situations of spatial interference.
 - .2 Ensure that each trade provides all other trades reasonable opportunity for completion of Work and in such a way as to prevent unnecessary delays, cutting, patching and removal or replacement of completed work.
 - .3 Ensure disputes between subcontractors are resolved.
 - .4 Departmental Representative is not responsible for, or accountable for extra costs incurred as a result of Contractor's failure to coordinate Work.
 - .5 Maintain efficient and continuous supervision.

1.20 APPROVAL OF SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- .1 In accordance with Section 01 33 00, submit the requested shop drawings, product data, MSDS sheets and samples indicated in each of the technical Sections.

- .2 Allow sufficient time for the following:
 - .1 Review of product data.
 - .2 Approval of shop drawings.
 - .3 Review of re-submission.
 - .4 Ordering of approved material and/or products. Refer to individual technical sections of specifications.

1.21 PROJECT MEETINGS

- .1 Departmental Representative will arrange project meetings and assume responsibility for setting times and recording and distributing minutes.

1.22 TESTING AND INSPECTION

- .1 Particular requirements for inspection and testing to be carried out by testing service or laboratory approved by the Departmental Representative.
- .2 The Contractor will appoint and pay for the services of testing agency or testing laboratory as specified, and where required for the following:
 - .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
 - .2 Inspection and testing performed exclusively for Contractor's convenience.
 - .3 Testing, adjustment and balancing of mechanical and electrical equipment and systems.
 - .1 Mill tests and certificates of compliance.
 - .2 Tests specified in the contract documents to be carried out by Contractor which may be under the Departmental Representative's supervision.
- .3 Within 15 working days after Contract award provide a list of proposed testing services or testing laboratories for Departmental Representative's approval.
- .4 The Departmental Representative may require, and pay for, additional inspection and testing services not included in paragraph 1.22.2.
- .5 Where tests or inspections by designated testing laboratory reveal work is not in accordance with the Contract requirements, Contractor shall pay costs for additional tests or inspections as the Departmental Representative may require to verify acceptability of corrected work.
- .6 Contractor shall furnish labour and facilities to carry out specified testing and notify Departmental Representative in advance of planned testing.
- .7 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.
- .8 Pay costs for uncovering and making good work that is covered before required inspection or testing is completed and approved by Departmental Representative.
- .9 Provide Departmental Representative with 2 copies of testing laboratory reports as soon as they are available.

1.23 AS-BUILT DOCUMENTS

- .1 The Departmental Representative will provide 8 sets of drawings and 4 sets of specifications and PDF files, including 2 sets of drawings and specification and original AutoCAD files for "as-built" purposes.
- .2 Keep one set of current white prints of all contract drawings and all addenda, revisions,

- clarifications, change orders, and reviewed shop drawings in the site office; and have them available at all times for inspection by the Consultant.
- .3 As the work progresses, maintain accurate records to show all deviations from the Contract documents. Note on as-built specifications, drawings and shop drawings as changes occur.
 - .4 At completion of the Work, transfer all deviations, including those called up by addenda, revisions, clarifications, shop drawings and change order, to a set of Issued for Construction drawings. Submit the 'red-marked' as-built set to the Departmental Representative in hard copy with contractor's review stamp and date confirming that the set submitted are a true record of "as-built" information.
 - .5 Refer to Section 01 78 00 – Close-out Submittals.

1.25 CLEANING

- .1 Remove waste materials and debris from the site at the end of each day. Leave the work area unencumbered upon completion of each work shift. Store materials and equipment.
- .2 Ensure site is clean, orderly and neat at all times during the work shift. Provide additional cleaning as requested by the design authority, facility supervisor.
- .3 At the end of the project, remove dirt, dust and other disfigurements from all surfaces affected by the project including, but not limited to ceilings, walls, floors, fixtures and lights. Clean by dusting, damp wiping, washing, waxing and polishing to the satisfaction of the design authority, facility supervisor.
- .4 Upon completion, remove scaffolding, temporary protections and surplus materials. Make good any defects noted at this stage.
- .5 Clean areas affected under contract, to a condition at least equal to that previously existing and to satisfaction of the design authority, facility supervisor.
- .6 Use only cleaning materials recommended by manufacturer of surface to be cleaned.

1.26 DUST CONTROL

- .1 Provide temporary dust tight screens or partitions to localize dust generating activities, and for protection of workers, finished areas of work and public.
- .2 Maintain and relocate protection until such work is complete.

1.27 ENVIRONMENTAL PROTECTION

- .1 Prevent extraneous materials from contaminating air beyond construction area, by providing temporary enclosures during work.
- .2 Do not dispose of waste or volatile materials into water courses, storm or sanitary sewers.
- .3 Ensure proper disposal procedures in accordance with all applicable territorial regulations.

1.28 MAINTENANCE MATERIALS

- .1 Specific requirements for maintenance materials, are specified in individual technical sections of specifications.

1.29 ADDITIONAL DRAWINGS

- .1 The Departmental Representative may furnish additional drawings for clarification. These additional

drawings have the same meaning and intent as if they were included with drawings referred to in the Contract Documents.

- .2 Departmental Representative will furnish up to a maximum of eight (8) sets of Contract drawings and four (4) sets of specification for use by the Contractor at no additional cost. PDF files of all documents will be provided. Should more documents be required, the Departmental Representative will provide them at additional cost.

1.30 BUILDING SMOKING ENVIRONMENT

- .1 Smoking within the building and on the roof and within 7.5m of all air intakes is not permitted.

1.31 SYSTEM OF MEASUREMENT

- .1 The metric system of measurement (SI) will be employed on this Contract.

1.32 FAMILIARIZATION WITH SITE

- .1 Before submitting tender, visit site as indicated in tender documents and become familiar with all conditions likely to affect the cost of the work.

1.33 SUBMISSION OF TENDER

- .1 Submission of a tender is deemed to be confirmation of the fact that the Tenderer has analyzed the Contract documents and inspected the site, and is fully conversant with all conditions.

1.34 COST BREAKDOWN

- .1 Before submitting the first progress claim, submit a breakdown of the Contract price in detail as directed by the Departmental Representative and aggregating Contract price. After approval, the cost breakdown will form the basis of progress payments.
- .2 Within 2 weeks after award of contract, provide a monthly cash flow projection for the whole contract period in detail as directed by Departmental Representative. Contractor should provide a monthly update of the cash flow projection according to the actual work schedule.

1.35 CONTRACTOR PROJECT SUPERINTENDENT

- .1 The Contractor shall, upon award of contract, designate a Project Superintendent. The Contractor shall provide the name, cellular phone number to the Departmental Representative at the preconstruction meeting. The Project Superintendent shall have full responsibility for the project and shall be authorized to accept and act upon any notice or direction provided by the Departmental Representative. Project Superintendent shall be available on site at all times that work is being performed under this contract.
- .2 Supervise and direct all persons engaged in the work, including all tradesmen and suppliers. Become familiar with the requirements of each trade. Coordinate delivery and work operations. Examine the work of all trades during work operations to ensure compliance with the contract requirements. Expedite all work to maintain the contract schedule.
- .3 Cooperate with all other contractors working on site in parallel or related projects.
- .4 Attend coordination and project meetings at the direction of the Departmental Representative.

1.34 CONTRACTOR AND SUBCONTRACTORS

- .1 The Contractor agrees to employ those sub-contractors proposed by him in writing as listed in the Contractor's tender submission.

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- .2 Do not change or substitute approved contractor for sub-contractors without prior authorization from the design authority.
- .3 Contractor and sub-contractor personnel shall be qualified as per definitions under the Trades Qualification and Apprenticeship Acts and as required by regulatory agencies in British Columbia.
- .4 Electrical work shall be carried out by qualified and licensed electrical contractors as per British Columbia regulations.
- .5 Plumbing work shall be carried out by qualified and licensed plumbing contractors as per British Columbia regulations.

1.35 CONSTRUCTION SAFETY MEASURES

- .1 Observe and enforce construction safety measures required by the Canada Labour Code Part II, Occupational Health and Safety, Workers' Compensation Board, WorkSafeBC and municipal statutes and authorities and site specific Health and Safety Policies and Directives
- .2 In the event of conflict between any provisions of above authorities, the most stringent will apply.
- .3 Provide and maintain guardrails, fences, barricades, lights, signs and other devices required for protection of workmen and public in accordance with the requirements of the Canada Labour Code Part II, Occupational Health and Safety, WorkSafeBC and Safety Act and Regulations for Construction Projects and Local by-laws. All signs shall be bilingual or CSA universal pictograms.
- .4 Ensure the safety of building personnel at all times when performing work.
- .5 Refer to Specifications Section 01 35 30 for additional requirements

1.36 FIRE SAFETY REQUIREMENTS

- .1 Comply with the National Building Code of Canada for fire safety in construction and the National Fire Code of Canada for fire prevention, firefighting and life safety in building in use.
- .2 Comply with Human Resources Development Canada (HRDC), Fire Commissioner of Canada (FCC) Standards;
 - .1 No. 301: Standard for Construction Operations
 - .2 No. 302: Standard for Welding and Cutting
 - .3 No. 374: Fire Protection Standard for General Storage (Indoor and Outdoor)
 - .4 Available from Fire protection Engineering Services, Labour program, HRDC or following internet site: <http://www.labour.gc.ca/eng/home.shtml>
 - .5 Retains all fire safety documents on site.
- .3 Refer to Section 01 35 30 of this document for further information on Health and Safety

1.37 WORKPLACE SAFETY AND INSURANCE BOARD

- .1 Prior to commencing the work, throughout the total performance of the work when requesting payments and prior to receiving final payment, the Contractor shall provide evidence of good standing with Workplace Safety and WorkSafe BC.

1.38 UTILITIES

- .1 Water supply is available on site and will be provided for construction usage at no cost. Facility Supervisor reserves the right to limit volume of water utilized.
- .2 Existing electrical services to a maximum of 15 kVA required for the work may be used by the

Contractor without charge. Ensure capacity is adequate prior to connecting and imposing additional loads. Connect and disconnect at own expense and responsibility.

1.39 PROTECTION

- .1 Protect finished work against damage until take-over.
- .2 Protect the work and all surrounding equipment, landscape, structures, floors, ceilings, walls, etc., from damage.
- .3 Make good, at no cost to the Departmental Representative, any damage caused.
- .4 Protect any services, which are uncovered during work.
- .5 Protect all areas adjacent to the construction areas from dust and debris produced during construction. Use hoarding, solid walls, drop cloths, sealed dust screens and tarps and clean up and vacuum up all debris daily.

1.40 PRODUCT HANDLING AND STORAGE

- .1 Deliver materials in original and unopened containers or wrappings with Manufacturers' seals and labels intact and legible.
- .2 Deliver materials in sufficient quantity to allow continuity of the work. Do not encumber site with unnecessary materials.
- .3 All unused materials at the end of any working day shall be properly protected from damage.
- .4 All materials, equipment, etc. to be handled and stored as not to interfere with the operation of the building.
- .5 All material and equipment to be new unless specified otherwise.
- .6 Contractors who use controlled products must ensure that their workers are properly trained in the safe use and handling of such products in compliance with the Workplace Hazardous Materials Information System (WHMIS).
- .7 Comply with all requirements with respect to Controlled products labeling and Material Safety Data Sheets (MSDS) according to the requirements of WHMIS and the Hazardous Products Act.

1.41 PRODUCT AVAILABILITY

- .1 Upon award of contract immediately review product delivery requirements and advise the design authority of any foreseeable delays.
- .2 In the event of failure to notify the Departmental Representative at commencement of the work, the Departmental Representative reserves the right to require the supply of substitute products of equivalent quality at no increase in contract price to ensure adherence to project schedule.

1.42 MATERIALS STANDARDS

- .1 Materials shall be new and work shall conform to the minimum applicable standards of the Canadian General Standards Board, the Canadian Standards Association, the National Building Code of Canada and all applicable Provincial and Municipal codes. In the case of conflict or discrepancy the most stringent requirements shall apply.
- .2 Products (materials, equipment and articles) incorporated in work shall be new, not damaged or

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defective and of best quality compatible with specifications for purpose intended. If requested by the design authorities, furnish evidence as type, source, and quality of product.

- .3 Defective products will be rejected, regardless of previous inspections. Inspection does not relieve responsibility but is a precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .4 Should any dispute arise as to the quality of fitness of products, the decision shall rest with the Departmental Representative based upon requirements of Contract Documents. The Departmental Representative's decision shall be final.
- .5 Ensure that materials, equipment, services and labour are brought to site in sufficient quantity and in accordance with requirements of the work schedule.
- .6 Use materials/products containing highest percentage of recycled and recovered materials practicable – consistent with maintaining cost effective satisfactory levels of completion. Adhere to waste reduction requirements for reuse or recycling of waste materials, thus diverting materials from landfill.

1.42 MATERIALS OTHER THAN SPECIFIED

- .1 Secure in writing, permission from the Departmental Representative to use any materials other than those specified.
- .2 The listed suppliers/manufacturers are acceptable for their ability to meet the general design intent, quality and performance characteristics of the specified product. The listed equipment/materials does not endorse the acceptability of all products available from the listed manufacturers/suppliers.
- .3 It remains the responsibility of the contractor to ensure the products supplied are equal to the specified products in every aspect, operate as intended, and meet the performance specifications and physical dimensions of the specified product.
- .4 The contractor shall be fully responsible for any additional materials, to accommodate the use of equipment from the acceptable manufacturer and suppliers list.

1.42 HAZARDOUS MATERIALS

- .1 Comply with the requirements of the Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials: and regarding labeling and the provision of Material Safety Data Sheets (MSDS) acceptable to Human Resources Development Canada, Labour Program.

1.43 WASTE MANAGEMENT

- .1 Comply with the Environmental Protection Act and the British Columbia Waste Management Act for waste management programs on construction and demolition projects.

1.44 EXISTING SERVICES

- .1 Where work involves breaking into or connecting to existing services, Carry out work at times directed by the Departmental Representative. Connection to existing services shall be after hours and/or on weekends.
- .2 Before commencing Work, establish location and extent of service lines in area of Work and notify the Departmental Representative of findings.
- .3 Submit schedule to and obtain approval from the Departmental Representative for any shutdown or

closure of active service or Facility. Adhere to approved schedule and provide notice to affected parties. Do not alter schedule without prior written consent of the Departmental Representative.

- .4 Give the Departmental Representative 48 hours notice related to each necessary interruption of any mechanical or electrical service throughout the course of the work. Obtain written authorization from the Departmental Representative prior to any interruption. Keep duration of those interruptions to a minimum.
- .5 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.

1.45 EQUIPMENT

- .1 Provide and maintain equipment such as temporary stairs, ladders, ramps, scaffolds, swing stages, runways, chutes and the like, as required for execution of work.
- .2 Provide and maintain conveying equipment such as cranes, hoists, derricks and the like, as required for execution of work.
- .3 Assume complete responsibility for construction strength, placing, anchoring and operation of derricks, cranes, hoists and other mechanical contrivances used for work; and ensure that loads carried thereon can be safely supported and be free from accidents to all persons.
- .4 Comply with all governing safety regulations in force at the time of construction.
- .5 Remove immediately such equipment when not required for work.
- .6 Provide and maintain, on site, suitable fire extinguishers in sufficient quantities, as required by the Safety Code.

1.46 LOADING

- .1 Take precautions to prevent the overloading of any part of the structure during the progress of the work. Make good, at no expense to Departmental Representative, any damage resulting from such overloading.

1.47 HOISTING

- .1 All crane operations are restricted to the following:
 - .1 All craning of materials and equipment must be done outside normal building operating hours, ensure interior areas below are kept unoccupied.

1.48 TAXES

- .1 Pay all taxes properly levied by law (including Federal, Provincial and Municipal)
- .2 The Goods and Services Tax (GST) is NOT to be considered an applicable tax for the purposes of this bid. The bidder shall therefore include separately any amount in his bid price for the said GST. In the event the GST does apply, the successful Contractor will indicate on each application for payment as a separate amount the appropriate GST the Owner is legally obliged to pay. The Contractor's GST registration number must be shown on all invoices. This amount will be paid to the Contractor in addition to the amount certified for payment under the contract and will therefore not affect the contract price.

1.49 SIGNS-ADVERTISING

- .1 No advertising and/or posting of company signs shall be permitted.

- .2 Provide common-use signs as related to traffic control, information, instruction, health and safety, use of equipment, public safety devices, in both official languages or by the use of commonly understood graphic symbols to the Departmental Representative's approval.

1.50 SECURITY CLEARANCES

- .1 All personnel employed on this project shall be subject to a security check. Obtain the requisite clearance as instructed for each individual required to enter the premises.

1.51 GUARANTEE

- .1 Provide written one (1) year guarantee for all materials and labour provided as part of this Contract. Effective start date shall be date of final completion.
- .2 The contractor, at own expense, shall correct any defects in the work due to faulty products and/or workmanship appearing within the extended guarantee/warranty periods set out in the individual sections from date of final completion.

1.52 OPERATIONS AND MAINTENANCE MANUALS

- .1 Provide two (2) sets of operations and maintenance data detailed in 01 78 00. Data to include detailed technical information, documents and records describing operation and maintenance of individual components.

END OF SECTION 01 11 55

1.0 GENERAL

1.1 ADMINISTRATIVE

- .1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are co-ordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.
- .10 Keep one reviewed copy of each submission on site.
- .11 Do not proceed with work until relevant submissions are reviewed by Departmental Representative.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 When specified in the Contract document, submit drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia of Canada.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow 10 days for Departmental Representative's review of each submission, unless noted otherwise.
- .5 Adjustments made on shop drawings by Departmental Representative are not intended to change

- Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in shop drawings as Departmental Representative may require consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
 - .7 Accompany submissions with transmittal letter, in duplicate, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
 - .8 Submissions 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.
 - .9 After Departmental Representative's review, distribute copies.
 - .10 Submit (4) prints electronic copy of shop drawings for each requirement requested in specification sections and as Departmental Representative may reasonably request.
 - .11 Submit (4) prints electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
 - .12 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
 - .2 Testing must have been within 3 years of date of contract award for project.
 - .13 Submit electronic copies of certificates for requirements requested in specification Sections and as

- requested by Departmental Representative.
- .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 - .2 Certificates must be dated after award of project contract complete with project name.
- .14 Submit electronic copies of manufacturer's instructions for requirements requested in specification Sections and as requested by Departmental Representative.
- .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .15 Submit copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .17 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
- .18 Delete information not applicable to project.
- .19 Supplement standard information to provide details applicable to project.
- .20 If upon review by Departmental Representative, 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.
- .21 The review of shop drawings by Departmental Representative is for sole purpose of ascertaining conformance with general concept.
- .1 This review shall not mean that Departmental Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of Construction and Contract Documents.
 - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.
- .22 Shop drawings format larger than 11" x17" (275mm x 430mm) must be submitted with hardcopies together with electronic format. Submit sufficient copies such that Departmental Representative will keep 5 copies plus contractor's distribution and maintenance manual.
- .23 Electronic submissions will only be reviewed and returned electronically. No hardcopies will be returned to contractor.
- .24 All electronic submissions to be uploaded to Document Control System FTP site hosted by PWGSC.

1.3 SAMPLES

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

1.4 MOCK-UPS

- .1 Not used

1.5 PHOTOGRAPHIC DOCUMENTATION

- .1 Submit electronic copy of colour digital photography in jpg format, standard resolution monthly with progress statement and as directed by Departmental Representative.
- .2 Project identification: name and number of project and date of exposure indicated.
- .3 Viewpoints and their locations as reasonably determined by Departmental Representative.
- .4 Provide photographic documentation of adjacent existing conditions prior to commencement of construction for determining and accidental damage as a result of contractor's work.
- .5 Frequency of photographic documentation: monthly as directed by Departmental Representative.
 - .1 Upon completion of: demolition, framing and services before concealment of Work, and as directed by Departmental Representative.

1.6 CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of contract, submit Worker's Compensation Board Status.

HEALTH AND SAFETY REQUIREMENTS

1.0 GENERAL

1.1 REFERENCES

- .1 Government of Canada.
 - .1 Canada Labour Code - Part II
 - .2 Canada Occupational Health and Safety Regulations.
- .2 National Building Code of Canada (NBC 2010):
 - .1 Part 8, Safety Measures at Construction and Demolition Sites.
- .3 Canadian Standards Association (CSA as amended):
 - .1 CSA Z797-2009 Code of Practice for Access Scaffold
 - .2 CSA S269.1-1975 (R2003) Falsework for Construction Purposes
 - .3 CSA S350-M1980 (R2003) Code of Practice for Safety in Demolition of Structures
- .4 Fire Protection Engineering Services, HRSDC:
 - .1 FCC No. 301, Standard for Construction Operations.
 - .2 FCC No. 302, Standard for Welding and Cutting.
- .5 American National Standards Institute (ANSI):
 - .1 ANSI A10.3, Operations – Safety Requirements for Powder-Actuated Fastening Systems.
- .6 Province of British Columbia:
 - .1 Workers Compensation Act Part 3-Occupational Health and Safety.
 - .2 Occupational Health and Safety Regulation
- .7 Current B.C. Electrical Code

1.2 RELATED SECTIONS

- .1 Submittal Procedures Section 01 33 00

1.3 WORKERS' COMPENSATION BOARD COVERAGE

- .1 Comply fully with the Workers' Compensation Act, regulations and orders made pursuant thereto, and any amendments up to the completion of the work.
- .2 Maintain Workers' Compensation Board coverage during the term of the Contract, until and including the date that the Certificate of Final Completion is issued.

1.4 COMPLIANCE WITH REGULATIONS

- .1 Environment Canada may terminate the Contract without liability to Environment Canada where the Contractor, in the opinion of Environment Canada, refuses to comply with a requirement of the Workers' Compensation Act or the Occupational Health and Safety Regulations.
- .2 It is the Contractor's responsibility to ensure that all workers are qualified, competent and certified to perform the work as required by the Workers' Compensation Act or the Occupational Health and Safety Regulations.

1.5 SUBMITTALS

- .1 Submit to Departmental Representative submittals listed for review. In accordance with Section 01 33 00
- .2 Work effected by submittal shall not proceed until review is complete.

HEALTH AND SAFETY REQUIREMENTS

- .3 Submit the following:
 - .1 Health and Safety Plan, within 7 days after Notice to Proceed and prior to commencement of Work. The Health and Safety Plan must include:
 - .1 Site-specific safety hazard assessment
 - .2 Safety and health risk or hazard analysis for site risks and operation
 - .2 Copies of reports or directions issued by Federal and Provincial health and safety inspectors.
 - .3 Copies of incident and accident reports.
 - .4 Complete set of Material Safety Data Sheets (MSDS), and all other documentation required by Workplace Hazardous Material Information System (WHMIS) requirements.
 - .5 On-site Contingency and Emergency Response Plan: Address the standard operating procedures to be implemented during emergency situations.
- .4 The Departmental Representative will review the Contractor's site-specific project Health and emergency procedures, and provide comments to the Contractor within 2 days after Receipt of the plan. Revise the plan as appropriate and resubmit to Departmental Representative.
- .5 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 Departmental Representative.
- .6 Submission of the Health and Safety Plan, and any revised version, to the Departmental Representative is for information and reference purposes only. It shall not:
 - .1 Be construed to imply approval by the Departmental Representative.
 - .2 Be interpreted as a warranty of being complete, accurate and legislatively compliant.
 - .3 Relieve the Contractor of his legal obligations for the provision of health and safety on the project.

1.6 RESPONSIBILITY

- .1 Assume responsibilities as the Prime Contractor for work under this contract.
- .2 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .3 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.

1.7 CONTRACTOR ACCIDENT AND INCIDENT ROOM

- .1 The contractor shall advise the Departmental Representative of any accident, injury, near-miss incident, fire, explosion or chemical spill occurring at the Work site and any visit to the site by governmental enforcement office.

1.8 UNFORSEEN HAZARDS

- .1 Should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of Work, the contractor shall immediately stop work and advise the Departmental Representative verbally and in writing.

1.9 WORK STOPPAGE

- .1 The Departmental Representative and/or designated Health and Safety personnel may stop work

HEALTH AND SAFETY REQUIREMENTS

for health and safety considerations.

1.10 HEALTH AND SAFETY COORDINATOR

- .1 The Health and Safety Coordinator must:
 - .1 Be responsible for completing all health and safety training, and ensuring that personnel that do not successfully complete the required training are not permitted to enter the site to perform work.
 - .2 Be responsible for implementing, daily enforcing, and monitoring the site-specific Health and Safety Plan.
 - .3 Be on site during execution of work.

1.11 GENERAL CONDITIONS

- .1 Ensure that non-authorized persons are not allowed to circulate in designated construction areas of the work site.
 - .1 Provide appropriate means by use of barricades, fences, warning signs, traffic control personnel, and temporary lighting as required.
 - .2 Secure site at night time as deemed necessary to protect site against entry.

1.12 REGULATORY REQUIREMENTS

- .1 Comply with specified codes, acts, bylaws, standards and regulations to ensure safe operations at site.
- .2 In event of conflict between any provision of the above authorities, the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, the Departmental Representative will advise on the course of action to be followed.

1.13 WORK PERMITS

- .1 Obtain specialty trade permits related to project before start of work.

1.14 FILING OF NOTICE

- .1 The General Contractor is to complete and submit a Notice of Project as required by Provincial authorities.
- .2 Provide copies of all notices to the Departmental Representative.

1.15 HEALTH AND SAFETY PLAN

- .1 Conduct a site-specific hazard assessment based on review of Contract documents, required work, and project site. Identify any known and potential health risks and safety hazards.
- .2 Prepare and comply with a site-specific project Health and Safety Plan based on hazard assessment, including, but not limited to, the following:
 - .1 Primary requirements:
 - .1 Contractor's safety policy.
 - .2 Identification of applicable compliance obligations.
 - .3 Definition of responsibilities for project safety/organization chart for project.
 - .4 General safety rules for project.
 - .5 Job-specific safe work, procedures.
 - .6 Inspection policy and procedures.
 - .7 Incident reporting and investigation policy and procedures.
 - .8 Occupational Health and Safety Committee/Representative procedures.
 - .9 Occupational Health and Safety meetings.
 - .10 Occupational Health and Safety communications and record keeping procedures.
 - .2 Summary of health risks and safety hazards resulting from analysis of hazard

HEALTH AND SAFETY REQUIREMENTS

- assessment, with respect to site tasks and operations which must be performed as part of the work.
- .3 List hazardous materials to be brought on site as required by work.
 - .4 Indicate Engineering and administrative control measures to be implemented at the site for managing identified risks and hazards.
 - .5 Identify personal protective equipment (PPE) to be used by workers.
 - .6 Identify personnel and alternates responsible for site safety and health.
 - .7 Identify personnel training requirements and training plan, including site orientation for new workers.
- .3 Develop the plan in collaboration with all subcontractors. Ensure that work/activities of subcontractors are included in the hazard assessment and are reflected in the plan.
 - .4 Revise and update Health and Safety Plan as required, and re-submit to the Departmental Representative.
 - .5 Departmental Representative's review: the review of Health and Safety Plan by Environment Canada shall not relieve the Contractor of responsibility for errors or omissions in final Health and Safety Plan or of responsibility for meeting all requirements of construction and Contract documents.

1.16 EMERGENCY PROCEDURES

- .1 List standard operating procedures and measures to be taken in emergency situations. Include an evacuation plan and emergency contacts (i.e. names/telephone numbers) of:
 - .1 Designated personnel from own company.
 - .2 Regulatory agencies applicable to work and as per legislated regulations.
 - .3 Local emergency resources.
 - .4 Departmental Representative and site staff.
- .2 Include the following provisions in the emergency procedures:
 - .1 Notify workers and the first-aid attendant, of the nature and location of the emergency.
 - .2 Evacuate all workers safely.
 - .3 Check and confirm the safe evacuation of all workers.
 - .4 Notify the fire department or other emergency responders.
 - .5 Notify adjacent workplaces or residences which may be affected if the risk extends beyond the workplace.
 - .6 Notify Departmental Representative and site staff.
- .3 Provide written rescue/evacuation procedures as required for, but not limited to:
 - .1 Work at high angles.
 - .2 Work in confined spaces or where there is a risk of entrapment.
 - .3 Work with hazardous substances.
 - .4 Underground work.
 - .5 Work on, over, under and adjacent to water.
 - .6 Workplaces where there are persons who require physical assistance to be moved.
- .4 Design and mark emergency exit routes to provide quick and unimpeded exit.
- .5 Revise and update emergency procedures as required, and re-submit to the Departmental Representative.

1.17 HAZARDOUS PRODUCTS

- .1 Comply with requirements of Workplace Hazardous Materials Information system (WHMIS) regarding use, handling, storage and disposal of hazardous materials, and regarding labeling and provision of material Safety Data Sheets (MSDS) acceptable to the Departmental Representative and in accordance with the Canada Labour Code.
- .2 Where use of hazardous and toxic products cannot be avoided:
 - .1 Advise Departmental Representative beforehand of the product(s) intended for use. Submit applicable MSDS and WHMIS documents as per Section 01 33 00.
 - .2 In conjunction with Departmental Representative, schedule to carry out work during "off hours" when Pacific Environmental Science Centre Staff have left the building.
 - .3 Provide adequate means of ventilation in accordance with Section 01 51 00.

1.18 ELECTRICAL SAFETY REQUIREMENTS

- 1 Comply with authorities and ensure that, when installing new facilities or modifying existing facilities, all electrical personnel are completely familiar with existing and new electrical circuits and equipment and their operation.
 - .1 Before undertaking any work, coordinate required energizing and de-energizing of new and existing circuits with Departmental Representative.
 - .2 Maintain electrical safety procedures and take necessary precautions to ensure safety of all personnel working under this Contract, as well as safety of other personnel on site.

1.19 ELECTRICAL LOCKOUT

- .1 Develop, implement and enforce use of established procedures to provide electrical lockout and to ensure the health and safety of workers for every event where work must be done on any electrical circuit or facility.
- .2 Prepare the lockout procedures in writing, listing step-by-step processes to be followed by workers, including how to prepare and issue the request/authorization form. Have procedures available for review upon request by the Departmental Representative.
- .3 Keep the documents and lockout tags at the site and list in a log book for the full duration of the Contract. Upon request, make such data available for viewing by Departmental Representative or by any authorized safety representative.

1.20 OVERLOADING

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

1.21 CONFINED SPACES

- .1 Carry out work in confined spaces in compliance with Occupational Health and Safety Regulation, Part 9.

1.22 FIRE SAFETY AND HOT WORK

- .1 Obtain Departmental Representative's authorization before any welding, cutting or any other hot work operations can be carried out on site.
- .2 Hot work includes cutting/melting with use of torch, flame heating roofing kettles, or other open flame devices and grinding with equipment which produces sparks.

1.23 FIRE SAFETY REQUIREMENTS

- .1 Store oily/paint-soaked rags, waste products, empty containers and materials subject to

HEALTH AND SAFETY REQUIREMENTS

spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.

- .2 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

1.24 FIRE PROTECTION AND ALARM SYSTEM

- .1 Fire protection and alarm systems shall not be:
 - .1 Obstructed.
 - .2 Shut off.
 - .3 Left inactive at the end of a working day or shift.
- .2 Do not use fire hydrants, standpipes and hose systems for purposes other than firefighting.
- .3 Be responsible/liable for costs incurred from the fire department, the building owner and the tenants, resulting from false alarms.

1.25 SITE HEALTH AND SAFETY POLICIES AND DIRECTIVES

- .1 The Contractor shall comply and follow all prescribed site Health and Safety Policies and Directives including but not limited to the following:
 - .1 Worker Profile Sheet: The Contractor shall submit to the Departmental Representative a completed Worker Profile Sheet c/w all attachments including copies of licenses, certificates and permits for supporting qualifications to perform required work for a given project for individual worker requiring access to the site. The completed Work Profile Sheets are required for each individual worker prior to the working on site.
 - .2 Emergency and Fire Evacuation Route: The Contractor shall obtain training on procedures of evacuating the site under emergency and/or fire situations. Contractor training and sign-off is required prior to initiating site work.
 - .3 Trade Qualifications and Apprenticeship Act: The Contractor shall sign-off confirming that the Trades Qualifications and Apprenticeship Act shall be observed and followed. Contractor sign-off is required prior to initiating site work.

1.26 UNFORESEEN HAZARDS

- .1 Should any unforeseen or peculiar safety-related factor, hazard or condition become evident during performance of the work, immediately stop work and advise the Departmental Representative verbally and in writing.

1.27 POSTED DOCUMENTS

- .1 Post legible versions of the following documents on site:
 - .1 Health and Safety Plan.
 - .2 Sequence of work.
 - .3 Emergency procedures.
 - .4 Site drawing showing project layout, locations of the first-aid station, evacuation route and marshalling station, and the emergency transportation provisions.
 - .5 Notice of Project.
 - .6 Floor plans or site plans.
 - .7 Notice as to where a copy of the Workers' Compensation Act and Regulations are available on the work site for review by employees and workers.
 - .8 Workplace Hazardous Materials Information System(WHMIS) documents.
 - .9 Material Safety Data Sheets (MSDS).
 - .10 List of names of Joint Health and Safety Committee members, or Health and Safety Representative, as applicable.

HEALTH AND SAFETY REQUIREMENTS

- .2 Post all Material Safety Data Sheets (MSDS) on site, in a common area, visible to all workers and in locations accessible to tenants when work of this Contract includes construction activities adjacent to occupied areas.
- .3 Postings should be protected from the weather, and visible from the street or the exterior of the principal construction site shelter provided for workers and equipment, or as approved by the Departmental Representative.

1.28 MEETINGS

- .1 Attend health and safety pre-construction meeting and all subsequent meetings called by the Departmental Representative.

1.29 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by the Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance with health and safety issues identified.
- .3 The Departmental Representative may issue a "stop work order" if non-compliance of health and safety regulations is not corrected immediately or within posted time. The General Contractor/subcontractors will be responsible for any costs arising from such a "stop work order".

1.30 DISCIPLINARY ACTIONS

- .1 The Contractor's disregard and/or lack of compliance to health and safety measures, procedures and policies shall lead to disciplinary action by the Departmental Representative.

END OF SECTION 01 35 33

CLOSEOUT SUBMITTALS

1.0 GENERAL

1.1 RELATED SECTIONS

- | | | |
|----|----------------------|------------------|
| .1 | General Instructions | Section 01 11 55 |
| .2 | Commissioning | Section 01 91 00 |

1.2 SUBMISSION

- .1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .2 Copy will be returned after final inspection, with Departmental Representative's comments.
- .3 Revise content of documents as required prior to final submittal.
- .4 Two weeks prior to Completion of the Work, submit to the Departmental Representative, four final copies of operating and maintenance manuals in English.
- .5 An electronic copy Interactive Operating and Maintenance Manual System is required as specified under clause 1.3. Provide 4 sets of the Electronic Interactive Operating and Maintenance Manual System to the Departmental Representative.
- .6 Hard copies of the Operating and Maintenance Manual System is required as specified under clause 1.4. Provide 4 sets of the Hard Copy Interactive Operating and Maintenance Manual System to the Departmental Representative.
- .7 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work. Refer to individual specification sections and Appendix G of this specification for all extra parts, materials, fixtures and equipment required.
- .8 If requested, furnish evidence as to type, source and quality of products provided.
- .9 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .10 Pay costs of transportation.
- .11 Certificate of Completion.

1.3 INTERACTIVE OPERATING AND MAINTENANCE MANUAL SYSTEM

- .1 In addition to the printed copies, submit provide an Interactive Operating and Maintenance Manual System as specified herein.
- .2 System Description and Requirements
 - .1 All as constructed drawings and operation and maintenance (O&M) manuals listed under the Scope of Work shall be converted, where necessary, into Portable Data File (PDF) format for viewing using the Adobe Acrobat Reader.
 - .2 Documentation storage and retrieval system shall be structured based on a database framework with direct links to the appropriate PDF files. Documents retrieval and viewing shall be executed through a menu driven approach.

CLOSEOUT SUBMITTALS

- .3 Program shall be capable of storing separately and independently data of multiple buildings and shall be expandable for addition of new buildings and systems.
- .4 Data of each building shall be accessible by the input of either the building name or building number as defined by the Departmental Representative.
- .5 O&M data and as constructed drawings shall be classified by their corresponding disciplines, including:
 - .1 Architectural
 - .2 Mechanical
 - .3 Electrical
 - .4 Data & Communication
 - .5 BSCS
 - .6 Under each discipline, data shall be grouped into the following four major categories:
 - .1 Basic Documents
 - .1 'Basic Documents' shall, according to the type of services or disciplines, include the full contents of each hard copy of the O&M manuals with the addition of Miscellaneous Maintenance Reports and Records, or as defined by the user. In general the following shall be included unless specifically excluded by the Departmental Representative:
 - .1 Introduction
 - .2 Consultant/Contractor/Suppliers List
 - .3 System Description
 - .4 Maintenance and Lubrication Schedules
 - .5 Testing and Commissioning (T&C) Reports
 - .6 Misc. Reports
 - .7 Specifications
 - .8 Equipment and/or point schedules as identified in the hard copy documents
 - .9 Others as stipulated by the Departmental Representative
 - .2 All Basic Documents PDF files shall be enhanced with appropriate bookmarks to facilitate searching of information within the document or linking to other relevant documents for references.
 - .2 'As-Constructed' Drawings
 - .1 'As-Constructed' drawings shall be converted from the original electronic files, such as CAD, into PDF format. If only the hard copies of the 'as constructed' drawings are available, they shall be scanned and saved in PDF format. PDF files of the 'As-Constructed' drawings shall be enhanced with the following bookmarks to zoom into legible views on the computer screen as a minimum:
 - .1 Drawing Number and Title
 - .2 Drawing Notes
 - .3 Major Equipment Locations
 - .4 Cross-links to other related drawings
 - .5 Revisions
 - .3 System Data
 - .1 Building systems shall be identified by their services, disciplines, function, nature and specific scope. System data shall be classified into the following categories:
 - .1 System Description
 - .2 Schematic (where applicable)

CLOSEOUT SUBMITTALS

- .3 Equipment List
- .2 Provide hot key buttons, where applicable, for direct access to drawings/data referenced on the schematics. The same shall be applied to listed equipment for direct links to the corresponding equipment data.
- .4 Equipment Data
 - .1 Equipment data shall be classified into the following categories:
 - .1 Equipment submittals
 - .2 T&C Report
 - .3 Maintenance Data
 - .4 Maintenance Records
 - .5 Photo
 - .2 Provide a summary screen to list all equipment classified under a specific system. On the summary screen, provide direct links to the corresponding equipment data under each category with addition links to the relevant 'As Constructed' drawings.
- .6 The system shall be executed by Professional Engineers with a minimum of 10 years post qualification experience in the field of Building Services Engineering.
- .7 The Contractor shall provide a minimum of 3 past job references as proven record of similar undertakings.
- .8 The Contractor shall provide a demonstration of the system to the Departmental Representative to provide verification that the requirements of the specification are fulfilled.

1.4 FORMAT HARD COPY MANUALS

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

1.5 CONTENTS - EACH VOLUME

- .1 Table of Contents: provide title of project;

CLOSEOUT SUBMITTALS

- .1 date of submission;
 - .2 names, addresses, and telephone and fax numbers of Contractor, Subcontractors, Suppliers with name of responsible parties;
 - .3 schedule of products and systems, indexed to content of volume.
 - .4 copy of hardware schedule and paint schedules, complete with the actual manufacturer, supplier and identification names and numbers.
 - .5 all extended guarantees, warranties, maintenance bonds, certificates, letters of guarantees, registration cards, as called for in the various sections of the specification.
 - .6 complete set of all final reviewed shop drawings.
 - .7 certificates of inspection by authorities having jurisdiction.
 - .8 test reports and certificates as applicable.
 - .9 complete set of as constructed drawings.
- .2 For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
 - .3 Product Data: mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.
 - .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
 - .5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

1.6 'AS CONSTRUCTED' DRAWINGS AND SAMPLES

- .1 In addition to requirements in General Conditions, maintain at the site one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to the Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Field test records.
 - .7 Inspection certificates.
 - .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Departmental Representative.
- .6 Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring. Transfer information weekly to reproduces, revising reproduces to show work as actually installed. Use different colour waterproof ink for each service.

- .7 Provide an electronic copy of as constructed drawings.

1.7 RECORDING ACTUAL SITE CONDITIONS

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

1.8 FINAL EQUIPMENT LAYOUT

- .1 Submit final as-built equipment layout, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

1.9 EQUIPMENT AND SYSTEMS

- .1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
 - .1 Operation data to include:
 - .1 Control schematics for systems including environmental controls.
 - .2 Description of systems and their controls.
 - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
 - .4 Operation instruction for systems and component.
 - .5 Description of actions to be taken in event of equipment failure.
 - .6 Valves schedule and flow diagram.
 - .7 Colour coding chart.
 - .2 Maintenance data to include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.

CLOSEOUT SUBMITTALS

- .3 Description of plumbing specialties and accessories, giving manufacturer's name, type, model, year, capacity. List of recommended spare parts.
- .3 Performance data to include:
 - .1 Equipment performance verification test results.
 - .2 Special performance data as specified.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.
- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide Contractor's coordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports
- .15 Additional requirements: As specified in individual specification sections.

1.10 MATERIALS AND FINISHES

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

1.11 SPARE PARTS

- .1 Provide spare parts, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Deliver to location as directed; place and store.
- .4 Receive and catalogue all items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

1.12 MAINTENANCE MATERIALS

- .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Deliver to location as directed; place and store.
- .4 Receive and catalogue all items. Submit inventory listing to Departmental Representative. Include approved listings in the Operating and Maintenance Manuals.
- .5 Obtain receipt for delivered products and submit prior to final payment.

1.13 SPECIAL TOOLS

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

1.14 STORAGE, HANDLING AND PROTECTION

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

1.15 WARRANTIES AND BONDS

- .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
- .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

CLOSEOUT SUBMITTALS

- .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers within ten days after completion of the applicable item of work.
- .4 Except for items put into use with Departmental Representative's permission; leave date of beginning of time of warranty until the Date of Substantial Performance is determined.
- .5 Verify that documents are in proper form, contain full information, and are notarized.
- .6 Co-execute submittals when required.
- .7 Retain warranties and bonds until time specified for submittal.

END OF SECTION 01 78 00

1.0 GENERAL

1.1 INCLUDED WORK

- .1 Develop appropriate verification forms and submit to Departmental Representative for approval prior to use.
- .2 Commissioning Forms to be completed for equipment, system and integrated system.
- .3 Report Forms and Schematics
- .4 Training of O&M Personnel

1.2 RELATED SECTIONS

- .1 Submittal Procedures Section 01 33 00
- .2 Health and Safety Requirements Section 01 35 30
- .3 Closeout Submittals Section 01 78 00

1.3 INSTALLATION/START-UP CHECK LIST

- .1 Include the following data:
 - .1 Product manufacturer's installation instructions and recommended checks.
 - .2 Special procedures as specified in relevant technical sections.
 - .3 Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.
- .2 Equipment manufacturer's installation/start-up check lists are acceptable for use. As deemed necessary D.R. supplemental additional data lists will be required for specific project conditions.
- .3 Use check lists for equipment installation. Document check list verifying checks have been made, indicate deficiencies and corrective action taken.
- .4 Installer to sign check lists upon completion, certifying stated checks and inspections have been performed. Return completed check lists to D.R. Check lists will be required during Commissioning and will be included in Maintenance Manual at completion of project.
- .5 Use of check lists will not be considered part of commissioning process but will be stringently used for equipment pre-start and start-up procedures.

1.4 PERFORMANCE VERIFICATION

- .1 PV forms to be used for checks, running dynamic tests and adjustments carried out on equipment and systems to ensure correct operation, efficiently and function independently and interactively with other systems as intended with project requirements.
- .2 PV report forms include those developed by Contractor records measured data and readings taken during functional testing and Performance Verification procedures.
- .3 Prior to PV of integrated system, complete PV forms of related systems and obtain D.R.'s approval.
- .4

1.5 COMMISSIONING FORMS

- .1 Use Commissioning Forms to verify installation and record performance when starting equipment and systems.
- .2 Strategy for Use:
 - .1 Develop Commissioning forms with Specification data included.
 - .2 Contractor will provide required shop drawings information and verify correct installation and operation of items indicated on these forms.
 - .3 Confirm operation as per design criteria and intent.
 - .4 Identify variances between design and operation and reasons for variances.
 - .5 Verify operation in specified normal and emergency modes and under specified load conditions.
 - .6 Record analytical and substantiating data.
 - .7 Verify reported results.
 - .8 Form to bear signatures of recording technician and reviewed and signed off by D.R.
 - .9 Submit immediately after tests are performed.

- .10 Reported results in true measured SI unit values. Contact the D.R for clarification of acceptable units.
- .11 Provide D.R. with originals of completed forms.
- .12 Maintain copy on site during start-up, testing and commissioning period.
- .13 Forms to be both hard copy and electronic format with typed written results in Maintenance Manual.

1.6 SUBMITTALS

- .1 Commissioning of system will be carried out by firm responsible for TAB and preparation of Maintenance Manual.
- .2 Prior to start of Work, submit name of organization proposed to perform services. Designate who has managerial responsibilities for coordination of entire testing, adjusting and balancing.
- .3 Submit documentation to confirm organization compliance with quality assurance provision.
- .4 Submit 3 preliminary specimen copies of each of report forms proposed for use.
- .5 Fifteen days prior to Substantial Performance, submit 3 copies of final reports on applicable forms.
- .6 Submit reports of testing, adjusting, and balancing postponed due to seasonal, climatic, occupancy, or other reasons beyond Contractor's control, promptly after execution of those services.

1.7 PROCEDURES - GENERAL

- .1 Comply with procedural standards of certifying association under whose standard services will be performed.
- .2 Report to D.R. any deficiencies or defects noted during performance of services. Include steps taken to bring performance of services with required services.

1.8 FINAL REPORTS

- .1 Organization having managerial responsibility shall make reports.
- .2 Ensure each form bears signature of recorder, and that of supervisor of reporting organization.
- .3 Identify each instrument used, and latest date of calibration of each.

1.9 CONTRACTOR RESPONSIBILITIES

- .1 Prepare each system for testing and balancing.
- .2 Cooperate with testing organization and provide access to equipment and systems.
- .3 Provide personnel and operate systems at designated times, and under conditions required for proper testing, adjusting, and balancing.
- .4 Notify testing organization 7 days prior to time project will be ready for testing, adjusting, and balancing.

1.10 PREPARATION

- .1 Provide instruments required for testing, adjusting, and balancing operations.
- .2 Make instruments available to Departmental Representative to facilitate spot checks during testing.
- .3 Retain possession of instruments and remove at completion of services.
- .4 Verify systems installation is complete and in continuous operation.
- .5 Verify equipment such as computers, laboratory and electronic equipment are in full operation.

1.11 SCHEDULE OF SYSTEMS REQUIRING TESTING, ADJUSTING AND BALANCING SERVICES

- .1 Co-ordinate with Building Manager for convenient opportunity causing least interruption to normal operation of labs.

1.12 TRAINING

- .1 Objective is to ensure safe, reliable, cost-effective, energy-efficient operation of systems, effective on-going inspection, measurements of system performance, proper preventative

- maintenance, diagnosis and trouble-shooting. Clarify how to operate equipment and systems under emergency conditions until appropriate assistance arrives.
- .2 Provide instructions on start-up, operation, shut-down of equipment, components and systems. Include control features, implication on adjustment of set points, etc.
 - .3 Instructors to be responsible for content and quality of training materials. Training materials to include:
 - .1 "As-Built" Contract Documents.
 - .2 Operating Manual.
 - .3 Maintenance Manual.
 - .4 Management Manual.
 - .5 TAB and PV Reports.
 - .4 Project Manager will review training manuals.
 - .5 Training materials to be in a format that permits future training procedures to same degree of detail.
 - .6 Supplement training materials:
 - .1 Presentation materials include MS Power Point and printed copies.
 - .2 Multimedia presentations.
 - .3 Manufacturer's training videos.
 - .4 Equipment models.

END OF SECTION 01 91 00

1.0 GENERAL

1.1 DOCUMENTS

- .1 This Section of the Specifications forms part of the Contract Documents and is to be read, interpreted and co-ordinated with all other parts.

1.2 SECTION INCLUDES

Generally, but not limited to the following:

- .1 Demolish, or remove or re-use existing, millwork, lighting, walls (non-structural), doors, mechanical and electrical fixtures; etc. as shown on drawing, or as required to complete the work.
- .2 All material and debris resulting from demolition shall be promptly removed from Site and disposed of in a legal manner. Salvaged materials are to be reused or turned over to the Departmental Representative as indicated in drawings or other sections of the spec.
- .3 Selling of any materials at the Site is not permitted; Contractor will be assumed to have allowed for any credit he may obtain from such materials.
- .4 Make good damaged areas, which will not be concealed by new construction. Make good all structural damage. Match patching and making good work at least to that displayed by the existing; provide so new surfaces are plumb, level and properly aligned with existing.

1.3 RELATED SECTIONS

- .1 Mechanical
- .2 Electrical

1.4 REQUIREMENTS OF REGULATORY AGENCIES

- .1 Comply with all bylaws and acquire all necessary permits.
- .2 Comply with all Workers' Compensation Board of B.C. Accident Prevention Regulations.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- .1 Store materials and equipment at Site only when immediately necessary, and as otherwise approved; and so as not to cause any obstruction.

1.6 SITE CONDITIONS

- .1 The Contractor should accept the Site as it exists and will be responsible for all demolition work as shown on the Drawings or specified.
- .2 The Contractor shall visit the Site at his own expense prior to the submission of Bids and take whatever time is required to ascertain the Site conditions and surrounding features related to the proposed demolition and new construction work, and ensure himself that conditions are suitable for the execution of the work.
- .3 No additional sums of money will be allowed for any items resulting from lack of familiarity with the Site conditions; report any discrepancies to the Consultant.
- .4 Use sufficient measures to protect existing services and existing space adjacent to the project area. Make good all damaged areas, which will not be covered up by new work.
- .5 The Contractor will be held responsible for any such damage (movement or settlement) and must repair promptly such damage to the Departmental Representative's property at no additional cost to the Departmental Representative.

- .6 Provide and maintain all legal and necessary hoarding, lights and warning signs during the execution of the work to fully protect all persons; provide adequate insurance in order that the Departmental Representative shall be saved harmless from any loss, damage, death or injury through neglect, carelessness, or incompetence of the Contractor, or the handling or condition of appliances.
- .7 Maintain unobstructed safe access for personnel and removal of materials at all times.
- .8 Take precautions to guard against movements, settlements, collapse and damages to adjacent structures, services, utilities and construction.
- .9 Prevent debris from accumulating and blocking drainage systems and blocking safe exit passage to adjoining streets and property.
- .10 Verify the existence of all known service utilities by Site examination and review of applicable engineering drawings available from the municipality, the Departmental Representative and the utility companies prior to submission of a bid and prior to the commencement of the work to identify exact locations.
- .11 Keep fire extinguishing suppression equipment on hand at all times.
- .12 Provide illumination for safe demolition and working conditions, but in no case less than prescribed by WSBC regulations in areas where work is being done.

1.7 SCHEDULING OF WORK

- .1 Schedule the removal, capping and sealing of existing services first; then plan the demolition and removal of any other components.
- .2 Sequence of Demolition is responsibility of the Contractor.

2.0 PRODUCTS

2.1 MATERIALS

- .1 All materials, or equipment not specifically described but required for the proper completion of the work of this Section, shall be selected by the Contractor subject to approval by the Departmental Representative.
- .2 Except for materials and equipment to be removed and relocated and materials designated to be salvaged, the Departmental Representative does not require recovery of any existing materials, fittings, fixtures and equipment to be salvaged during the demolition operation. All materials forming part of this Section of the work shall become the Contractors property and shall be removed entirely from the Site and disposed of in a legal manner to an approved disposal waste-dumping Site as applicable.
- .3 Selling or burning of salvaged materials, fittings, fixtures, and equipment on Site is not permitted.

3.0 EXECUTION

3.1 INSPECTION

- .1 Inspect the work and notify the Departmental Representative of any conditions affecting the performance of the work. Review the drawings and determine the total content of work to follow.
- .2 Ensure all services, whether built-in or exposed, are properly located and marked as to position, type of service, size, direction of flow.

- .3 Inspect materials, equipment, components to be reused or turned over to the Departmental Representative. Note their condition and advise the Departmental Representative in writing of any defects or conditions which would affect removal and reuse.
- .4 Site verify and locate all existing services, in ceiling. Any damage to existing services will be the responsibility of the Contractor.

3.2 PREPARATION

- .1 Cap off, disconnect and seal any required existing services, sanitary and storm sewers, waterlines, electrical and telephone services, gas service, in accordance with the contract documents as established by the appropriate consultant before starting with demolition.
- .2 Take adequate measures during demolition to protect the public in conformance with CSA S350 and requirements of authorities having jurisdiction.
- .3 Provide protection to ensure materials, finishes and surfaces to remain will not be damaged, scratched, or marred by work of this Section.
- .4 Ensure that affected services and utilities designated for removal have been disconnected prior to the commencement of work.

3.3 WORKMANSHIP

- .1 Do work in accordance with CSA S350 and Part 8.0 of BCBC 2012.
- .2 Cutting, removing and demolition shall be performed so as not to cut or remove more than is necessary or to damage adjacent work. Cut existing construction back to meet straight lines allowing for replacement finishes of follow.
- .3 Breakup large pieces of demolished material for handling and to prevent overloading and damage to existing construction.
- .4 Schedule and execute all work in a careful manner with all necessary consideration to prevent injury or damages to persons and to surrounding property. Do not interfere with the passage to and from and operation of adjoining space.
- .5 Do not let piled material endanger structure or persons at any time.
- .6 Where any material, component, assembly or item is indicated for reuse, removal shall be by a trade, which normally provides or installs such an item.
- .7 Store such items being reused in a protected area until ready to be reinstalled into the new construction proposed.
- .8 Cut out and remove assemblies, materials, items indicated as being removed, abandoned or discarded on the drawings.
- .9 Repair and make good damage to existing construction caused by the work of this Section. Use mechanics skilled in the type of work involved to replace such damaged work.
- .10 Demolish in a manner as to minimize dusting. Keep dusty materials, areas contained within the project area.
- .11 Clear and remove promptly by the end of each working day all demolished materials from the Site.
- .12 Inspect existing conditions to confirm the extent and location of demolition will not damage adjacent areas.

- .13 Should any conflicts arise, immediately contact the Consultant for direction prior to proceeding. At completion recover all materials. Leave Site neat and clean.

3.4 CLEAN-UP

- .1 Continuously during the work of this Section remove all dirt, debris discarded material and deposit in waste containers. Keep routes to and from waste containers clear.

END OF SECTION 02 41 19

1.0 GENERAL

1.1 RELATED SECTIONS

- .1 Finish Carpentry Section 06 20 00
- .2 Architectural Woodwork Section 06 40 00

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA B111-1974 (R2003), Wire Nails, Spikes and Staples.
 - .2 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CSA O121-08 (R2013), Douglas Fir Plywood.
 - .4 CAN/CSA-O141-05 (R2014), Softwood Lumber.
 - .5 CSA O151-09 (R2014), Canadian Softwood Plywood.
 - .6 CAN/CSA-O325-07 (R2012), Construction Sheathing.
 - .7 Comply with AWWA.M4 and revisions specified in CAN/CSA-080 Series, Supplementary Requirements to AWWA Standard M2.
- .2 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2014.
- .3 Forest Stewardship Council (FSC)
 - .1 FSC-STD-01-001- 2004, FSC Principle and Criteria for Forest Stewardship.
 - .2 FSC-STD-20-002- 2004, Structure and Content of Forest Stewardship Standards V2-1.
 - .3 FSC Accredited Certified Bodies.
- .4 Green Seal Environmental Standards (GS)
 - .1 GS-11- 2008, 2nd Edition, Paints and Coatings.
- .5 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1113- A2007, Architectural Coatings.

1.3 ACTION & INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for rough carpentry work and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Wood Certification: submit vendor's Chain-of-Custody Certificate number for FSC certified wood.
- .4 Low-Emitting Materials:
 - .1 Submit listing of paints and coatings used in building, comply with VOC and chemical component limits or restriction requirements.

- .2 Submit listing of composite wood products used in building, stating that they contain no added urea-formaldehyde resins, and laminate adhesives used in building, stating that they contain no urea-formaldehyde.

1.4 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.
- .4 Sustainable Standards Certification:
 - .1 Certified Wood: submit listing of wood products and materials used in accordance with FSC-STD-01-001.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – 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 recycling, reuse and composting facility approved by Departmental Representative.
- .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.
- .8 Dispose of unused wood preservative material at official hazardous material collections site approved by Departmental Representative.
- .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.

1.6 DELIVERY, STORAGE & HANDLING

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

- .2 Store and protect wood from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

- .4 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section 01 74 19 Waste Management and Disposal.

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

2.0 PRODUCTS

2.1 LUMBER MATERIALS

- .1 Lumber Material
 - .1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% or less in accordance with following standards:
 - .2 CAN/CSA-O141.
 - .3 FSC certified.

 - .2 NLGA Standard Grading Rules for Canadian Lumber. Furring, blocking, nailing strips, grounds, rough bucks, cants, curbs, fascia backing and sleepers:
 - .1 Board sizes: "Standard" or better grade.
 - .2 Dimension sizes: "Standard" light framing or better grade.
 - .3 Post and timbers sizes: "Standard" or better grade species except as indicated.
 - .4 Framing and board lumber: in accordance with NBCC 2010 Subsection 9.3.2, except as follows:
 - .1 Wall studs: D-Fir species, NLGA No.2 grade or better.
 - .2 Glued end-jointed (finger-jointed) lumber products are acceptable for framing of interior non-load bearing studs.

2.2 PANEL MATERIALS

- .1 Douglas fir plywood (DFP): to CSA O121, standard construction.

- .2 Canadian softwood plywood (CSP): to CSA O151, standard construction.

- .3 Plywood, OSB and wood based composite panels: to CAN/CSA-O325.

2.3 ACCESSORIES

- .1 Nails, spikes and staples: to CSA B111. All nailing shall be common nails. If P-nails (Power driven nails) are intended as substitution, submit P-nails information for Departmental representative's review prior to use. Adjustment of nails spacing or requirements may be required.

- .2 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and cut steel washers. All bolts and anchor bolts shall conform to ASTM A307. Bolt holes shall be 1 mm larger than the bolt diameter. Bolts in wood shall not be less than 7 diameter from the end and 4 diameters from the edge unless otherwise detailed.

- .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.

- .4 Steel plates: All steel plates used in connection details shall be grade 300W.
- .5 Lag screws: Lag screws shall be predrilled with a bit size of 65% of the shank diameter for the threaded portion. Lead holes shall be the same length as the unthreaded portion and the same diameter as the shank. Screw all lags into place. Cut washers shall be provided under heads which bear on wood.
- .6 No checks or splits allowed at areas to be bolted or lagged.
- .7 All bolts, steel plates/connections and nails for use with red cedar wood to be hot dipped galvanized to ASTM A653 class G90 as produced by Simpson Strong Tie or approved equal by the Departmental representative.
- .8 Galvanizing: to CSA G164 unless noted otherwise. Use galvanized fasteners for exterior work, interior highly humid areas.
- .9 Joist/beam hangers, post bases: unless noted otherwise shall be hot dipped galvanized as per manufacture and approved by the Departmental representative.

2.4 FINISHES

- .1 Galvanizing: to CAN/CSA-G164, use galvanized fasteners for exterior work, interior highly humid areas, pressure- preservative, and fire-retardant treated lumber.
- .2 Stainless steel: use stainless steel or alloy for fastener for work mentioned in .1 above or alternative are acceptable and at contractors cost.

2.5 WOOD PRESERVATIVES

- .1 Surface-applied wood preservative: clear, coloured, or 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.

3.0 EXECUTION

3.1 PREPARATION

- .1 Comply with AWWA.M4, use copper naphthenate to manufacturer's instructions.
- .2 Treat surfaces of material with wood preservative, before installation.
- .3 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.
- .4 Re-treat surfaces of PT Lumber and plywood exposed by cutting, trimming or boring with liberal brush application of preservative before installation.

3.2 INSTALLATION

- .1 Comply with requirement of NBCC 2010, Part 9. Where conflict exists, the more stringent

requirements will apply.

- .2 Install members true to line, levels and elevations.
- .3 Construct continuous members from pieces of longest practical length.
- .4 Install spanning members with "crown-edge" up.
- .5 Install lumber and panel materials so that grade-marks and other defacing marks are not visible or are removed by sanding at location (s) where exposed in final assembly.
- .6 Install furring, strapping and solid backing in walls and structures as required to space-out and support casework, cabinets, applied finishes, facings, pipe chases, wall mounted door stops, access hatches, electrical and mechanical fixtures, washroom accessories, benches, prefab showers, overhead door hardware and other work as required. Use solid blocking or 19 mm plywood securely nailed to framing members.
- .7 Frame and strap for suspended gypsum board ceiling finishes.
- .8 Align and plumb faces of furring and blocking to tolerance of 1:600.
- .9 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding and other work as required.
- .10 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.
- .11 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.

END OF SECTION 06 10 11

1.0 GENERAL

1.1 RELATED REQUIREMENTS

- | | | |
|----|-----------------------|------------------|
| .1 | Rough Carpentry | Section 06 10 11 |
| .2 | Architecture Woodwork | Section 06 40 00 |
| .3 | Door Hardware | Section 08 71 00 |

1.2 REFERENCES

- .1 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)
 - .1 Architectural Woodwork Quality Standards, 1st edition, 2009.
- .2 Canada Green Building Council (CaGBC)
 - .1 LEED Canada- CI Version 1.0, LEED (Leadership in Energy and Environmental Design): Green Building Rating System and Reference Package For Commercial Interiors.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-11.3-M87, Hardboard.
- .4 CSA International
 - .1 CSA B111-74(R2003), Wire Nails, Spikes and Staples.
 - .2 CAN/CSA G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CSA O121-08, Douglas Fir Plywood.
 - .4 CSA O141-05, Softwood Lumber.
 - .5 CSA O151-09, Canadian Softwood Plywood.
 - .6 CSA O153-M1980 (R2008), Poplar Plywood.
- .5 Forest Stewardship Council (FSC)
 - .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.
 - .2 FSC-STD-20-002-2004, Structure and Content of Forest Stewardship Standards V2-1.
 - .3 FSC Accredited Certified Bodies.
- .6 National Lumber Grades Authority (NLGA)
 - .1 NLGA Standard Grading Rules for Canadian Lumber 2008.
- .7 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1168 2005, Adhesives and Sealants Applications.
- .8 Underwriters Laboratories of Canada (ULC)
 - .1 CAN4-S104-80(R1985), Standard Method for Fire Tests of Door Assemblies.
 - .2 CAN/ULC-S105-09, Standard Specification for Fire Door Frames.

1.3 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for plywood MDF and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and

Safety Requirements.

- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia, Canada.
 - .2 Indicate details of construction, profiles, jointing, fastening and other related details.
- .4 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Samples will be returned for inclusion into work.
 - .3 Submit duplicate 300 x 300 mm samples of handrails, soffits and cedar siding, wood trim.
- .5 Certifications: submit certificates signed by manufacturer certifying materials comply with specified performance characteristics and physical properties.
- .6 Test and Evaluation Reports: submit certified test reports for composite wood from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
- .7 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.
 - .2 Recycled Content:
 - .1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.
 - .3 Regional Materials: submit evidence that project incorporates required percentage 10% of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.
 - .4 Certified Wood:
 - .1 Submit listing of wood products and materials used, produced from wood obtained from forests certified by FSC Accredited Certification Body in accordance with FSC-STD-01-001.
 - .2 Submit manufacturer's FSC Chain-of-Custody Certificate number.
 - .5 Low-Emitting Materials:
 - .1 Submit listing of adhesives and sealants used in building, showing compliance with VOC and chemical component limits or restrictions requirements.
 - .2 Submit listing of composite wood products used in building, stating that they contain no added urea-formaldehyde resins, and laminate adhesives used in building, stating that they contain no urea-formaldehyde.

1.4 QUALITY ASSURANCE

- .1 Lumber by grade stamp of agency certified by Canadian Lumber Standards Accreditation Board (CLSAB).

- .2 Plywood, particleboard, OSB and wood based composite panels to CSA and ANSI standards.
- .3 Wood fire rated frames and panels: listed and labelled by an organization accredited by Standards Council of Canada to CAN4-S104 and CAN/ULC-S105.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground and in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect wood products from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan Waste Reduction Workplan related to Work of this Section
- .5 Packaging Waste Management: remove for reuse of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal

2.0 PRODUCTS

2.1 MATERIALS

- .1 Softwood lumber: S4S, moisture content 19% or less in accordance with following standards:
 - .1 CSA O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber
 - .3 AWMAC custom or premium grade, where noted, moisture content as specified.
 - .4 Machine stress-rated lumber is acceptable.
 - .5 Hardwood lumber: moisture content in accordance:
 - .1 AWMAC custom grade, moisture content as specified.
- .2 Panel Material: Urea-formaldehyde free
 - .1 Recycled content: provide information indicating recycled content on a % (Post-Consumer + ½ Post-Industrial)
 - .2 FSC certified.
 - .3 Douglas fir plywood (DFP): to CSA O121, standard construction. 6.1.5 and 6.2.5 where both sides exposed to view.
 - .4 Hardwood plywood: to ANSI/HPVA HP-1.
 - .5 Medium density fibreboard (MDF): to ANSI A208.2, density 640-800 kg/m³.
 - .6 Decorative overlaid composite panels.
 - .1 Decorative overlay, heat and pressure laminated with suitable resin to thickness indicated mm thick MDF urea-formaldehyde free core.
 - .2 Overlay bonded to both faces where exposed two sides, and when panel material require surface on one side only, reverse side to be overlaid with a plain (buff) balancing sheet.
 - .3 Furniture finish: stain wood grain pattern selected by Departmental Representative.
 - .4 Edge finishing: edges dadoed or saw kerfed to take plastic "T" moulding in width and colour to match melamine finish.

2.2 ACCESSORIES

- .1 Nails and staples: to CSA B111; galvanized to CAN/CSA-G164 for exterior work, interior humid areas and for treated lumber; plain finish elsewhere.
- .2 Wood screws: plain, type and size to suit application.
- .3 Splines: wood
- .4 Adhesive and Sealants: in accordance with Section 07 92 00 - Joint Sealants.

3.0 EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Do finish carpentry to Quality Standards of (AWMAC).
- .2 Scribe and cut as required, fit to abutting walls, and surfaces, fit properly into recesses and to accommodate piping, columns, fixtures, outlets, or other projecting, intersecting or penetrating objects.
- .3 Form joints to conceal shrinkage.

3.3 CONSTRUCTION

- .1 Fastening:
 - .1 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.
 - .2 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.
 - .3 Set finishing nails to receive filler. Where screws are used to secure members, countersink screw in round smooth cut hole and plug with wood plug to match material being secured.
 - .4 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.
- .2 Standing and running trim:
 - .1 Butt and cope internal joints of baseboards to make snug, tight, joint. Cut right angle joints of casing and base with mitred joints.
 - .2 Fit backs of baseboards and casing snugly to wall surfaces to eliminate cracks at junction of base and casing with walls.
 - .3 Make joints in baseboard, where necessary using a 45 degrees scarf type joint.
 - .4 Install door and window trim in single lengths without splicing.
- .3 Interior frames:
 - .1 Set frames with plumb sides and level heads and sills and secure.

- .4 Counters & Cupboards:
 - .1 Install Counters & Cupboards as indicated.

3.4 INSTALLATION OF SHELVING

- .1 MDF custom grade, 12 mm thick, plastic laminate or melamine finish/decorative overlay as indicated.

3.5 CLEANING

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

3.6 PROTECTION

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

END OF SECTION 06 20 00

1.0 GENERAL

1.1 RELATED REQUIREMENTS

- | | | |
|----|-------------------|------------------|
| .1 | Rough Carpentry | Section 06 10 11 |
| .2 | Joint Sealants | Section 07 92 00 |
| .3 | Interior Painting | Section 09 91 23 |

1.2 REFERENCES

- .1 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)
 - .1 Architectural Woodwork Quality Standards Illustrated, 8th edition, Version 1.0 2009.
- .2 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For Commercial Interiors.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-71.20-M88, Adhesive, Contact, Brushable.
- .4 CSA International
 - .1 CSA B111-74 (R2003), Wire Nails, Spikes and Staples.
 - .2 CSA O112.4 SERIES-M1977 (R2006), Standards for Wood Adhesives.
 - .3 CSA O121-08, Douglas Fir Plywood.
 - .4 CSA O141-05, Softwood Lumber.
 - .5 CSA O151-09, Canadian Softwood Plywood.
 - .6 CSA O153-M1980 (R2008), Poplar Plywood.
- .5 American National Standards Institute (ANSI)
 - .1 ANSI/NPA A208.1-09, Particleboard.
 - .2 ANSI/NPA A208.2-09, Medium Density Fiberboard (MDF) for Interior Applications.
 - .3 ANSI/HPVA HP-1 04, Standard for Hardwood and Decorative Plywood.
- .6 ASTM International
 - .1 ASTM E 1333-96 (2002), Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates From Wood Products Using A Large Chamber.
 - .2 ASTM D 2832-92 (R2005), Standard Guide for Determining Volatile and Nonvolatile Content of Paint and Related Coatings.
- .7 ASTM D 5116-06, Standard Guide For Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products.
- .8 Forest Stewardship Council (FSC)
 - .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.
 - .2 FSC-STD-20-002-2004, Structure and Content of Forest Stewardship Standards V2-1.
- .9 Green Seal Environmental Standards (GS)
 - .1 GS-11-2008, 2nd Edition, Paints and Coatings.
 - .2 GS-36-00, Commercial Adhesives.
- .10 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

- .11 National Electrical Manufacturers Association (NEMA)
 - .1 ANSI/NEMA LD-3-05, High-Pressure Decorative Laminates (HPDL).
- .12 National Hardwood Lumber Association (NHLA)
 - .1 Rules for the Measurement and Inspection of Hardwood and Cypress 1998.
- .13 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2003(R2007).
- .14 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1113-A2007, Architectural Coatings.
 - .2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

1.3 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for architectural woodwork and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .3 Shop Drawings:
 - .1 Indicate details of construction, profiles, jointing, fastening and other related details.
 - .1 Scales: profiles half-full sized, details quarter-full sized.
 - .2 Indicate materials, thicknesses, finishes and hardware.
 - .3 Indicate locations of service outlets in casework, typical and special installation conditions, and connections, attachments, anchorage and location of exposed fastenings.
- .4 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Samples will be returned for inclusion into work.
 - .3 Submit duplicate samples of laminated plastic, acrylic sheets, engineered resin, quartz surface and vinyl faced plexigraphic.
 - .4 Submit duplicate samples of laminated plastic joints, edging, cutouts and post formed profiles.
- .5 Certifications: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .6 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating amount of construction wastes that are recycled or salvaged.
 - .2 Recycled Content:
 - .1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.

- .3 Regional Materials: submit evidence that project incorporates required percentage 20% of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.
- .4 Certified Wood:
 - .1 Submit listing of wood products and materials used, produced from wood obtained from forests certified by FSC Accredited Certification Body in accordance with FSC-STD-01-001.
 - .2 Submit manufacturer's FSC Chain-of-Custody Certificate number.
- .5 Low-Emitting Materials:
 - .1 Submit listing of adhesives and sealants and paints and coatings used in building, comply with VOC and chemical component limits or restrictions requirements.
 - .2 Submit listing of composite wood products used in building, stating that they contain no added urea-formaldehyde resins, and laminate adhesives used in building, stating that they contain no urea-formaldehyde.

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
 - .1 Protect millwork against dampness and damage during and after delivery.
 - .2 Store millwork in ventilated areas, protected from extreme changes of temperature or humidity.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect architectural woodwork from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work
- .5 Packaging Waste Management: remove for reuse by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.6 COORDINATION & VERIFICATION

- .1 Verify all dimensions & existing conditions on job site prior to all shop fabrication and work on site. Where major discrepancies occur, alert Departmental Representative.
- .2 Coordinate work of this section with that of wall, electrical and mechanical sections where millwork interfaces with drywall partitions, plumbing, electrical outlets, etc.
- .3 It shall be the responsibility of this section to verify the dimensions and installation details for all Departmental Representative supplied equipment and furnishings requiring cut-outs, adaptations

and interfacing with millwork items.

1.7 INSPECTION

- .1 Architectural woodwork shall be manufactured and/or installed to AWMAC Quality Standards (Custom Grade) and shall be subject to an inspection at the plant and/or site, by an appointed inspector approved by the M.M.A.B.C. (the BC Chapter of AWMAC). Such inspection costs shall be included in the tender price for this project. Shop drawings shall be submitted for review or approval before any work is commenced. Where it is deemed necessary by the Departmental Representative, a sample cabinet (consisting of a minimum of 1 drawer, 1 door, showing precisely the materials, hardware and the type of construction the manufacturer intends to use), shall be submitted for inspection.
- .2 Any work which does not meet AWMAC Quality Standards as specified, shall be replaced by this Section at no additional cost to the Department Representative and to the satisfaction of the Departmental Representative and the inspector.

1.8 GUARANTEE

- .1 This section shall furnish the Departmental Representative with a two (2) year M.M.A.B.C. (The BC Chapter of AWMAC) Guarantee Certificate or an equivalent maintenance bond, to the full value of the architectural woodwork sub-contract, certifying that the architectural woodwork supplied will be in accordance with the Standards incorporated in the AWMAC Quality Standards manual, latest edition.
- .2 The Guarantee shall cover replacing and refinishing to make good any defects in architectural woodwork due to faulty workmanship or defective materials supplied by this Section, which appear during a two (2) year period following the substantial completion of the Project.

2.0 PRODUCTS

2.1 MATERIALS

- .1 Softwood lumber: unless specified otherwise, S4S, moisture content 15% or less in accordance with following standards:
 - .1 CSA O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
 - .3 AWMAC custom grade, moisture content as specified.
 - .4 Forestry Stewardship Council (FSC) certified.
- .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 Douglas fir plywood (DFP): to CSA O121, standard construction, FSC certified.
 - .1 Plywood resin to contain no added urea-formaldehyde.
- .5 Canadian softwood plywood (CSP): to CSA O151, standard construction, FSC certified.
 - .1 Plywood resin to contain no added urea-formaldehyde.
- .6 Hardwood plywood: to ANSI/HPVA HP-1, FSC certified.
 - .1 Plywood resin to contain no added urea-formaldehyde.
- .7 Poplar plywood (PP): to CSA 0153, standard construction, FSC certified.

- .1 Plywood resin to contain no added urea-formaldehyde.
- .8 Hardboard:
 - .1 To CAN/CGSB-11.3, FSC certified.
 - .2 Hardboard resin to contain no added urea-formaldehyde.
- .9 MDF (medium density fibreboard) core: to ANSI/NPA A208.2, Grade Custom, density 769 kg/m², FSC certified.
 - .1 Medium density fibreboard performance requirements to: ANSI/NPA A208.2.
 - .2 MDF resin to contain no added urea-formaldehyde.
- .10 Laminated plastic for flatwork: to NEMA LD3, Type: General Purpose. Colours, pattern and finish, refer to schedule.
 - .1 For Cabinet tops, rigid plastic bases, countertops, backsplashes: Grade HGS, Size 1.27mm thick.
 - .2 For exposed vertical surfaces including front of doors, drawers and outside of gables: Grade VGS, Size 0.76m thick.
- .11 Laminated plastic for post forming work: to NEMA LD3, Type: Postforming, Grade HGP, size 1mm thick. Colours, pattern and finish, refer to schedule.
- .12 Laminated plastic backing sheet: Grade BK, Type S minimum of 0.5 mm thick or same thickness as face laminate, colour same as face laminate.
- .13 Laminated plastic liner sheet: Grade GP, Type S, size 0.5mm thick, white colour U.N.O.
- .14 Thermofused Melamine: to NEMA LD3 Grade VGL.
 - .1 High wear resistant thermofused melamine: equal or exceed 400 cycles (Minimum standard for HPL abrasion test).
- .15 Nails and staples: to CSA B111.
- .16 Wood screws: stainless steel, type and size to suit application.
- .17 Splines: metal.
- .18 Sealant: in accordance with Section 07 92 00 - Joint Sealants.
 - .1 Sealants: VOC limit 250 g/L maximum to SCAQMD Rule 1168.
- .19 Laminated plastic adhesive:
 - .1 Adhesive: contact adhesive to CAN/CGSB-71.20.
 - .2 Adhesives: VOC limit 30 g/L maximum to SCAQMD Rule 1168 GS-36.
 - .3 Clear Wood Finishes: VOC limit 250 g/L maximum to GS-11
 - .4 Paints: VOC limit 50 g/L maximum to GS-11.

2.2 FABRICATION

- .1 Fabricate material in accordance with manufacturer's Fabrication Guide.
- .2 Fabricate countertops, sinks, and splash of 13 mm thick material unless otherwise indicated.
- .3 Cut and finish component edges with clean, sharp returns. Finished edges shall have a 1.6 mm radius.

- .4 Integral Cove: Provide shop fabricated integrally molded coves at backsplash and ends where against walls or other vertical surfaces, with 9.5 mm radius between top and splash.
- .5 Cutouts for sinks shall be smooth and uniform without saw marks. The top and bottom of openings shall be finished smooth. Maintain minimum 6 mm radius for sink cutouts.
- .6 Cutouts for accessories shall be smooth and uniform without saw marks. The top and bottom of openings shall be finished smooth.
- .7 Set nails and countersink screws apply stained wood filler to indentations, sand smooth and leave ready to receive finish.
- .8 Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes and other fixtures.
- .9 Shop assemble work for delivery to site in size easily handled and to ensure passage through building openings.
- .10 Apply laminate backing sheet to reverse side of core of plastic laminate work.

2.3 LAB WORKSURFACES

- .1 1" Thick Grey Epoxy
- .2 Sinks to be epoxy with seamless joint between sink and countertop. The drainage grooves on the counter and marine edge.
- .3 Student table to have epoxy mounted on plywood as noted on drawings. Solid wood trim to be maple with clear finish.

2.4 COUNTERTOPS (OFFICE)

- .1 Plastic laminate on plywood core.
- .2 Post-form countertop for counter, conform to AWI/AWMAC AS1 Manual Section 400C.
- .3 Backer sheets to be applied to the reverse side of all laminated countertops.
- .4 Edge treatment: Same as laminate on horizontal surfaces, U.N.O.
- .5 Core Materials: 19mm minimum non-telegraphing plywood at countertops with sink or other plumbing cut-outs. 25mm thick for longer span as per AWMAC requirement.
- .6 Caulking at all edges

3.0 EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Do architectural woodwork to Quality Standards of AWMAC.
- .2 Install millwork in accordance with manufacturer's instructions installation guidelines and recommendations.
- .3 Install prefinished millwork at locations shown on drawings.
 - .1 Position accurately, level, plumb straight.
- .4 Form joints using manufacturer's approved adhesive, with joints inconspicuous in finished work.
- .5 Cure countertops for 24 hours, minimum, before exposure to moisture or pressure.
- .6 Corner joints: Form 3 mm-wide joints, sealed with manufacturer's color-matching silicone sealant.
- .7 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.
- .8 Provide integral backsplashes and end splashes as shown on the Drawings.
- .9 Field joints shall be hard seamed unless otherwise specified.
- .10 Attach solid surfaces material to leveled supports on frame with dabs of silicone every 18 to 24 inches.
- .11 Fasten solid surface material to frame by anchoring screws to supports at all corner blocks. Screws should not come in contact with solid surface material, as this may cause cracking of countertop.
- .12 Apply water resistant building paper over wood framing members in contact with masonry or cementitious construction.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
 - .1 Clean millwork and cabinet work inside cupboards and drawers and outside surfaces.
 - .2 Remove excess glue from surfaces.
 - .3 Solid surface to be cleaned as per manufacturer's instructions.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

- .1 Protect millwork from damage until final inspection.
- .2 Protect installed products and components from damage during construction.
- .3 Repair damage to adjacent materials caused by architectural woodwork installation.

END OF SECTION 06 40 00

1.0 GENERAL

1.1 RELATED REQUIREMENTS

- | | | |
|----|-------------------------|------------------|
| .1 | Finish Carpentry | Section 06 20 00 |
| .2 | Architectural Woodwork | Section 06 40 00 |
| .3 | Metal Doors and Frames | Section 08 11 00 |
| .4 | Gypsum Board Assemblies | Section 09 21 16 |
| .5 | Interior Painting | Section 09 92 13 |
| .6 | Plumbing and Mechanical | Divisions 21-22 |
| .7 | Electrical | Divisions 26 |

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C 919- 12, Standard Practice for Use of Sealants in Acoustical Applications.
- .2 ASTM C920-11 Standard Specification for Elastomeric Joint Sealants
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Manufacturer's product to describe.
 - .1 Caulking compound.
 - .2 Primers.
 - .3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.
- .3 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .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 00 - Submittal Procedures.
 - .1 Instructions to include installation instructions for each product used.

1.4 QUALITY ASSURANCE / MOCK-UPS

- .1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
- .2 Construct mock-up to show location, size, shape and depth of joints complete with back-up material, primer, caulking and sealant.
- .3 Mock-up will be used:
 - .1 To judge workmanship, substrate preparation, operation of equipment and material application.

- .4 Location to be decided with Departmental Representative.
- .5 Allow 24 hours for inspection of mock-up by Departmental Representative before proceeding with sealant work.
- .6 When accepted, mock-up will demonstrate minimum standard of quality required for this Work. Approved mock-up may remain as part of finished Work.

1.5 DELIVERY, STORAGE & HANDLING

- .1 Deliver, handle, store and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.
- .3 Upon completion of Work, after cleaning is carried out.

1.6 ENVIRONMENTAL REQUIREMENTS

- .1 Environmental Limitations:
 - .1 Do not proceed with installation of joint sealants under following conditions:
 - .1 When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4 degrees C.
 - .2 When joint substrates are wet.
- .2 Joint-Width Conditions:
 - .1 Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- .3 Joint-Substrate Conditions:
 - .1 Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.
- .4 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.
- .5 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
- .6 Ventilate area of work as directed by Departmental Representative by use of approved portable supply and exhaust fans.

2.0 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.

- .4 Standard: For interior work unless otherwise specified, ensure compatibility of sealants being used and other materials in contact with them, meet VOC level of 250 g/L for architectural sealant.

2.2 SEALANT TYPE

- .1 S-1:
.1 ASTM C920, polyurethane or polysulfide.
.2 Type M.
.3 Class 25.
.4 Grade NS.
.5 Shore A hardness of 20-40.
- .2 S-2:
.1 ASTM C920, polyurethane or polysulfide.
.2 Type M.
.3 Class 25.
.4 Grade P.
.5 Shore A hardness of 25-40.
- .3 S-3:
.1 ASTM C920, polyurethane or polysulfide.
.2 Type S.
.3 Class 25, joint movement range of plus or minus 50 percent.
.4 Grade NS.
.5 Shore A hardness of 15-25.
.6 Minimum elongation of 700 percent.
- .4 S-4:
.1 ASTM C920, polyurethane or polysulfide.
.2 Type M.
.3 Class 25,
.4 Grade NS.
.5 Shore A hardness of 25-40.
- .5 S-5:
.1 ASTM C920, polyurethane or polysulfide.
.2 Type M.
.3 Class 25.
.4 Grade P.
.5 Shore A hardness of 25-40.
- .6 S-6:
.1 ASTM C920, silicone, neutral cure.
.2 Type S.
.3 Class: Joint movement range of plus 100 percent to minus 50 percent.
.4 Grade NS.
.5 Shore A hardness of 15-20.
.6 Minimum elongation of 1200 percent.
- .7 S-7:
.1 ASTM C920, silicone, neutral cure.
.2 Type S.
.3 Class 25.
.4 Grade NS.

- .5 Shore A hardness of 25-30.
- .6 Structural glazing application.

- .8 S-8:
 - .1 ASTM C920, silicone, acetoxo cure.
 - .2 Type S.
 - .3 Class 25.
 - .4 Grade NS.
 - .5 Shore A hardness of 25-30.
 - .6 Structural glazing application.

- .9 S-9:
 - .1 ASTM C920, silicone.
 - .2 Type S.
 - .3 Class 25.
 - .4 Grade NS.
 - .5 Shore A hardness of 25-30.
 - .6 Non-yellowing, mildew resistant.

- .10 S-10:
 - .1 ASTM C920, coal tar extended fuel resistance polyurethane.
 - .2 Type M/S.
 - .3 Class 25.
 - .4 Grade P/NS.
 - .5 Shore A hardness of 15-20.

- .11 S-11:
 - .1 ASTM C920, polyurethane.
 - .2 Type M/S.
 - .3 Class 25.
 - .4 Grade P/NS.
 - .5 Shore A hardness of 35-50.

 - .6 Structural glazing application.

- .12 S-12:
 - .1 ASTM C920, polyurethane.
 - .2 Type M/S.
 - .3 Class 25, joint movement range of plus or minus 50 percent.
 - .4 Grade P/NS.
 - .5 Shore A hardness of 25-50.

2.3 CAULKING COMPOUND

- .1 C-1: ASTM C834, acrylic latex.
- .2 C-2: One component acoustical caulking, non-drying, non hardening, synthetic rubber.

2.4 JOINT CLEANER

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

3.0 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 and ASTM C919.
 - .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.

3.7 CLEANING

- .1 Clean adjacent surfaces immediately and leave work clean and neat. Remove excess sealant and droppings using recommended cleaners as work progresses. Remove masking after tooling of joints.

3.8 LOCATIONS

- .1 Sanitary Joints:
 - .1 Pipe Penetrations: Type S-12.
- .2 Interior Caulking:
 - .1 Typical Narrow Joint 6mm, (1/4 inch) or less at Walls and Adjacent Components: Type C-1 and C-2.
 - .2 Perimeter of Doors, Windows, Access Panels which Adjoin Concrete or Exterior Walls: Types C-1 and C-2.
 - .3 Joints at Masonry Walls and Columns, Piers, Concrete Walls or Exterior Walls: Types C-1 and C-2.
 - .4 Expose Isolation Joints at Top of Full Height Walls: Types C-1 and C-2.
 - .5 Exposed Acoustical Joint at Sound Rated Partitions Type C-2.
 - .6 Concealed Acoustic Sealant Types S-4, C-1 and C-2.

END OF SECTION 07 92 00

1.0 GENERAL

1.1 RELATED REQUIREMENTS

- | | | |
|----|-------------------|------------------|
| .1 | Rough Carpentry | Section 06 10 11 |
| .2 | Finish Carpentry | Section 06 20 00 |
| .3 | Door Hardware | Section 08 71 00 |
| .4 | Interior Painting | Section 09 91 23 |

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
 - .2 CGSB 41-GP-19Ma-84, Rigid Vinyl Extrusions for Windows and Doors.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA-G40.20-04/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CSA W59-03, Welded Steel Construction (Metal Arc Welding).
- .3 Canadian Steel Door Manufacturers' Association (CSDMA)
 - .1 CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, 2000.
 - .2 CSDMA, Selection and Usage Guide for Commercial Steel Doors, 1990.
- .4 National Fire Protection Association (NFPA)
 - .1 NFPA 80-2007, Standard for Fire Doors and Fire Windows.
 - .2 NFPA 252-2012, Standard Methods of Fire Tests of Door Assemblies.
- .5 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1113-04, Architectural Coatings.
 - .2 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.
- .6 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .2 CAN/ULC-S702-09, Standard for Thermal Insulation, Mineral Fibre, for Buildings.
 - .3 CAN/ULC-S704-03, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
 - .4 CAN4-S104-M80, Standard Method for Fire Tests of Door Assemblies.
 - .5 CAN4-S105-M85, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN4-S104.

1.3 SYSTEM DESCRIPTION

- .1 Design Requirements:
 - .1 Provide fire labeled frames for openings requiring fire protection ratings. Test products in conformance with CAN4-S104, and listed by nationally recognized agency having factory inspection services and to ULC fire protection rating.

1.4 SUBMITTALS

- .1 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, glazed, arrangement of hardware and fire rating and finishes.

METAL DOOR AND FRAMES

- .2 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings and finishes.
- .3 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

2.0 PRODUCTS

2.1 MATERIALS

- .1 Hot dipped galvanized steel sheet: to ASTM A 653M, minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts.
 - .1 Interior Door and Frame: galvanized with ZF75 designation
- .2 Reinforcement to CSA G40.20/G40.21, Type 44W, coating designation to ASTM A 653M, ZF75.
- .3 Existing door frame to remain.

2.2 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 Stiffened: doors to be reinforced with 0.8mm (20 gauge) hat shaped steel stiffeners welded to inside of face sheets. Stiffeners to be located a maximum 152mm (6") on center and welded to face sheet on 100mm(4") centers. Areas between stiffeners to be filled with fiberglass insulation.

2.3 ADHESIVES

- .1 Honeycomb cores and steel components: heat resistant, spray grade, resin reinforced neoprene/rubber (polychloroprene) based, low viscosity, contact cement.
 - .1 Adhesive: maximum VOC content 50 g/L to SCAQMD Rule 1168.
- .2 Lock-seam doors: fire resistant, resin reinforced polychloroprene, high viscosity, and sealant/adhesive.

2.4 PRIMER

- .1 Touch-up prime CAN/CGSB-1.181.
 - .1 Maximum VOC limit 50 g/L to GC-03.

2.5 PAINT

- .1 Field paint steel doors and frames in accordance with Sections 09 91 23 - Interior Painting. Protect weatherstrips from paint. Provide final finish free of scratches or other blemishes.
 - .1 Maximum VOC emission level 50 g/L to GS-11 to SCAQMD Rule 1113.

2.6 ACCESSORIES

- .1 Door silencers: single stud rubber/neoprene type.
- .2 Exterior and interior top and bottom caps: rigid polyvinylchloride extrusion conforming to CGSB 41-

METAL DOOR AND FRAMES

GP-19Ma.

- .3 Fabricate glazing stops as formed channel, minimum 16 mm height, accurately fitted, butted at corners and fastened to frame sections with counter-sunk oval head sheet metal screws.
- .4 Metallic paste filler: to manufacturer's standard.
- .5 Fire labels: metal riveted.
- .6 Sealant:
 - .1 Maximum VOC limit 250 g/L to SCAQMD Rule 1168.

2.7 FRAMES FABRICATION GENERAL

- .1 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.
- .2 Prepare frame for door silencers, 3 for single door.
- .3 Manufacturer's nameplates on frames and screens are not permitted.
- .4 Conceal fastenings except where exposed fastenings are indicated.
- .5 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.

2.8 FRAME ANCHORAGE

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

2.9 FRAMES: WELDED TYPE

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

2.10 DOOR FABRICATION GENERAL

- .1 Doors: swing type, flush, with provision for glass opening as indicated.
- .2 Fabricate doors with longitudinal edges welded. Seams: grind welded joints to a flat plane, fill with metallic paste filler and sand to a uniform smooth finish.

METAL DOOR AND FRAMES

- .3 Blank, reinforce, drill doors and tap for mortised, templated hardware and electronic hardware.
- .4 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.
- .5 Reinforce doors where required, for surface mounted hardware. Provide flush steel top caps to exterior doors. Provide inverted, recessed, spot welded channels to top and bottom of interior doors.
- .6 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.
- .7 Provide ULC OR WHI fire labelled doors for those openings requiring fire protection ratings, as scheduled. Test such products in conformance with 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.
- .8 Manufacturer's nameplates on doors are not permitted.

2.13 DOORS: HONEYCOMB CORE CONSTRUCTION

- .1 Form face sheets for exterior and interior doors from 1.2 mm sheet steel with honeycomb or laminated under pressure to face sheets.

2.14 HOLLOW STEEL CONSTRUCTION

- .1 Form face sheets for interior doors from 1.2mm sheet steel.
- .2 Reinforce doors with vertical stiffeners, securely welded to face sheets at 150 mm on centre maximum.
- .3 Fill voids between stiffeners of interior doors with honeycomb core.

3.0 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION GENERAL

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

3.3 FRAME INSTALLATION

- .1 Set frames plumb, square, level and at correct elevation.
- .2 Secure anchorages and connections to adjacent construction.
- .3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 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.

METAL DOOR AND FRAMES

- .6 Maintain continuity of air barrier and vapour retarder.

3.4 DOOR INSTALLATION

- .1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 00 - Door Hardware.
- .2 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows.
 - .1 Hinge side: 1.0 mm.
 - .2 Latchside and head: 1.5 mm.
 - .3 Finished floor: 13 mm.
- .3 Adjust operable parts for correct function.

3.5 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 08 11 00

1.0 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Finish Carpentry Section 06 20 00
- .2 Metal Doors & Frames Section 08 11 00

1.2 REFERENCES

- .1 Canadian Steel Door and Frame Manufacturers' Association (CSDMA)
 - .1 CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames latest edition.
- .2 Canadian General Standards Board (CGSB) – latest edition.
 - .1 CAN/CGSB-69.18-M90/ANSI/BHMA A156.1, Butts and Hinges.
 - .2 CAN/CGSB-69.20-M90/ANSI/BHMA A156.4, Door Controls (Closers).
 - .3 CAN/CGSB-69.22-M90/ANSI/BHMA A156.6, Architectural Door Trim.
 - .4 CAN/CGSB-69.24-M90/ANSI/BHMA A156.8, Door Controls -Overhead Holders.
 - .5 CAN/CGSB-69.29-93/ANSI/BHMA A156.13, Mortise Locks and Latches.
 - .6 CAN/CGSB-69.31-M89/ANSI/BHMA A156.15, Closer/Holder Release Device.
 - .7 CAN/CGSB-69.32-M90/ANSI/BHMA A156.16, Auxiliary Hardware.
 - .8 CAN/CGSB-69.34-93/ANSI/BHMA A156.18, Materials and Finishes.

1.3 HARDWARE/SECURITY COORDINATION

- .1 Prior to preparation and submittal of hardware list, door hardware supplier's hardware consultant shall arrange a coordination meeting with the following attendees:
 - .1 Hardware supplier's hardware consultant.
 - .2 Facility's Building Maintenance Manager.
 - .3 Departmental Representative.
 - .4 General Contractor.
- .2 The final door hardware lists shall reflect all decisions made at said coordination meeting.

1.4 ACTION & INFORMAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for door hardware and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Samples will be returned for inclusion into work.
 - .3 Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware package number.
 - .4 After approval samples will be returned for incorporation in Work.
- .4 Hardware List:
 - .1 Submit contract hardware list.
 - .2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.
- .5 Test Reports: certified test reports showing compliance with specified performance characteristics

and physical properties.

- .6 Manufacturer's Instructions: submit manufacturer's installation instructions.

1.5 CLOSEOUT SUBMITTALS

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

1.6 MAINTENANCE MATERIALS SUBMITTALS

- .1 Extra Stock Materials:
 - .1 Supply maintenance materials in accordance with Section 01 78 00 – Closeout Submittals.
 - .2 Tools:
 - .1 Supply 2 sets of wrenches for door closers, locksets, and fire exit hardware.
 - .3 Provide the following extra spare finish hardware in its original package to Departmental Representative as spare maintenance.
 - .1 One (1) Barrier Free Pneumatic Door Operator C3.
 - .2 Two (2) lock set of each type B2, B3, B4 and B5 completed with cylinders keyed to master key as directed by Departmental Representative.
 - .3 Two (2) closer C1.

1.7 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.

1.8 DELIVERY, STORAGE & HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Package items of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.
- .4 Storage and Handling Requirements:
 - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect door hardware from nicks, scratches, and blemishes.
 - .3 Protect prefinished surfaces with wrapping strippable coating.
 - .4 Replace defective or damaged materials with new.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal

1.9 REDUNDANT LOCKSETS

- .1 Where existing and other lock-bearing devices are to be removed and disposed of: turn-over to

Departmental Representative and obtain receipt. In order to maintain building keying security, no existing locksets are to be removed from building.

2.0 PRODUCTS

2.1 HARDWARE ITEMS

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

2.2 DOOR HARDWARE

- .1 See drawing A-02.

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 Doors, padlocks and cabinet locks to be keyed to grand master keyed as directed by Departmental Representative and as noted in Hardware Schedule. Prepare detailed keying schedule in conjunction with Departmental Representative.
- .2 Supply (five) 5 master keys for each master key or grand master key group.
- .3 Supply 5 keys for each lock.
- .4 Stamp keying code numbers on keys and cylinders.
- .5 Hand over permanent cores and keys to Departmental Representative.
- .6 All core to be interchangeable NA A4 core.

2.5 KEYS

- .3 Upon completion of construction, Departmental Representative will, in conjunction with the lock manager:
 - .1 Prepare an operational keying schedule.
 - .2 Accept the operational keys and cylinders directly from the lock manufacturer.
 - .3 Arrange for removal and return of the construction cores.

3.0 EXECUTION

3.1 INSTALLATION

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

- .2 Supply metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.
- .3 Supply manufacturers' instructions for proper installation of each hardware component.
- .4 Install hardware to standard hardware location dimensions in accordance with CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction).
- .5 Where door stop contacts door pulls, mount stop to strike bottom of pull.
- .6 Use only manufacturer's supplied fasteners.
 - .1 Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.
- .7 Install permanent cores and ensure locks operate correctly.

3.2 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 ensure tight fit at contact points with frames.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturer's instructions.
 - .3 Remove protective material from hardware items where present.
 - .4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

3.4 DEMONSTRATION

- .1 Keying System Setup and Cabinet:
 - .1 Turnover file keys and duplicate keys in existing key cabinet on their respective hooks and turn over to Departmental Representative.
- .2 Maintenance Staff Briefing:
 - .1 Brief maintenance staff regarding:
 - .1 Proper care, cleaning, and general maintenance of projects complete hardware.
 - .2 Description, use, handling, and storage of keys.
 - .3 Use, application and storage of wrenches for door closers locksets.
- .3 Demonstrate operation, operating components, adjustment features, and lubrication requirements.

3.5 PROTECTION

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

DOOR HARDWARE

3.6 FINISH HARDWARE SCHEDULE

.1 See drawing A-02.

3.7 DOOR HARDWARE TYPE

.1 See drawing A-02.

END OF SECTION 08 71 00

GYMPSUM BOARD ASSEMBLIES

1.0 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Rough Carpentry Section 06 10 11
- .2 Joint Sealants Section 07 92 00
- .3 Interior Painting Section 09 91 23

1.2 REFERENCES

- .1 Aluminum Association (AA)
 - .1 AA DAF 45-03 (R2009), Designation System for Aluminum Finishes.
- .2 ASTM International
 - .1 ASTM C 475-12 Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - .2 ASTM C 514-04 (2009e1), Standard Specification for Nails for the Application of Gypsum Board.
 - .3 ASTM C 557-03 (2009) e1, Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
 - .4 ASTM C 840-11, Standard Specification for Application and Finishing of Gypsum Board.
 - .5 ASTM C 954-07, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
 - .6 ASTM C 1002-07, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - .7 ASTM C 1047-10a, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
 - .8 ASTM C 1280-13, Standard Specification for Application of Gypsum Sheathing.
 - .9 ASTM C 1177/C 1177M-08, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 - .10 ASTM C 1178/C 1178M-08, Standard Specification for Glass Mat Water-Resistant Gypsum Backing Board.
 - .11 ASTM C 1396/C 1396M-06a, Standard Specification for Gypsum Wallboard.
- .3 Association of the Wall and Ceiling Contractors (AWCC)
 - .1 Specifications Standards Manual 2012
- .4 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.
- .5 Green Seal Environmental Standards (GS)
 - .1 GS-11-2008, 2nd Edition, Paints and Coatings.
- .6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1113-A2007, Architectural Coatings.
 - .2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.
- .7 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-07, Standard Method of Test of Surface Burning Characteristics of Building Materials and Assemblies.

1.3 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for gypsum board assemblies and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Sustainable Design Submittals.
 - .1 Low-Emitting Materials:
 - .1 Submit listing of adhesives and sealants and used in building, showing compliance with VOC and chemical component limits or restriction requirements.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store gypsum board assemblies materials level off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect gypsum board assemblies from nicks, scratches, and blemishes.
 - .3 Protect from weather, elements and damage from construction operations.
 - .4 Handle gypsum boards to prevent damage to edges, ends or surfaces.
 - .5 Protect prefinished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.
 - .6 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

1.5 AMBIENT CONDITIONS

- .1 Maintain temperature 10 degrees C minimum (21 degrees C maximum) for 48 hours prior to and during application of gypsum boards and joint treatment, and for 48 hours minimum 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.

2.0 PRODUCTS

2.1 MATERIALS

- .1 Standard board: to ASTM C 1396/C 1396M regular, 12.7mm and 15.9 mm thick, 12.7 mm and 15.9 mm thick, 1200 mm wide x maximum practical length, ends square cut, edges tapered.
- .2 Nails: to ASTM C 514.
- .3 Steel drill screws: to ASTM C 1002.
- .4 Laminating compound: as recommended by manufacturer, asbestos-free.

GYPSUM BOARD ASSEMBLIES

- .5 Casing beads, corner beads, control joints and edge trim: to ASTM C 1047, metal, zinc-coated by hot-dip process, 0.5 mm base thickness, perforated flanges, one piece length per location.
- .6 Sealants: in accordance with Section 07 92 00 - Joint Sealants.
 - .1 VOC limit 250 g/L maximum to SCAQMD Rule 1168.
 - .2 Acoustic sealant: in accordance with Section 07 92 00 - Joint Sealants.
- .7 Joint compound: to ASTM C 475, asbestos-free.

3.0 EXECUTION

3.1 EXAMINATION

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

3.2 ERECTION

- .1 Do application and finishing of gypsum board to ASTM C 840 except where specified otherwise.
- .2 Erect hangers and runner channels for suspended gypsum board ceilings to ASTM C 840 except where specified otherwise.
- .3 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
- .4 Install work level to tolerance of 1:1200.
- .5 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles.
- .6 Install 19 x 64 mm furring channels parallel to, and at exact locations of steel stud partition header track.
- .7 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.
- .8 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.
- .9 Install wall furring for gypsum board wall finishes to ASTM C 840, except where specified otherwise.
- .10 Furr openings and around built-in equipment, cabinets, access panels on four sides. Extend furring into reveals. Check clearances with equipment suppliers.
- .11 Furr duct shafts, beams, columns, pipes and exposed services where indicated.

3.3 APPLICATION

- .1 Apply gypsum board after bucks, anchors, blocking as specified in Section 06 08 99, sound attenuation, electrical and mechanical work have been approved by Departmental Representative.

- .2 Apply single or double layer gypsum board to wood furring or framing using screw fasteners for first layer, screw fasteners for second layer. Maximum spacing of screws 300 mm on centre.
 - .1 Single-Layer Application:
 - .1 Apply gypsum board on ceilings prior to application of walls to ASTM C 840.
 - .2 Apply gypsum board vertically or horizontally, providing sheet lengths that will minimize end joints.
 - .2 Double-Layer Application:
 - .1 Install gypsum board for base layer and exposed gypsum board for face layer.
 - .2 Apply base layer to ceilings prior to base layer application on walls; apply face layers in same sequence. Offset joints between layers at least 250 mm.
 - .3 Apply base layers at right angles to supports unless otherwise indicated.
 - .4 Apply base layer on walls and face layers vertically with joints of base layer over supports and face layer joints offset at least 250 mm with base layer joints.
- .3 Apply 12 mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, and ducts, in partitions where perimeter sealed with acoustic sealant.
- .4 Install gypsum board on walls vertically to avoid end-butt joints. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs, except where local codes or fire-rated assemblies require vertical application.
- .5 Install gypsum board with face side out.
- .6 Do not install damaged or damp boards.
- .7 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

3.4 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 at 150 mm on centre.
- .2 Install casing beads around perimeter of suspended ceilings.
- .3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.
- .4 Install insulating strips continuously at edges of gypsum board and casing beads abutting metal window and exterior door frames, to provide thermal break.
- .5 Construct control joints of preformed units set in gypsum board facing and supported independently on both sides of joint.
- .6 Provide continuous polyethylene dust barrier behind and across control joints.
- .7 Locate control joints at changes in substrate construction at approximate 10 m spacing on long corridor runs at approximate 15 m spacing on ceilings.
- .8 Install control joints straight and true.
- .9 Construct expansion joints as detailed, at building expansion and construction joints. Provide continuous dust barrier.

- .10 Install expansion joint straight and true.
- .11 Install cornice cap where gypsum board partitions do not extend to ceiling.
- .12 Fit cornice cap over partition, secure to partition track with two rows of sheet metal screws staggered at 300 mm on centre.
- .13 Splice corners and intersections together and secure to each member with 3 screws.
- .14 Install access doors to electrical and mechanical fixtures specified in respective sections.
 - .1 Rigidly secure frames to furring or framing systems.
- .15 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.
- .16 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with AWCI Levels of Gypsum Board Finish:
 - .1 Levels of finish:
 - .1 At typical wall and ceiling locations. 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 edges.
- .17 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.
- .18 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.
- .19 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.
- .20 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.6 PROTECTION

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

1.0 GENERAL

1.1 RELATED REQUIREMENTS

- | | | |
|----|-----------------------|------------------|
| .1 | Rough Carpentry | Section 06 10 11 |
| .2 | Finish Carpentry | Section 06 20 00 |
| .3 | Metal Doors & Frames | Section 08 11 00 |
| .4 | Gypsum Board Assembly | Section 09 21 16 |

1.2 REFERENCES

- .1 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33
- .2 Environmental Protection Agency (EPA)
 - .1 EPA Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 - 1995, (for Surface Coatings).
- .3 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .4 Master Painters Institute (MPI)
 - .1 MPI Architectural Painting Specifications Manual, November 2007.
 - .2 MPI Maintenance Repainting Manual, latest edition.
- .5 National Fire Code of Canada - 2010
- .6 Society for Protective Coatings (SSPC)
 - .1 SSPC Painting Manual, Volume Two, 8th Edition, Systems and Specifications Manual.

1.3 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Contractor: minimum of five years proven satisfactory experience. Provide list of last three comparable jobs including, job name and location, specifying authority, and project manager.
 - .2 Journeymen: qualified journeymen who have "Tradesman Qualification Certificate of Proficiency" engaged in painting work.
 - .3 Apprentices: working under direct supervision of qualified trade's person in accordance with trade regulations.
- .2 Conform to the standards contained in the Master Painters Institute Architectural Painting Specification Manual, latest edition (hereafter referred to as MPI Painting Specification Manual) for all painting products including preparation and application of materials. MPI Painting Specification Manual as issued by the local MPI Accredited Quality Assurance Association having jurisdiction.
- .3 All paint manufacturers and products used shall be as listed under the "Approved Products" section of the MPI Painting Specification manual.
- .4 Other paint materials shall be the highest quality product of an approved manufacturer listed in MPI Painting Specification Manual and shall be compatible with other coating materials as required.

- .5 Single-Source Responsibility: provide primers and undercoat paint produced by the same manufacturer as the finish coat.
- .6 Pre-Installation Meeting:
 - .1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Coordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.
- .7 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.4 PERFORMANCE REQUIREMENTS

- .1 Environmental Performance Requirements:
 - .1 Provide paint products meeting MPI "Environmentally Friendly" E2 ratings based on VOC (EPA Method 24) content levels.
- .2 Green Performance in accordance with MPI Standard GPS-1.

1.5 SCHEDULING

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

1.6 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit product data and instructions for each paint and coating product to be used.
 - .2 Submit product data for the use and application of paint thinner.
 - .3 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 35 33 - Health and Safety Requirements.
- .3 Samples:
 - .1 Submit manufacturer's standard range of color choices on each specified color type as listed in Colour Schedule of this section for selection, review and acceptance of each color.
 - .2 Submit triplicates 200 x 300 mm sample panels of each paint with specified paint in colours, gloss/sheen and textures required, based on selected colors, to MPI Architectural Painting Specification Manual standards submitted on following substrate materials:
 - .1 3 mm plate steel for finishes over metal surfaces.
 - .2 13 mm gypsum board for finishes over gypsum board and other smooth surfaces.
 - .3 Retain reviewed samples on-site to demonstrate acceptable standard of quality for appropriate on-site surface. 50mm concrete block for finishes over concrete or concrete masonry surfaces.

- .4 Test reports: submit certified test reports for paint from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
 - .1 Lead, cadmium and chromium: presence of and amounts.
 - .2 Mercury: presence of and amounts.
 - .3 Organochlorines and PCBs: presence of and amounts.
- .5 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .6 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.
- .7 Closeout Submittals: submit maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals include following:
 - .1 Product name, type and use.
 - .2 Manufacturer's product number.
 - .3 Colour numbers.
 - .4 MPI Environmentally Friendly classification system rating.

1.7 MAINTENANCE

- .1 Extra Materials:
 - .1 Deliver to extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Section 01 78 00 - Closeout Submittals.
 - .2 Quantity: provide one - 4 litre (1 gallon) can of each type and colour of primer stain finish coating. Identify colour and paint type in relation to established colour schedule and finish system.
 - .3 Delivery, storage and protection: comply with Departmental Representative requirements for delivery and storage of extra materials.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Packing, Shipping, Handling and Unloading:
 - .1 Pack, ship, handle and unload materials in accordance with Section 01 61 00 - Common Product Requirements and manufacturer's written instructions.
- .2 Acceptance at Site:
 - .1 Identify products and materials with labels indicating:
 - .1 Manufacturer's name and address.
 - .2 Type of paint or coating.
 - .3 Compliance with applicable standard.
 - .4 Colour number in accordance with established colour schedule.
- .3 Remove damaged, opened and rejected materials from site.
- .4 Storage and Protection:
 - .1 Provide and maintain dry, temperature controlled, secure storage.
 - .2 Store materials and supplies away from heat generating devices.
 - .3 Store materials and equipment in well-ventilated area with temperature range 7 degrees C to 30 degrees C.
- .5 Store temperature sensitive products above minimum temperature as recommended by manufacturer.

INTERIOR PAINTING

- .6 Keep areas used for storage, cleaning and preparation clean and orderly. After completion of operations, return areas to clean condition.
- .7 Remove paint materials from storage only in quantities required for same day use.
- .8 Fire Safety Requirements:
 - .1 Provide one Type ABC fire extinguisher adjacent to storage area.
 - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
 - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada requirements.
- .9 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - 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 (WMP).
 - .4 Separate for recycling and place in designated containers Steel, Metal, Plastic waste in accordance with Waste Management Plan (WMP).
 - .5 Place materials defined as hazardous or toxic in designated containers.
 - .6 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal, regulations.
 - .7 Ensure emptied containers are sealed and stored safely.
 - .8 Unused paint, coating materials must be disposed of at official hazardous material collections site as approved by Departmental Representative.
 - .9 Paint, stain and wood preservative finishes and related materials (thinners and solvents) are regarded as 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.
 - .10 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
 - .11 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
 - .12 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into ground follow these procedures:
 - .1 Retain cleaning water for water-based materials to allow sediments to be filtered out.
 - .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 approved legal manner in accordance with hazardous waste regulations.
 - .5 Empty paint cans are to be dry prior to disposal or recycling (where available).
 - .13 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.
 - .14 Set aside and protect surplus and uncontaminated finish materials. Deliver to or arrange collection by organizations for verifiable re-use or re-manufacturing.

1.9 SITE CONDITIONS

- .1 Heating, Ventilation and Lighting:

- .1 Provide heating facilities to maintain ambient air and substrate temperatures above 10 degrees C for 24 hours before, during and after paint application until paint has cured sufficiently.
 - .2 Provide continuous ventilation for seven days after completion of application of paint.
 - .3 Coordinate use of existing ventilation system with Departmental Representative and ensure its operation during and after application of paint as required.
 - .4 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.
 - .5 Provide minimum lighting level of 323 Lux on surfaces to be painted.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
- .1 Unless pre-approved written approval by Paint Inspection Agency Authority and product manufacturer, perform no painting when:
 - .1 Ambient air and substrate temperatures are below 10 degrees C.
 - .2 Substrate temperature is above 32 degrees C unless paint is specifically formulated for application at high temperatures.
 - .3 Substrate and ambient air temperatures are not expected to fall within MPI or paint manufacturer's prescribed limits.
 - .4 The relative humidity is under 85% or when the dew point is more than 3 degrees C variance between the air/surface temperature. Paint should not be applied if the dew point is less than 3 degrees C below the ambient or surface temperature. Use sling psychrometer to establish the relative humidity before beginning paint work.
 - .5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.
 - .6 Ensure that conditions are within specified limits during drying or curing process, until newly applied coating can itself withstand 'normal' adverse environmental factors.
 - .2 Perform painting work when maximum moisture content of the substrate is below:
 - .1 Allow new concrete and masonry to cure minimum of 28 days.
 - .2 15% for wood.
 - .3 12% for plaster and gypsum board.
 - .3 Test for moisture using calibrated electronic Moisture Meter. Test concrete floors for moisture using "cover patch test".
 - .4 Test concrete, masonry and plaster surfaces for alkalinity as required.
- .3 Surface and Environmental Conditions:
- .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
 - .2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits.
 - .3 Apply paint when previous coat of paint is dry or adequately cured.
- .4 Additional interior application requirements:
- .1 Apply paint finishes when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.
 - .2 Apply paint in occupied facilities during silent hours only. Schedule operations to approval of Departmental Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.

1.10 GUARANTEE

- .1 Furnish a 100% two (2) year Maintenance Bond.
- .2 Painting and decorating Subcontractors providing a Maintenance Bond shall provide a maintenance bond consent from a reputable surety company licensed to do business in Canada. Cash or certified cheque are not acceptable in lieu of surety consent.

2.0 PRODUCTS

2.1 MATERIALS

- .1 Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.
- .2 Provide paint materials for paint systems from single manufacturer.
- .3 Only qualified products with E2 "Environmentally Friendly" rating are acceptable for use on this project.
- .4 Conform to latest MPI requirements for interior painting work including preparation and priming.
- .5 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) in accordance with MPI Architectural Painting Specification Manual "Approved Product" listing.
- .6 Linseed oil, shellac, and turpentine: highest quality product from approved manufacturer listed in MPI Architectural Painting Specification Manual, compatible with other coating materials as required.
- .7 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids:
 - .1 Water-based.
 - .2 Non-flammable.
 - .3 Manufactured without compounds which contribute to ozone depletion in the upper atmosphere.
 - .4 Manufactured without compounds which contribute to smog in the lower atmosphere.
 - .5 Do not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.
- .8 Formulate and manufacture water-borne surface coatings with no aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.
- .9 Flash point: 61.0 degrees C or greater for water-borne surface coatings and recycled water-borne surface coatings.
- .10 Ensure manufacture and process of both water-borne surface coatings and recycled water-borne surface coatings does not release:
 - .1 Matter in undiluted production plant effluent generating 'Biochemical Oxygen Demand' (BOD) in excess of 15 mg/L to natural watercourse or sewage treatment facility lacking secondary treatment.
 - .2 Total Suspended Solids (TSS) in undiluted production plant effluent in excess of 15 mg/L to natural watercourse or a sewage treatment facility lacking secondary treatment.
- .11 Recycled water-borne surface coatings must not contain:
 - .1 Lead in excess of 600.0 ppm weight/weight total solids.
 - .2 Mercury in excess of 50.0ppm weight/weight total product.
 - .3 Cadmium in excess of 1.0ppm weight/weight total product.
 - .4 Hexavelant chromium in excess of 3.0 ppm weight/weight total product.

- .5 Organochlorines or polychlorinated biphenyls (PCBS) in excess of 1.0 ppm weight/weight total product.

2.2 COLOURS

- .1 Departmental Representative will provide Colour Schedule after Contract award. Submit proposed Colour Schedule to Departmental Representative for approval.
- .2 Colour schedule will be based upon selection of one colour. No more than five colours will be selected for entire project and no more than three colours will be selected in each area.
- .3 Selection of colours will be from manufacturers full range of colours.
- .4 Where specific products are available in restricted range of colours, selection will be based on limited range.
- .5 Second coat in three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.
- .6 Refer to Colour Schedule of this Section, and Section 09 06 00 Finish Schedule and drawings for identification and location of colours.

2.3 MIXING AND TINTING

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

2.4 GLOSS/SHEEN RATINGS

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

	Gloss @ 60 degrees	Sheen @ 85 degrees
Gloss Level 1 Matte	Max.5	Max.10
Finish (flat) Gloss Level 2 -Velvet-Like Finish	Max.10	10 to 35
Gloss Level 3 -Eggshell Finish	10 to 25	10 to 35
Gloss Level 4 -Satin-Like Finish	20 to 35	Min.35
Gloss Level 5 -Traditional Semi-Gloss Finish	35 to 70	
Gloss Level 6 -Gloss finish	70 to 85	
Gloss Level 7 -High Gloss Finish	More than 85	

- .2 Gloss level ratings of painted surfaces as indicated.

2.5 INTERIOR SYSTEMS NEW CONSTRUCTION

- .1 Galvanized Metal: doors, frames, railings, misc steel, pipes, overhead decking, ducts, etc.
 - .1 INT 5.3B Waterbourne light industrial gloss level 5 coating.
- .2 Plaster and Gypsum Board Surfaces: gypsum wallboard, drywall, "sheet rock type material", etc.
 - .1 INT 9.2A Latex, gloss level 3 finish for wall typical, gloss level 1 finish for ceiling typical.
- .3 All paint systems to be MPI Premium Grade minimum 3 coat systems.
- .4 Provide additional coat as required to achieve the desired colour output, such as light colour over dark surface or dark accent colour.

2.7 SOURCE QUALITY CONTROL

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

3.0 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 GENERAL

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

3.3 EXAMINATION

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

3.4 PREPARATION

- .1 Protection:
 - .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Departmental Representative.
 - .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
 - .3 Protect factory finished products and equipment.
 - .4 Protect passing pedestrians, building occupants and general public in and about the building.
- .2 Surface Preparation in accordance with MPI Repainting Manual:
 - .1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.
 - .2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
 - .3 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Departmental Representative.
- .3 Clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
 - .1 Remove dust, dirt, and other surface debris by wiping with dry, clean cloths or compressed air.
 - .2 Wash surfaces with a biodegradable detergent and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.
 - .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
 - .4 Allow surfaces to drain completely and allow to dry thoroughly.
 - .5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.
 - .6 Use trigger operated spray nozzles for water hoses.
 - .7 Many water-based paints cannot be removed with water once dried. Minimize use of mineral spirits or organic solvents to clean up water-based paints.
- .4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.
- .5 Where possible, prime non-exposed surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.
 - .1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas.
 - .2 Apply wood filler to nail holes and cracks.
 - .3 Tint filler to match stains for stained woodwork.
- .6 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.
- .7 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes or vacuum cleaning.

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

3.5 APPLICATION

- .1 Method of application to be as approved by Departmental Representative. Apply paint by brush, roller, air or airless sprayer. Conform to manufacturer's application instructions unless specified otherwise.
- .2 Brush and Roller Application:
 - .1 Apply paint in uniform layer using brush and/or roller type suitable for application.
 - .2 Work paint into cracks, crevices and corners.
 - .3 Paint surfaces and corners not accessible to brush using spray daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
 - .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces free of roller tracking and heavy stipple.
 - .5 Remove runs, sags and brush marks from finished work and repaint.
- .3 Spray application:
 - .1 Provide and maintain equipment that is suitable for intended purpose, capable of atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
 - .2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
 - .3 Apply paint in uniform layer, with overlapping at edges of spray pattern. Back roll first coat application.
 - .4 Brush out immediately all runs and sags.
 - .5 Use brushes and rollers to work paint into cracks, crevices and places which are not adequately painted by spray.
- .4 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access.
- .5 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
- .6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
- .7 Sand and dust between coats to remove visible defects.
- .8 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.
- .9 Finish closets and alcoves as specified for adjoining rooms.
- .10 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

3.6 MECHANICAL/ELECTRICAL EQUIPMENT

- .1 Paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as indicated.
- .2 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.

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

3.7 SITE TOLERANCES

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

3.8 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 exposed surfaces that were not painted. Remove smears and patten immediately as operations progress, using compatible solvent.
- .4 Protect freshly completed surfaces from paint droppings and dust to approval of Departmental Representative. 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.

3.9 PAINT COLOUR SCHEDULE

- .1 All metal doors / frames allow different colour for door and frame.
- .2 Gypsum wall board – white to match existing as continued on site by Contractor.

1.0 GENERAL

1.1 SECTIONS INCLUDED

- .1 Supply and installation of anti-fatigue mat.

1.2 RELATED SECTIONS

- .1 Rough Carpentry Section 06 10 00
.2 Finish Carpentry Section 06 20 00

1.3 SUBMITTALS

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

1.4 MAINTENANCE DATA

- .1 Submit maintenance data for maintenance materials in accordance with Section 01 33 00.

1.5 WARRANTY

- .1 Contractor to provide two-year manufacturer's warranty for each item.

1.6 PROTECTION

- .1 Protect finished surfaces during shipment and installation by approved means. Do not remove until immediately prior to final completion.

2.0 PRODUCTS

- .1 Diamond Plate Ergonomic Anti-Fatigue Mat:
Length Inches: Confirm Length on-site
Width Inches: 36 (91.44cm)
Colour Finish: Black
Assembly: Assembled
Border Color: Chevron
Brand: Apache Mills
Construction: Vinyl
Manufacturers Part Number: 276019CB
Model: 276019CB
Size: Cut Length/Min 1 Ft., Max. 75 Ft.
Thickness Inches: 9/15
Weight Lbs: 4.8 (2.18kg)

3.0 EXECUTION

3.1 INSTALLATION

- .1 Install manufactured specialty items in locations shown and in accordance with manufacturer's recommended details, reviewed shop drawings and manufacturer's instructions.
- .2 Inspect the work of other sections upon which the work of this section depends. Proceed only after deficiencies, if any, in the work of other sections have been corrected.
- .3 Exposed fastenings unless otherwise approved, are to be of the same materials, colour and finish as the base metal on which they occur.
- .4 Finish work is to be plumb and level, free from distortion and defects detrimental to appearance or performance.

3.2 PROTECTION AND CLEAN-UP

- .1 Protect adjacent surfaces from damage during installation.
- .2 Protect from damage resulting from the work of other Sections.
- .3 Promptly, as the work proceeds, and on completion, remove all crating, wrapping and surplus materials and equipment.

3.3 DEMONSTRATION

- .1 Demonstrate proper operation to Owner's Representative.
- .2 Instruct Owner's Representative in maintenance procedures.

END OF SECTION 10 80 00

PART 1 - GENERAL

1.1 SUBMITTALS

- .1 Submittals: in accordance with Division 1 documents.
- .2 Shop drawings; submit drawings stamped and signed by the Contactor.
- .3 Shop drawings to show:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
- .4 Shop drawings and product data accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Acoustical sound power data, where applicable.
 - .3 Points of operation on performance curves.
 - .4 Manufacturer to certify current model production.
 - .5 Certification of compliance to applicable codes.
- .5 Prior to ordering any equipment, submit 6 sets of shop drawings to the Engineer for review/acceptance. The Engineer is not responsible for determining the quantity or handling of equipment.
- .6 Closeout Submittals:
 - .1 Provide operation and maintenance data for incorporation into manual specified in Division 1 documents.
 - .2 Operation and maintenance manual approved by, and final copies deposited with, the Engineer before final inspection.
 - .3 Operation data to include:
 - .1 Description of systems and their controls.
 - .2 Operation instruction for systems and component.
 - .3 Description of actions to be taken in event of equipment failure.
 - .4 Maintenance data to include:
 - .1 Servicing, maintenance, operation and troubleshooting instructions for each item of equipment.
 - .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.
- .6 Approvals:
 - .1 Submit 1 copy of draft Operation and Maintenance Manual to the Engineer for approval. Submission of individual data will not be accepted.
 - .2 Make changes as required and re-submit as directed by the Engineer.
- .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 Contractor to provide 1 set of reproducible mechanical drawings. Mark changes as work progresses and as changes occur.
 - .2 Transfer information daily 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 Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
- .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
- .3 Submit to the Engineer 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.
- .10 Submit copies of as-built drawings for inclusion in final TAB report.
- 1.2 DELIVERY, STORAGE, AND HANDLING
- .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section Division 1 documents.
- 1.3 SCOPE
- .1 The mechanical specifications form part of the contract documents and shall be read in conjunction with all other parts.
- .2 Contractor is required to provide complete, tested and fully operational systems in accordance with all codes, ordinances, base building standards and contract documents.
- .3 Layout drawings are approximate to scale and in some instances diagrammatic. Unless stated otherwise, they are not detailed installation instructions.
- .4 In the event of any conflicts between the drawings, specifications, or code requirements, the Contractor shall advise the Engineer in writing to allow resolution of the matter. This is to be done during the tender phase. Should this not happen, the better quality or greater extent of work shall be estimated upon and undertaken. All work to be to the satisfaction of the Engineer and client.
- .5 Prior to submitting their bid and when appointed, the Contractor shall visit the site to become thoroughly familiar with all aspects and issues relating to the work. Changes in contract due to failure in this regard on issues that could have been identified will not be considered.
- .6 Contractors undertaking the work must be skilled and experienced in the field of work, and shall within reason allow for all or any additional fittings, equipment or material to execute the work.

- .7 Tenders are to be based on equipment as specified. Alternate equipment offered to be identified separately with confirmation of equipment being similar and equal in all aspects. Tenders to state any difference in cost, delivery, benefit options relating to alternate equipment offered, including any revisions necessary to accommodate alternate equipment.
- .8 All drawings are to be read in conjunction with the mechanical specifications. Contractor to coordinate all required project phasing with the General Contractor.
- .9 All mechanical equipment, piping, ductwork, etc. installed on this project shall be seismically restrained in accordance with code requirements and as detailed in the specifications.
- .10 Routing and layout of all services is diagrammatic. The Contractor is responsible for field measurements and material coordination prior to installation, and is to offset as required to avoid conflicts with new and existing services.
- .11 The mechanical contractor is to liaise with all other trades to ensure required service and adequate space is provided for the installation of services.
- .12 All materials shall be new and ULC listed. Installation of materials shall be by approved contractor.
- .13 All grilles and diffusers to be balanced to air quantities noted on the drawings.
- .14 Firestop all piping sleeves through fire separations to match ratings. Confirm required ratings prior to start of work and submit shop drawings. Notify the Engineer prior to concealment for site inspection. Retain fire stopping mineral wool and sealant on site with manufacturer's packaging for review. Fire stopping to be in compliance with local codes.
- .15 All new sprinkler heads shall be installed in accordance with latest NFPA 13 (ordinary hazard group 2).
- .16 All domestic water piping shall be insulated and vapour sealed for entire length of service. Pipes to be insulated in ceiling and wall voids.
- .17 All plumbing fixtures to be installed complete with isolation valves on domestic water services.
- .18 All work is to be in compliance with all applicable local codes and landlord requirements. Contractor is responsible for being aware of and adhering to all landlord requirements.
- .19 Unless specifically identified otherwise, all equipment capacities and performance data (ie: cooling output, heating output, flow, head loss, etc.) are net values and understood to be external to any internal losses or gains associated with the equipment.

1.4 REGULATIONS, PERMITS,
FEES

- .1 All work to be in accordance with all applicable and latest codes, regulations of all Authorities Having Jurisdiction including but not limited to:
 - .1 Applicable City or District Building By-Laws
 - .2 National Building Code
 - .3 Worker's Compensation Board
 - .4 Fire Marshal
 - .5 CSA
 - .6 Electrical Code
 - .7 Canadian Gas Code
 - .8 National Fire Protection Association

1.5 INTENT AND REQUIREMENTS

- .1 Provide a complete and fully operational mechanical system as specified. Equipment and systems shall be installed as indicated close to structure with minimum interference with other services and equipment. Maintain all required service and access spaces.
- .2 Coordinate with other trades prior to installation to avoid conflicts
- .3 Improperly installed equipment shall be removed and replaced to the satisfaction of the Engineer.

1.6 QUERIES

- .1 During the tender, any conflicts, ambiguities, omissions or code compliant issues shall be submitted to the Engineer in writing for resolution. Such queries shall be submitted a minimum of 2 days prior to tender close.
- .2 Should no such queries be made, tenders will be deemed to be governed by the reasonable interpretation of the Engineer.

1.7 RESPONSIBILITY AND
LAYOUT

- .1 The Contractor shall be responsible for laying out his work.
- .2 Protect equipment and material from damage or weather.
- .3 Leave factory covers on equipment until installation and take precautions to avoid ingress of dirt or foreign material into pipes or ducts during construction.
- .4 Check and confirm all dimensions on site to ensure adequate space and clearances for equipment prior to ordering of same. Confirm layout of existing arrangements.
- .5 As space is often limited, liaise closely with other trades to ensure adequate space is provided to allow for drain lines, vent grading and service space.

1.8 EXISTING SERVICES

- .1 Notify the Engineer in writing should any existing services be observed as being defective, non-operational, dangerous or deemed unacceptable.
- .2 Interruption of any services shall be coordinated with and agreed with the client as to the duration and time of the event.

- 1.9 GUARANTEE AND WARRANTY. .1 Provide written guarantee warranting equipment supplied as part of the contract will be serviceable condition for a one year period from date of substantial completion. This date to be agreed with the Client and Engineer. During this period any defects in equipment, material, or workmanship shall be remedied promptly, to the satisfaction of the Engineer and at no cost to the Client.
- 1.10 SITE REVIEWS .1 The Contractor shall notify the Engineer in writing requesting a 50% review at rough-in prior to back filling of below grade work or concealment of any work. Notify the Engineer for review 2 working days in advance.
- 1.11 PROJECT CLOSE OUT REQUIREMENTS .1 Close out information required at completion of construction. Items noted with an "*" are required prior to FWD Engineering issuance of substantial completion.
- .2 General
- .1 Provision of operating and maintenance manuals.
- .2 A list of all/any outstanding items. If the list is deemed excessive, substantial completion will not be considered.
- .3 Contractor's guarantee letter.
- .4 *Seismic Engineer's Schedule S-B & S-C letters of assurance.
- .3 Plumbing
- .1 Final plumbing inspection acceptance report
- .4 HVAC
- .1 *Equipment commissioning reports
- .2 Air Balance Report
- .5 Fire Protection and Sprinklers
- .1 *Letter from the sprinkler contractor stating all fire protection sprinkler installations were completed in compliance with NFPA 13.
- 1.12 ALTERNATE TRADES AND EQUIPMENT SUPPLIERS .1 Alternate equipment suppliers/trades wishing to receive approval shall submit for approval 2 sets of performance and technical data at least 7 days prior to tender closing. Full information shall be provided including performance ratings, material, features, etc. and include information on previously installed locations with reference names and contact numbers.
- .2 Refer to the alternate trades and equipment suppliers list noted on the mechanical drawings.
- PART 2 - EXECUTION
- 2.1 PAINTING REPAIRS AND RESTORATION .1 Do painting in accordance with the specifications
- .2 Prime and touch up marred finished paint work to match original.
- .3 Restore to new condition, finishes which have been damaged.

2.2 CLEANING

- .1 Clean interior and exterior of all systems.

2.3 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.

2.4 PROTECTION

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

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- .1 Section Includes:
- .1 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, 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 C 335, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
 - .2 ASTM C 449/C 449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - .3 ASTM C 533, Calcium Silicate Block and Pipe Thermal Insulation.
 - .4 ASTM C 547, Mineral Fiber Pipe Insulation.
 - .5 ASTM C 921, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- .3 Canadian General Standards Board (CGSB)
 - .1 CGSB 51-GP-52Ma, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
- .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
- .6 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC-S701, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .3 CAN/ULC-S702, Thermal Insulation, Mineral Fibre, for Buildings
 - .4 CAN/ULC-S702.2, Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.

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.

<u>1.4 QUALITY ASSURANCE</u>	.1	Installer: shall be a specialist in performing the work of this Section.
<u>1.5 DELIVERY, STORAGE AND HANDLING</u>	.1	Deliver, store and handle in accordance with manufacturer's written instructions.
	.2	Deliver, store and handle materials in accordance with manufacturer's written instructions.
	.3	Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
	.2	Storage and Protection:
	.1	Protect from weather, construction traffic.
	.2	Protect against damage.
	.3	Store at temperatures and conditions required by manufacturer.
 <u>PART 2 - PRODUCTS</u>		
<u>2.1 FIRE AND SMOKE RATING</u>	.1	In accordance with CAN/ULC-S102.
	.1	Maximum flame spread rating: 25.
	.2	Maximum smoke developed rating: 50.
<u>2.2 INSULATION</u>	.1	Mineral fibre specified includes glass fibre, rock wool, slag wool.
	.2	Thermal conductivity ("k" factor) not to exceed specified values at 24 degrees C mean temperature when tested in accordance with ASTM C 335.
	.3	TIAC Code A-1: rigid moulded mineral fibre without factory applied vapour retarder jacket.
	.1	Mineral fibre: to CAN/ULC-S702
	.2	Maximum "k" factor: to CAN/ULC-S702.
	.4	TIAC Code C-2: mineral fibre blanket faced with factory applied vapour retarder jacket.
	.1	Mineral fibre: to CAN/ULC-S702.
	.2	Jacket: to CGSB 51-GP-52Ma.
	.3	Maximum "k" factor: to CAN/ULC-S702.
	<u>2.3 INSULATION SECUREMENT</u>	.1
.2		Contact adhesive: quick setting.
.3		Canvas adhesive: washable.
<u>2.4 CEMENT</u>	.1	Thermal insulating and finishing cement:
	.1	Hydraulic setting or Air drying on mineral wool, to ASTM C 449/C 449M.

<u>2.5 VAPOUR RETARDER LAP ADHESIVE</u>	.1	Water based, fire retardant type, compatible with insulation.
<u>2.6 INDOOR VAPOUR RETARDER FINISH</u>	.1	Vinyl emulsion type acrylic, compatible with insulation.
<u>PART 3 - EXECUTION</u>		
<u>3.1 MANUFACTURER'S INSTRUCTIONS</u>	.1	Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.
<u>3.2 PRE-INSTALLATION REQUIREMENT</u>	.1	Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.
	.2	Surfaces clean, dry, free from foreign material.
<u>3.3 INSTALLATION</u>	.1	Install in accordance with TIAC National Standards.
	.2	Apply materials in accordance with manufacturer's instructions and this specification.
	.3	Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.
	.4	Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
	.1	Install hangers, supports outside vapour retarder jacket.
	.5	Supports, Hangers:
	.1	Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.
<u>3.4 PIPING INSULATION SCHEDULES</u>	.1	Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.
	.2	TIAC Code: A-1.
	.1	Securements: Tape at 300 mm on center.
	.2	Seals: lap seal adhesive, lagging adhesive.
	.3	Installation: TIAC Code 1501-H.
	.3	TIAC Code: A-6
	.1	Securements: Tape at 300mm on center.
	.2	Seals: lap seal adhesive, lagging adhesive.
	.3	Installation: TIAC Code: 1501-C.
	.4	TIAC Code: C-2 with vapour retarder jacket.
	.1	Insulation securements: Tape at 300 mm on center.
	.2	Seals: lap seal adhesive, lagging adhesive.
	.3	Installation: TIAC Code: 1501-C.

- .5 Thickness of insulation as listed in following table.
- .1 Run-outs to individual units and equipment not exceeding 4000 mm long.

Application	TIAC code	Pipe sizes (NPS) and insulation thickness (mm)		
Runout		to 1	1 1/4	2 1/2
DHW	[A-1]	25	25	25
DCW w/ vapour seal	[C-2]	25	25	25
Refrigeration Tubing	[A-6]	25	25	25

- .6 Finishes:
- .1 Exposed indoors: paper.
- .2 Exposed outdoors: aluminum jacketing, water tight.
- .3 Concealed, indoors: paper.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for wet pipe fire protection and sprinkler systems for heated areas.

1.2 REFERENCES

- .1 American National Standards Institute/National Fire Prevention Association (ANSI/NFPA)
 - .1 ANSI/NFPA 13, Installation of Sprinkler Systems.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 National Fire Protection Association (NFPA)

1.3 DESIGN REQUIREMENTS

- .1 Design automatic wet pipe fire suppression sprinkler systems in accordance with required and advisory provisions of NFPA 13, by pipe schedules for ordinary hazard group 2.
- .2 Include with each system materials, accessories, and equipment inside and outside building to provide each system complete and ready for use.
- .3 Design and provide each system to give full consideration to blind spaces, piping, electrical equipment, ducts, and other construction and equipment in accordance with detailed shop drawings.
- .4 Locate sprinkler heads in consistent pattern with ceiling grid, lights, and air supply diffusers.
- .5 Devices and equipment for fire protection service: ULC approved for use in wet pipe sprinkler systems.
- .6 Design systems for earthquake protection for buildings.
- .7 Location of Sprinkler Heads:
 - .1 Locate heads in relation to ceiling and spacing of sprinkler heads not to exceed that permitted by NFPA 13.
 - .2 Uniformly space sprinklers on branch.
- .8 Water Distribution:
 - .1 Make distribution uniform throughout the area in which sprinkler heads will open.
 - .2 Discharge from individual heads in hydraulically most remote area to be 100% of specified density.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store and handle in accordance with Division 1 documents.
 - .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Storage and Protection:
 - .1 Store materials indoors

- .2 Store and protect materials from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

PART 2 - PRODUCTS

2.1 ABOVE GROUND PIPING SYSTEMS

- .1 Provide fittings for changes in direction of piping and for connections.

2.2 PIPE, FITTINGS AND VALVES

- .1 Pipe:
 - .1 Ferrous: to ANSI/NFPA 13.
- .2 Fittings and joints to ANSI/NFPA 13:
 - .1 Ferrous: screwed, welded, flanged or roll grooved.
 - .2 Provide threaded, fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are threaded.
 - .3 Plain-end fittings with mechanical couplings and fittings which use steel gripping devices to bite into pipe when pressure is applied will not be permitted.
 - .4 Fittings: ULC approved for use in wet pipe sprinkler systems.
 - .5 Ensure fittings, mechanical couplings, and rubber gaskets are supplied by same manufacturer.
 - .6 Side outlet tees using rubber gasketed fittings are not permitted.
 - .7 Sprinkler pipe and fittings: metal.
- .3 Pipe hangers:
 - .1 ULC listed for fire protection services in accordance with NFPA.

2.3 SPRINKLER HEADS

- .1 General: to ANSI/NFPA 13 and ULC listed for fire services.
- .2 Provide nominal orifice sprinkler heads.
 - .1 Release element of each head to be of standard temperature rating or higher as suitable for specific application.
 - .2 Provide fully concealed sprinkler heads and escutcheon plates where indicated.
 - .3 Ceiling cups: not permitted.

2.4 ESCUTCHEON PLATES

- .1 Provide polished chromium plated metal plates for piping passing through walls, floors, and ceilings.
- .2 Provide paint finish on metal plates in unfinished spaces.

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, inspect and test to acceptance in accordance with ANSI/NFPA 13 and ANSI/NFPA 25.
- 3.3 PIPE INSTALLATION .1 Install piping straight and true to bear evenly on hangers and supports. Do not hang piping from plaster ceilings.
- .2 Keep interior and ends of new piping and existing piping thoroughly cleaned of water and foreign matter.
- .3 Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of piping to prevent entry of water and foreign matter.
- .4 Inspect piping before placing into position.
- 3.4 FIELD PAINTING .1 Clean, pretreat, prime, and paint new systems including valves, piping, conduit, hangers, supports, miscellaneous metalwork, and accessories.
- .2 Apply coatings to clean, dry surfaces, using clean brushes.
- .3 Clean surfaces to remove dust, dirt, rust, and loose mill scale.
- .4 Immediately after cleaning, provide metal surfaces with 1 coat of pre-treatment primer.
- .5 Shield sprinkler heads with protective covering while painting is in progress.
- .6 Upon completion of painting, remove protective covering from sprinkler heads.
- .7 Remove sprinkler heads which have been painted and replace with new sprinkler heads.
- 3.5 FIELD QUALITY CONTROL .1 Site Test, Inspection:
- .1 Perform test to determine compliance with specified requirements and provide written notification of such to the Engineer.
- .2 Test, inspect, and approve piping before covering or concealing.
- .3 Preliminary Tests:
- .1 Hydrostatically test each system at 200 psig for a 2 hour period with no leakage or reduction in pressure.
- .2 Flush piping with potable water in accordance with NFPA 13.
- .3 Piping above suspended ceilings: tested, inspected, and approved before installation of ceilings.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME)
- .1 ANSI/ASME B16.15, Cast Bronze Threaded Fittings, Classes 125 and 250.
- .2 ANSI/ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
- .3 ANSI/ASME B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- .4 ANSI/ASME B16.24, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500 and 2500.
- .2 ASTM International Inc.
- .1 ASTM B 88M, 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-80, Bronze Gate, Globe, Angle and Check Valves.
- .5 National Research Council (NRC)/Institute for Research in Construction
- .1 NRCC 38728, National Plumbing Code of Canada (NPC) .

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 B 88M.

2.2 FITTINGS

- .1 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.

2.3 JOINTS

- .1 Bolts, nuts, hex head and washers: to ASTM A 307, heavy series.
- .2 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.

2.4 BALL VALVES

- .1 NPS 2 and under, soldered:
- .1 To ANSI/ASME B16.18, Class 150.
- .2 Bronze body, stainless steel ball, PTFE adjustable packing, brass gland and PTFE steel lever handle.

PART 3 - EXECUTION

3.1 APPLICATION

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

3.2 INSTALLATION

- .1 Install in accordance with NPC and local authority having jurisdiction.
- .2 Install pipe work in accordance with Section 23 05 05 - Installation of Pipework, supplemented as specified herein.
- .3 Assemble piping using fittings manufactured to ANSI standards.
- .4 Install DCW piping below and away from DHW and other hot piping so as to maintain temperature of cold water as low as possible.
- .5 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

3.3 VALVES

- .1 Isolate equipment, fixtures and branches with ball valves.

3.4 PRESSURE TESTS

- .1 Conform to requirements of Section 21 05 01 - Common Work Results for Mechanical.
- .2 Test pressure: greater of 1 times maximum system operating pressure or 860 kPa.

3.5 FLUSHING AND CLEANING

- .1 Clean domestic water system at completion of construction and prior to turn over to the Client thoroughly flush and clean piping.

3.6 PRE-START-UP INSPECTIONS

- .1 Systems to be complete, prior to flushing, testing and start-up.
- .2 Verify that system can be completely drained.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 ASTM International Inc.
- .1 ASTM B 32, Standard Specification for Solder Metal.
- .2 ASTM B 306, Standard Specification for Copper Drainage
Tube (DWV).
- .3 ASTM C 564, Standard Specification for Rubber Gaskets for
Cast Iron Soil Pipe and Fittings.

- .2 Canadian Standards Association (CSA International).
- .1 CSA B67, Lead Service Pipe, Waste Pipe, Traps, Bends and
Accessories.
- .2 CAN/CSA-B70, Cast Iron Soil Pipe, Fittings and Means of
Joining.
- .3 CAN/CSA-B125.3, Plumbing Fittings.

1.2 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Division 1 documents.
- .2 Deliver materials to site in original factory packaging, labelled with
manufacturer's name, address.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

- .1 Above ground sanitary and vent Type DWV to: ASTM B 306.
- .1 Fittings.
 - .1 Cast brass: to CAN/CSA-B125.3.
 - .2 Wrought copper: to CAN/CSA-B125.3.
- .2 Solder: lead free, tin to ASTM B 32.

2.2 CAST IRON PIPING AND FITTINGS

- .1 Above ground sanitary and vent: to CAN/CSA-B70.
- .1 Joints:
 - .1 Hub and spigot:
 - .1 Caulking lead: to CSA B67.
 - .2 Mechanical joints:
 - .1 Neoprene or butyl rubber compression
gaskets with stainless steel clamps.

PART 3 - EXECUTION

3.1 APPLICATION

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

3.2 INSTALLATION

- .1 Install in accordance with National Plumbing Code of Canada.

3.3 TESTING

- .1 Hydraulically test to verify grades and freedom from obstructions.
- .2 Submit pressure test reports in project manuals.

3.4 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 that cleanout rods can probe as far as the next cleanout, at least.
- .2 Test to ensure traps are fully and permanently primed.
- .3 Ensure that fixtures are properly anchored, connected to system and effectively vented.
- .4 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 REFERENCES
- .1 American Society for Testing and Materials International (ASTM).
 - .1 ASTM A 126, Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
 - .2 ASTM B 62, Specification for Composition Bronze or Ounce Metal Castings.
 - .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
 - .3 Plumbing and Drainage Institute (PDI).
 - .1 PDI-G101, Testing and Rating Procedure for Grease Interceptors with Appendix of Sizing and Installation Data.

1.2 SUBMITTALS

- .1 Submittals in accordance with Division 1 requirements
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet for fixtures and equipment.
 - .2 Indicate dimensions, construction details and materials for specified items.
- .3 Shop Drawings:
 - .1 Submit shop drawings to indicate materials, finishes, method of anchorage, dimensions, construction and assembly details
- .4 Instructions: submit manufacturer's installation instructions.

PART 2 - PRODUCTS

2.1 CLEANOUTS

- .1 Cleanout Plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.
- .2 Access Covers:
 - .1 Wall Access: face or wall type, polished nickel bronze or stainless steel square or round cover with flush head securing screws, bevelled edge frame complete with anchoring lugs.
 - .2 Floor Access: round cast iron body and frame with adjustable secured nickel bronze top and:
 - .1 Plugs: bolted bronze with neoprene gasket.
 - .2 Cover for Unfinished Concrete Floors: cast iron, gasket, vandal-proof screws.

2.2 SEDIMENT INTERCEPTORS

- .1 Reuse existing sediment interceptor for new layouts.

2.3 SINKS .1 Refer to drawings for specification of sink type and accessories.

PART 3 - EXECUTION

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

3.2 INSTALLATION .1 Install in accordance with National Plumbing Code of Canada and local authority having jurisdiction
.2 Install in accordance with manufacturer's instructions and as specified.

3.3 CLEANOUTS .1 Install cleanouts at base of soil and waste stacks, at locations required code, and as indicated.
.2 Bring cleanouts to wall or finished floor unless serviceable from below floor.
.3 Building drain cleanout and stack base cleanouts: line size to maximum NPS4.

3.4 SEDIMENT INTERCEPTORS .1 Install with sufficient space, as indicated, for ease of maintenance, access and cleaning.

END OF SECTION

PART 1 - GENERAL

1.1 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Division 1 documents.
- .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

PART 2 - EXECUTION

2.1 APPLICATION

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

2.2 CONNECTIONS TO EQUIPMENT

- .1 In accordance with manufacturer's instructions unless otherwise indicated.
- .2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.
- .3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

2.3 CLEARANCES

- .1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer and National Fire Code of Canada.
- .2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer without interrupting operation of other system, equipment, components.

2.4 DRAINS

- .1 Install piping with grade in direction of flow except as indicated.
- .2 Install drain valve at low points in piping systems, at equipment and at section isolating valves.
- .3 Pipe each drain valve discharge separately to above floor drain.
 - .1 Discharge to be visible.
- .4 Drain valves: NPS 3/4 gate or globe valves unless indicated otherwise, with hose end male thread, cap and chain.

2.5 DIELECTRIC COUPLINGS

- .1 General: compatible with system, to suit pressure rating of system.
- .2 Locations: where dissimilar metals are joined.
- .3 NPS 2 and under: isolating unions or bronze valves.

.4 Over NPS 2: isolating flanges.

2.6 PIPEWORK INSTALLATION

.1 Install pipework to CSA B139.

.2 Screwed fittings jointed with Teflon tape.

.3 Protect openings against entry of foreign material.

.4 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.

.5 Assemble piping using fittings manufactured to ANSI standards.

.6 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.

.7 Install concealed pipework to minimize furring space, maximize headroom, conserve space.

.8 Slope piping, except where indicated, in direction of flow for positive drainage and venting.

.9 Install, except where indicated, to permit separate thermal insulation of each pipe.

.10 Group piping wherever possible and as indicated.

.11 Ream pipes, remove scale and other foreign material before assembly.

.12 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.

.13 Provide for thermal expansion as indicated.

.14 Valves:

.1 Install in accessible locations.

.2 Remove interior parts before soldering.

.3 Install with stems above horizontal position unless indicated.

.4 Valves accessible for maintenance without removing adjacent piping.

.5 Use ball valves at branch take-offs for isolating purposes except where specified.

2.7 ESCUTCHEONS

.1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.

.2 Construction: one piece type with set screws.

.1 Chrome or nickel plated brass or type 302 stainless steel..

.3 Sizes: outside diameter to cover opening or sleeve.

.1 Inside diameter to fit around pipe or outside of insulation if so provided.

2.8 FLUSHING OUT OF PIPING SYSTEMS

.1 Flush and clean systems prior to turn over to the Client.

2.9 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

.1 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant mechanical sections.

.2 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.

.3 Pay costs for repairs or replacement, retesting, and making good. Engineer to determine whether repair or replacement is appropriate.

.4 Insulate or conceal work only after approval and certification of tests by the Engineer.

2.10 EXISTING SYSTEMS

.1 Be responsible for damage to existing plant by this work.

END OF SECTION

PART 1 - GENERAL

- 1.1 SYSTEM DESCRIPTION .1 Design Requirements:
- .1 Base maximum load ratings on allowable stresses prescribed by MSS SP 58. ASME B31.9 or
- .2 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
- .3 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
- .4 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP 58.

PART 2 - PRODUCTS

- 2.1 GENERAL .1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.9 and MSS SP 58.
- .2 Use components for intended design purpose only. Do not use for rigging or erection purposes.
- 2.2 VARIABLE SUPPORT SPRING HANGERS .1 Vertical movement: 13 mm minimum, 50 mm maximum, use single spring pre-compressed variable spring hangers.
- .2 Vertical movement greater than 50 mm: use double spring pre-compressed variable spring hanger with 2 springs in series in single casing.
- .3 Variable spring hanger complete with factory calibrated travel stops.
- .4 Steel alloy springs: to ASTM A 125, shot peened, magnetic particle inspected, with +/-5 % spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.
- 2.3 EQUIPMENT SUPPORTS .1 Fabricate equipment supports not provided by equipment manufacturer.
- 2.4 EQUIPMENT ANCHOR BOLTS AND TEMPLATES .1 Provide templates to ensure accurate location of anchor bolts.

PART 3 - EXECUTION

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

- 3.2 INSTALLATION .1 Install in accordance with:
.1 Manufacturer's instructions and recommendations.

- 3.3 HANGER SPACING .1 Plumbing piping: to National Plumbing Code
.2 Fire protection: to applicable fire code.
.3 Copper piping: up to NPS 1/2: every 1.5 m.
.4 Flexible joint roll groove pipe: in accordance with table below, but not less than one hanger at joints.
.5 Within 300mm of each elbow.

Maximum Pipe Size : NPS	Maximum Spacing Steel	Maximum Spacing Copper
up to 1-1/4	2.1 m	1.8 m
1-1/2	2.7 m	2.4 m
2	3.0 m	2.7 m
2-1/2	3.6 m	3.0 m
3	3.6 m	3.0 m
3-1/2	3.9 m	3.3 m
4	4.2 m	3.6 m
5	4.8 m	
6	5.1 m	
8	5.7 m	
10	6.6 m	
12	6.9 m	

- 3.4 HANGER INSTALLATION .1 Install hanger so that rod is vertical under operating conditions.
.2 Adjust hangers to equalize load.
.3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

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

- 3.6 FINAL ADJUSTMENT .1 Adjust hangers and supports:
.1 Ensure that rod is vertical under operating conditions.
.2 Equalize loads.

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

END OF SECTION

PART 1 - GENERAL

- 1.1 SUMMARY .1 Section Includes:
.1 Materials and requirements for the identification of piping systems, duct work, valves and controllers, including the installation and location of identification systems.
- 1.2 REFERENCES .1 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-1.60, Interior Alkyd Gloss Enamel.
.2 CAN/CGSB-24.3, Identification of Piping Systems.
- .2 National Fire Protection Association (NFPA)
.1 NFPA 13-, Standard for the Installation of Sprinkler Systems.

PART 2 - PRODUCTS

- 2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES .1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.
.2 Lettering and numbers raised or recessed.
.3 Information to include, as appropriate:
.1 Equipment: manufacturer's name, model, size, serial number, capacity.
.2 Motor: voltage, Hz, phase, power factor, duty, frame size.
- 2.2 SYSTEM NAMEPLATES .1 Colours:
.1 Hazardous: red letters, white background.
.2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).
- .2 Construction:
.1 3 mm thick laminated plastic, matte finish, with square corners, letters accurately aligned and machine engraved into core.
- .3 Sizes:
.1 Conform to following table:

Size #	mm Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

- .2 Use maximum of 25 letters/numbers per line.
- .4 Identification for PWGSC Preventive Maintenance Support System (PMSS):
 - .1 Use arrangement of Main identifier, Source identifier, Destination identifier.
 - .2 Equipment in Mechanical Room:
 - .1 Main identifier: size #9.
 - .2 Source and Destination identifiers: size #6.
 - .3 Terminal cabinets, control panels: size #5.
 - .3 Equipment elsewhere: sizes as appropriate.

2.3 EXISTING IDENTIFICATION SYSTEMS

- .1 Apply existing identification system to new work.
- .2 Where existing identification system does not cover for new work, use identification system specified this section.
- .3 Before starting work, obtain written approval of identification system from the Engineer.

2.4 PIPING SYSTEMS GOVERNED BY CODES

- .1 Identification:
 - .1 Natural gas: to CSA/CGA B149.1
 - .2 Sprinklers: to NFPA 13.

2.5 IDENTIFICATION OF PIPING SYSTEMS

- .1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.
- .2 Legend:
 - .1 Block capitals to sizes and colours listed in CAN/CGSB 24.3.
- .3 Arrows showing direction of flow:
 - .1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.
 - .2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.
 - .3 Use double-headed arrows where flow is reversible.
- .4 Extent of background colour marking:
 - .1 To full circumference of pipe or insulation.
 - .2 Length to accommodate pictogram, full length of legend and arrows.
- .5 Materials for background colour marking, legend, arrows:
 - .1 Pipes and tubing 20 mm and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.
 - .2 Other pipes: pressure sensitive plastic-coated cloth with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150 degrees C.
- .6 Colours and Legends:
 - .1 Where not listed, obtain direction the Engineer
 - .2 Colours for legends, arrows: to following table:

<u>Background colour:</u>	<u>Legend, arrows:</u>
Yellow	BLACK
Green	WHITE
Red	WHITE

.3 Background colour marking and legends for piping systems:

<u>Contents</u>	<u>Background colour</u>	<u>Legend marking</u>
Domestic hot water supply	Green	DOM. HW SUPPLY
Domestic cold water supply	Green	DOM. CWS
Sanitary	Green	SAN
Plumbing vent	Green	SAN. VENT

<u>2.6 IDENTIFICATION DUCTWORK SYSTEMS</u>	.1	50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.
	.2	Colours: back, or co-ordinated with base colour to ensure strong contrast.
<u>2.7 CONTROLS COMPONENTS IDENTIFICATION</u>	.1	Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.
	.2	Inscriptions to include function and (where appropriate) fail-safe position.
<u>2.8 LANGUAGE</u>	.1	Identification in English
	.2	Use one nameplate and label.
 <u>PART 3 - EXECUTION</u>		
<u>3.1 MANUFACTURER'S INSTRUCTIONS</u>	.1	Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.
<u>3.2 INSTALLATION</u>	.1	Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.
	.2	Provide ULC or CSA registration plates as required by respective agency.
	.3	Identify systems, equipment to conform to PWGSC PMSS.
<u>3.3 NAMEPLATES</u>	.1	Locations:
	.1	In conspicuous location to facilitate easy reading and identification from operating floor.

3.4 LOCATION OF
IDENTIFICATION ON
PIPING AND DUCTWORK
SYSTEMS

- .2 Standoffs:
 - .1 Provide for nameplates on hot and/or insulated surfaces.
- .3 Protection:
 - .1 Do not paint, insulate or cover.
- .1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.
- .2 Adjacent to each change in direction.
- .3 At least once in each small room through which piping or ductwork passes.
- .4 On both sides of visual obstruction or where run is difficult to follow.
- .5 On both sides of separations such as walls, floors, partitions.
- .6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.
- .7 At beginning and end points of each run and at each piece of equipment in run.
- .8 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.
- .9 Identification easily and accurately readable from usual operating areas and from access points.
 - .1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 QUALIFICATIONS OF TAB PERSONNEL

- .1 TAB shall be undertaken by an approved agency as listed on the drawings and in the specifications.
- .2 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.
- .3 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 START-UP .1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.
- 1.7 START OF TAB .1 Start TAB when building is essentially completed, including:
- .2 Installation of ceilings, doors, windows, other construction affecting TAB.
- .3 Application of weatherstripping, sealing, and caulking.
- .4 Pressure, leakage, other tests specified elsewhere Division 23.
- .5 Provisions for TAB installed and operational.
- .6 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:
- .1 Proper thermal overload protection in place for electrical equipment.
- .2 Air systems:
- .1 Duct systems clean.
- .2 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.
- .3 Correct fan rotation.
- .4 Access doors, installed, closed.
- .5 Outlets installed, volume control dampers open.
- 1.8 TAB REPORT .1 TAB report to show results and to include:
- .1 Project record drawings.
- .2 System schematics.
- .2 Submit 1 copy of TAB Report the Engineer for verification and approval, in English. TAB Report to be included in each of the project manuals.
- 1.9 SETTINGS .1 After TAB is completed to satisfaction of the Engineer, 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.
- 1.10 COMPLETION OF TAB .1 TAB considered complete when final TAB Report received and approved by the Engineer.
- 1.11 AIR SYSTEMS .1 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.

- .2 Locations of equipment measurements: to include as appropriate:
 - .1 Inlet and outlet of dampers, filter, coil, fan, other equipment causing changes in conditions.
 - .2 At controllers, controlled device.
- .3 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

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 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
.1 Material Safety Data Sheets (MSDS).
.3 National Fire Protection Association (NFPA).
.1 NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems.
.2 NFPA 90B, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
.4 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
.1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2nd Edition
.2 SMACNA HVAC Air Duct Leakage Test Manual, 1st Edition.
- 1.3 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 During construction meet or exceed the requirements of SMACNA IAQ Guideline for Occupied Buildings under Construction.
- 1.4 DELIVERY, STORAGE AND HANDLING .1 Protect on site stored or installed absorptive material from moisture damage.

PART 2 - PRODUCTS

- 2.1 SEAL CLASSIFICATION .1 Classification as follows:

<u>Maximum Pressure Pa</u>	<u>SMACNA Seal Class</u>
500	[C]
250	[C]
125	[C]

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

- .2 Class B: longitudinal seams, transverse joints and connections made airtight with sealant.
- .3 Class C: transverse joints and connections made air tight with sealant. Longitudinal seams unsealed.
- .4 Unsealed seams and joints.

- 2.2 SEALANT .1 Sealant: oil resistant, or water borne flame resistant duct sealant.

- 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: standard radius times width of duct.
 - .2 Round: smooth radius Centreline radius: 1.5 times diameter.
- .3 Transitions:
 - .1 Diverging: 20 degrees maximum included angle.
 - .2 Converging: 30 degrees maximum included angle.
- .4 Offsets:
 - .1 Full radiused elbows

- 2.5 GALVANIZED STEEL .1 Lock forming quality: to ASTM A 653/A 653M, Z90 zinc coating.
- .2 Thickness, fabrication and reinforcement: to SMACNA
- .3 Joints: to SMACNA.

- 2.6 HANGERS AND SUPPORTS .1 Hangers and Supports: in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
- .1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct
- .2 Hanger configuration: to SMACNA.
- .3 Hangers: galvanized steel angle with galvanized steel rods to SMACNA

<u>Duct Size</u> (mm)	<u>Angle Size</u> (mm)	<u>Rod Size</u> (mm)
up to 750	25 x 25 x 3	6
751 to 1050	40 x 40 x 3	6
1051 to 1500	40 x 40 x 3	10
1501 to 2100	50 x 50 x 3	10
2101 to 2400	50 x 50 x 5	10
2401 and over	50 x 50 x 6	10

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

PART 3 - EXECUTION

3.1 GENERAL

- .1 Do work in accordance with SMACNA
- .2 Do not break continuity of insulation vapour barrier with hangers or rods.
- .3 Install breakaway joints in ductwork on sides of fire separation.
- .4 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.

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

<u>Duct Size</u> (mm)	<u>Spacing</u> (mm)
to 1500	3000
1501 and over	2500

3.3 SEALING

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

3.4 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 Complete test before performance insulation or concealment Work.

END OF SECTION

PART 1 - GENERAL

- 1.1 SUMMARY .1 Section Includes:
.1 Materials and installation of high-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 (ASTM).
.1 ASTM A 653/A 653M-[04a], Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process. (Metric).
.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
.1 Material Safety Data Sheets (MSDS).
.5 Sheet Metal Air Conditioning Contractors' National Association (SMACNA).
.1 SMACNA HVAC Duct Construction Standards, Metal and Flexible.
.2 SMACNA HVAC Air Duct Leakage Test Manual.
- 1.3 QUALITY ASSURANCE .1 Certification of Ratings:
.1 Catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.
.2 Health and Safety:
.1 Do construction occupational health and safety in accordance with Division 1 requirements.
- 1.4 DELIVERY, STORAGE AND HANDLING .1 Protect on site stored or installed absorptive material from moisture damage.

PART 2 - PRODUCTS

- 2.1 DUCTWORK .1 Material:
.1 Galvanized steel with Z90 designation zinc coating lock forming quality: to ASTM A 653/A 653M.
.2 Thickness: to SMACNA.
.2 Construction - round.
.1 Ducts: factory fabricated, spiral wound, with matching fittings and specials to SMACNA.
.2 Transverse joints up to 900mm: slip type with tape and sealants.

- .3 Transverse joints over 90]mm: Vanstone.
- .4 Fittings:
 - .1 Elbows: smooth radius.
 - .2 Branches: conical transition with conical branch at 45 degrees and 45 degrees elbow.

2.2 SEAL CLASSIFICATION .1 Classification as follows:

Maximum Pressure Pa	SMACNA Seal Class
2500	[A]
1500	[A]
1000	[A]
750	[B]

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

2.3 HANGERS AND SUPPORTS .1

- Hangers and Supports: [in accordance with other specifications sections
- .1 Band hangers: use on round and oval ducts up to 500 mm diameter, of same material as duct but next sheet metal thickness heavier than duct.
 - .2 Trapeze hangers: ducts over 500 mm diameter or longest side, to SMACNA .
 - .3 Hangers: [galvanized] steel angle with galvanized steel rods to ASHRAE and SMACNA, or as follows with the most stringent requirements being applied:

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
up to 750	25 x 25 x 3	6
751 to 1050	40 x 40 x 3	6
1051 to 1500	40 x 40 x 3	10
1501 to 2100	50 x 50 x 3	10
2101 to 2400	50 x 50 x 5	10
2401 and over	50 x 50 x 6	10

PART 3 - EXECUTION

3.1 GENERAL

- .1 Do work in accordance with ASHRAE and SMACNA.
- .2 Do not break continuity of insulation vapour barrier with hangers or rods.
- .4 Install breakaway joints in ductwork on sides of fire separation.

3.2 HANGERS

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

3.3 SEALING AND TAPING

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

END OF SECTION

PART 1 - GENERAL

- 1.1 SUMMARY .1 Section Includes:
.1 Materials and installation for duct accessories including flexible connections, access doors, etc.
- 1.2 REFERENCES .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
.1 Material Safety Data Sheets (MSDS).
.2 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
.1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

PART 2 - PRODUCTS

- 2.1 GENERAL .1 Manufacture in accordance with SMACNA - HVAC Duct Construction Standards.
- 2.2 FLEXIBLE CONNECTIONS .1 Frame: galvanized sheet metal frame with fabric clenched by means of double locked seams.
.2 Material:
.1 Fire resistant, self extinguishing, neoprene coated glass fabric.

PART 3 - EXECUTION

- 3.1 MANUFACTURER'S INSTRUCTIONS .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.
- 3.2 INSTALLATION .1 Flexible Connections:
.1 Install in following locations:
.1 Inlets and outlets to supply air units and fans.
.2 Length of connection: 100 mm.
.3 Minimum distance between metal parts when system in operation: 75 mm.
.4 Install in accordance with recommendations of SMACNA.
.5 When fan is running:
.1 Ducting on sides of flexible connection to be in alignment.
.2 Ensure slack material in flexible connection.

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.

PART 2 - PRODUCTS

- 2.1 GENERAL .1 Manufacture to SMACNA standards.
- 2.2 SINGLE BLADE DAMPERS .1 Fabricate from same material as duct, but one sheet metal thickness heavier. V-groove stiffened.
.2 Size and configuration to recommendations of SMACNA.
.3 Locking quadrant.
.4 Channel frame of same material as adjacent duct, complete with angle stop.
- 2.3 MULTI-BLADED DAMPERS .1 Factory manufactured of material compatible with duct.
.2 Opposed blade: configuration, metal thickness and construction to recommendations of SMACNA.
.3 Linkage: shaft extension with locking quadrant.
.4 Channel frame of same material as adjacent duct, complete with angle stop.

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.

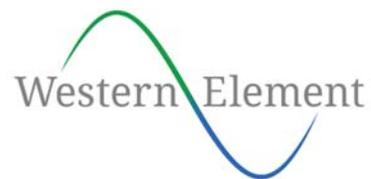
- .3 Locate balancing dampers in each branch duct, for supply, return and exhaust systems.
- .4 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.
- .5 Dampers: vibration free.
- .6 Ensure damper operators are observable and accessible.

END OF SECTION

PESC BLOCK B
Sediment preparation Room
Project PESC-028-Ji258
2645 Dollarton Hwy., North Vancouver

Electrical Specifications

Prepared for:
Chernoff Thompson Architects
110-1281 West Georgia
Vancouver



Prepared by:
Western Element Engineering Inc.
#209-201 Bewicke Ave.
North Vancouver

Project No. 1519

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- 1.7 As-Built Drawings
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SECTION 27 05 13 – COMMUNICATIONS SYSTEM

- 1.1 Telecom Distribution
- 1.2 Data Wiring

SECTION 28 13 00 – ACCESS CONTROL SYSTEM

- 1.1 General

1.1 GENERAL INSTRUCTIONS

- .1 The General Conditions and General Requirements shall apply to and govern these Specifications.
- .2 Provide all material, equipment and labour required to complete the work indicated on the Tender Documents.
- .3 Should any work or material be needed, which is not specified or shown on the drawings and is nevertheless necessary for properly carrying out the obvious intent, such work or materials shall be provided without additional cost.
- .4 The Contractor shall familiarize himself with all drawings and specifications and shall arrange his equipment in proper relation to all architectural and mechanical features. The architectural drawings shall be consulted for dimensional information.
- .5 Should any discrepancy between the specifications and drawings leave the Contractor in doubt regarding the intent, an interpretation shall be obtained from the Consultant before the tender is submitted. If this is not done, it will be assumed that the Contractor has included in his tender price the more expensive option.

1.2 MATERIALS

- .1 The drawings and specifications call for specific equipment. Alternate materials or equipment will not be considered.
- .2 Where two or more units of the same class are required, these units shall be the products of a single manufacturer.
- .3 All materials furnished shall be new and as specified, or an approved alternate. All electrical equipment and materials shall be CSA approved and bear approval marking.
- .4 Any substitutions made without approval render the material or equipment liable to rejection after installation.

1.3 WORKMANSHIP

- .1 The complete installation shall be carried out by qualified trades persons, in a neat workmanlike manner. The Contractor shall rectify unacceptable workmanship to the approval of the Consultant. Upon completion of daily work, clean up and remove all unused material, debris, etc. from the site.
- .2 The electrical foreman must be named at the outset of the project and must continue in this position until project completion.

1.4 GUARANTEE

- .1 Repair or replace any defective materials or installations, at no additions cost for a period of one year from the date of Substantial Performance, and pay for all resulting damage (labour and material) which appears within this warranty period.
- .2 Where, in the opinion of the Consultant, an unreasonable delay in replacement or acceptable repair occurs on the part of the Contractor, repairs or replacement will be made by the Owner, and the cost of such repairs shall be borne by this Contractor.
- .3 No certificate given, payment made or use of the equipment or systems by the Owner shall be construed as acceptance of defective work.

1.5 REGULATION

- .1 The Electrical Systems and components shall conform to requirements of the following Codes and Standards (current edition):
 - .1 BC Building Code
 - .2 Canadian Electrical Code including BC Electrical Safety Branch Directives and Bulletins.
 - .3 CSA/UL-c
 - .4 ANSI/TIA/EIA-569

1.6 SHOP DRAWINGS

- .1 Six copies of complete and detailed shop drawings of each electrical component and system shall be submitted to the Consultant for approval. Digital shop drawings will be acceptable provided certifications, stamps and signatures are non-removable.
- .2 Shop drawings submitted shall be certified by the manufacturer, checked by the Contractor and bear approval stamp and signature. Drawings not previously checked by the Contractor will not be reviewed.
- .3 The review of shop drawings by the Consultant is for the sole purpose of ascertaining conformance with the general design. This review shall not mean that the Consultant approves the detail inherent in the shop drawings, responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the Contractor of his responsibility for errors or omissions in the shop drawings or of his responsibility for meeting all requirements of the Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site and for coordination of work of all relevant subtrades.
- .4 Shop Drawings shall bear relevant C.S.A. Standard Approvals.

1.7 AS-BUILT DRAWINGS

- .1 Obtain one set of the electrical drawings, for the sole purpose of recording any changes made to the original drawings in the process of construction. These as-built mark-up drawings shall be **kept on site**, made available upon Consultant request, kept current and stamped "As-Built".
- .2 Prior to Substantial Performance, these mark-up drawings shall be resubmitted, with any required changes, to the Consultant for review and conversion to AutoCAD format as-built drawings. Contractor shall allow fee of \$500.00 to provide Autocad services. The project will not be considered substantially performed until corrected mark-up drawings have been submitted and approved.

1.8 IDENTIFICATION OF EQUIPMENT

- .1 Panelboards, circuit breakers, starters, switches, etc. shall be identified.
- .2 Panelboards shall be provided with word processor generated circuit directories clearly indicating usage of each breaker. Directories shall be removable, substantial cards held in a suitable card holder on the inside of the panel door. Additionally, one set of directories shall be submitted with maintenance manuals and electronic files shall be included. Acceptable format is Microsoft Word or Excel.

-
- .3 Identification of enclosures and panel boards shall be with "Lamicoid" nameplates with ¼" high letters. Provide list of nameplates and text to consultant for review and approval prior to manufacture. Panelboards shall have nameplates showing designation and supply source. Label for new circuit breaker panels shall be white lettering on black background for normal power and white lettering on red background for emergency power.
 - .4 Low voltage cables shall be identified using Panduit laser printed labels at both ends of cables as well as at field and communication room devices

1.9 OPERATING AND MAINTENANCE MANUALS

- .1 The Contractor shall furnish the Consultant with two complete maintenance manuals. The information shall be grouped in orderly arrangements and manuals shall have divider sheets with identifying tabs between categories. The final maintenance manual shall be provided in digital format on compact disk. The disk shall be provided with a laser-printed label indicating contents of disk and project identification information. Provide one disk in a ring-bound envelope in each maintenance manual.
- .2 The manuals shall include the following:
 - .1 A hard cover, 2" three ring binder labelled on the front cover and binder edge with the following information: building name and address, project number, project name and completion date.
 - .2 A title page indicating O & M Manual for building name and project. Include contractor name and contact information and consultant contact information.
 - .3 Table of Contents.
 - .4 Tab A: Dated and signed letter of warranty including contractors name and contact information. Identify project by name, location, warranty period. Any extended warranty of equipment to be included also.
 - .5 Tab B: sub-contractors name and suppliers' contact information
 - .6 Tab C: Copy of all reports, pre-functional tests, start-up reports, functional tests, performance verification reports, cabling verification reports, and any other building code certifications.
 - .7 D-H: Tab for each piece of new equipment to include shop drawings and specific service and maintenance manuals.

1.10 RENOVATIONS IN EXISTING BUILDING

- .1 All wiring and equipment not required for final design shall be removed.
- .2 Identify all circuits in existing panels and provide new panel labels and directories.
- .3 Dispose of or return to owner all lighting fixtures and equipment removed and not scheduled for reuse. Consult owner regarding correct disposition for each item.
- .4 Supply and install all conduit and connectors required to re-connect existing circuits in the existing building that may be disrupted due to construction.
- .5 Renovations shall be made in the existing building as shown on the drawing. All conduit and wiring shall be installed concealed in new construction and concealed where possible in existing construction.

- .6 Schedule shut-downs and interruptions of all systems with Owner, providing two weeks advance notice. Provide overtime allowance for any activities that cannot be performed during regular hours.
- .7 Remove all unused wiring, cover all open junction boxes, secure all cables and conduits and otherwise make the building safe electrically.

1.11 CUTTING AND PATCHING

- .1 Provide all cutting and patching required for the electrical installations and not provided by other trades.
- .2 Prior to any drilling, cutting or coring work, review as-built drawings and X-ray. All costs for these activities shall be included in the Tender price.
- .3 All cuts in structural metal, cable trays etc. shall be ground, polished and provided with galvanizing paint finish.

1.12 FIRE STOPPING

- .1 All openings in floors and walls for electrical systems including conduits, ducts, cables etc, shall be sealed with listed fire stopping material.
- .2 Provide and install fire stop products listed in accordance with CAN4-S115-M, "Standard Method of Fire Tests of Fire Stop Systems". Work shall be carried out only by a certified installer experienced with fire stopping and smoke seals application.
- .3 Have specific listing documentation on hand during each installation and inspection and post a fire stop system label adjacent to each installation in order to indicate the listing used..

END OF SECTION

1.1 **CONDUCTORS**

- .1 Unless otherwise indicated, no conductor smaller than No.12 AWG shall be used. Wire sizes for control and low voltage systems are covered in their respective clauses.
- .2 All conductors shall be stranded copper.
- .3 Conductors shall be sized to maintain voltage drop at less than 2% for feeders and 3% for branch circuits.
- .4 All conductors shall be identified as follows:

120/208 volt	Phase A	- Red
	Phase B	- Black
	Phase C	- Blue
	Neutral	- White
	Ground	- Green

347/600 volt	Phase A	- Red
	Phase B	- Black
	Phase C	- Blue
	Neutral	- White
	Ground	- Green

1.2 **GROUNDING**

- .1 Provide grounding as indicated on the drawings and as required by all applicable codes.
- .2 All lugs provided for termination of conductors shall be long-barrel compression type with 2-hole mounting design.

END OF SECTION

1.1

GENERAL

- .1 Provide and install all hangers, anchors, strap, supports etc. required for a complete installation.
- .2 Electrical equipment shall be adequately supported with hangers and fastenings to structural building members.
- .3 No explosive charges are to be used for installing or anchoring hangers, supports or enclosures.
- .4 All cuts in structural metal, cable trays etc. shall be ground, polished and provided with galvanizing paint finish.
- .5 fasteners shall not be used.
- .6 All equipment must be seismically secured to Code requirements. The Contractor shall engage the services of a Seismic Engineer to review-design all support methods and provide a stamp/seal on all support shop drawings. See Section 262800.

END OF SECTION

1.1 OUTLETS

- .1 All outlets shall be installed flush to finished surfaces unless they comprise part of an exposed conduit system.
- .2 Except as specified below, boxes for all flush single gang and double gang outlets for switches, receptacles and other devices shall be No. 52151 or No. 52171 (deep) with No. 52-C series covers (mudrings).
- .3 Boxes for surface-mounted outlets shall be No. 52151 with No. 8300 series 3/8" raised covers.
- .4 'MBD' series wall outlet boxes shall be provided for installations in concrete, masonry, or tile.
- .5 54500 series boxes shall be installed where boxes are located in concrete ceiling slabs.
- .6 Exterior wall device boxes shall be equipped with vapour barrier poly hats, model 5254-VB or equivalent for octagonal and multi gang device boxes.
- .7 Identify all junction box covers with indelible ink marker indicating system and circuiting.
- .8 Boxes and fittings for fire alarm system shall be painted red prior to installation. Boxes and fittings for security and access control system shall be painted blue prior to installation.
- .9 All device boxes shall be firmly anchored directly or with concealed bracing to building structural members only. Boxes must be attached so that they will not "rock" or "shift" at completion of rough wiring installations.

1.2 INSTALLATION OF WIRING DEVICES

- .1 Devices shall be located to suit the architectural details of the area involved. Refer to Architectural Elevation details, and millwork shop drawings prior to rough-in. Confirm all installation heights with the Consultant.
- .2 Wall-mounted receptacles shall be installed 18" above finished floor to centre of box or otherwise to conform with existing mounting heights. Receptacles mounted above counters shall be clear of the backsplash and otherwise 8" above counter to centre of box.
- .3 Switches shall be mounted at 48" above finished floor to centre of box except where required to suit special architectural features. Refer to the architectural drawings for final location of door frames, hinges etc. Switches shall generally be located on the strike side of the door.

1.3 COVERPLATES

- .1 Switch, telephone, convenience receptacle and other outlets shall be provided with stainless steel cover plates or to match existing.
- .2 Where two or more devices are mounted together, they shall be ganged and a suitable cover plate shall be provided.
- .3 Provide black-on-clear "Brother" style label showing circuit number on cover plate of all receptacles.

1.4 SWITCHES

- .1 Line voltage switches shall be specification grade Leviton or equal. Colour shall match building standard.
- .2 Occupancy sensor/ low voltage dimming switch, wall mounted Leviton.

1.5 RECEPTACLES

- .1 Receptacles shall match building standard in colour and shall be nylon, specification grade and side wired.
- .2 New receptacles for equipment, service rooms and corridors shall be NEMA 5-20-R connected to separate 20 ampere circuits.
- .3 Existing receptacles shall be cleaned and confirmed to be in good working condition. All defective receptacles shall be replaced.
- .4 An insulated green grounding conductor shall be connected from the receptacle grounding screw to the outlet box.

END OF SECTION

1.1 WIRING METHODS

- .1 Except where stated otherwise, all wiring shall be installed in conduit.
- .2 All wiring shall be concealed. Where this is not possible, Wiremold V500 (power), Wiremold 2800 (communications) or Wiremold 5400 surface raceway shall be used. Confirm colour with Consultant. Within Electrical Rooms all wiring shall be installed in conduit.
- .3 Type AC cable (BX) may be used for concealed installation in existing and new partitions and in ceiling spaces for drops from junction boxes to lighting fixtures or partitions. Type AC cable shall not cross partitions to adjacent rooms and shall not be used for homeruns to circuit breaker panels. All installations shall be properly supported and shall not lay on ceiling tile or be hung on ceiling support wires. All other use is prohibited unless approved by the Consultant.
- .4 Walls penetrated by conduits shall be sealed to the requirements of the Authority having Jurisdiction.
- .5 Every empty conduit shall be provided with a nylon pull string installed.
- .6 Electrical Nonmetallic Tubing shall not be used.
- .7 Nonmetallic Sheathed Cable shall not be used.
- .8 Connectors and couplings for fire alarm system shall be painted red prior to installation. Connectors and couplings for security and access control systems shall be painted blue prior to installation.

1.2 PULL BOXES AND TERMINATIONS

- .1 Supply and install all pull boxes as shown on the drawings or as required for a complete installation. All pull boxes shall conform to the Canadian Electrical Code in regard to size and gauge. In removable ceiling areas, pull box locations shall be coordinated to ensure maximum access.
- .2 Where electrical conduits are required to pass through the roof, supply and install necessary flashing and pitch pans and ensure that a waterproof installation is provided.
- .3 Where conduits, raceways, etc. are installed in concrete slabs or masonry walls across building expansion lines, an approved expansion joint or fitting shall be provided. Raceways shall be complete with grounding jumpers.

END OF SECTION

1.1 MAIN DISTRIBUTION

- .1 Provide additions and modifications to the existing building electrical distribution system as indicated on the drawings.

1.2 PANELBOARDS

- .1 Panelboards shall match building standard and shall be as manufactured by Cutler Hammer.
- .2 New panel boards are circuit breaker type 347/600V or 120/208 volt, 3-phase 4-wire, mounted as shown on the drawings. New panelboards shall be complete with trim, door, catch, lock and wordprocessor generated directory. Supply and install new circuit breakers, in branch circuit panels, to coordinate with new circuitry being provided.
- .3 All panelboards shall have a lamicaid nameplate with 1/4" high letters permanently fixed on the front of the door to indicate the panel name as indicated on the drawing, panel fed from and voltage, e.g. "Panel 'A', 120/208V, FED from MDP2".
- .4 New panelboards shall have all spaces filled with circuit breakers (no spaces). Circuit breakers for panelboards shall be bolted type.
- .5 Provide new panel directories for all panelboards affected by this project.

1.3 EQUIPMENT GROUNDING

- .1 Provide grounding systems to suit the code and as described herein and on the drawings. .

END OF SECTION

1.1 GENERAL

- .1 All electrical equipment installations shall be provided with anchorage and restraints to meet the seismic requirements of the Vancouver Building Bylaw (2007 edition) sub-section 4.1.9 including table 4.1.9.E.
- .2 Supply all labour, materials and equipment required and necessary to isolate and restrain the equipment and guarantee the function of the materials and equipment supplied.
- .3 All electrical connections to vibration isolated equipment shall be made with flexible conduit or other flexible means acceptable to the Consultant so as not to restrict the maximum anticipated movement of the equipment under the design seismic excitation.
- .4 All equipment shall be tested in an independent testing laboratory or shall be certified by a Registered Professional Structural Engineer to demonstrate that the equipment meets the requirements of all Codes and Bylaws in terms of "withstanding" the lateral forces in any direction to be expected in the project seismic zone. "Withstanding" shall generally mean remaining in one piece and not breaking away from moorings.
- .5 Provide certified, professionally sealed shop and placement drawings for all electrical equipment and equipment assemblies showing the methods of attachment to the particular structure for each piece of equipment and assembly and provide anchorage/attachment details approved and sealed by a BC Registered Professional Engineer. Shop drawings shall show the equipment type, manufacturer's name, model number and weight of the equipment to be restrained.
- .6 Provide Letters of Assurance and Conformance in compliance with the specified Codes, Standards and Bylaws. Letters must be issued to the Consultant prior to Substantial Performance.

END OF SECTION

1.1 MOTORS

- .1 Provide electrical connections for all motors indicated in the contract documents.
- .2 Motor connections shall include overcurrent protection, branch circuit wiring, disconnect and motor starter unless indicated otherwise. Provide additional disconnect whether or not shown on the drawings if motor is out of site or more than 25' from source disconnect.
- .3 Final connection to motors shall be with flexible conduit and separate insulated equipment bonding conductor.

1.2 STARTERS

- .1 Provide a motor starter for all motors unless indicated otherwise.
- .2 All equipment mounted outdoors shall be weatherproof.
- .3 All starters shall be provided with HOA, pilot light, and 2 NO / 2 NC auxiliary contacts.

1.3

END OF SECTION

1.1 **LIGHTING FIXTURES**

- .1 Lighting fixture types as describe on drawing. Alternate fixtures only if approved by Consultant prior to Tender closing.
- .2 Install lighting fixtures and associated wiring. Provide all mounting hardware and supports.

END OF SECTION

1.1 TELECOM DISTRIBUTION SYSTEM

- .1 Supply and install a raceway, wire management and pull box system, as shown on the drawings, specified herein and as required for systems in conformance with ANSI/TIA/EIA-569 Commercial Building Standard for Telecommunications Pathways and Spaces.
- .2 All data wiring shall be installed within this pathway system and fully terminated.
- .3 Provide system bonding in accordance with ANSI/TIA/EIA-607 Grounding and Bonding Requirements for Telecommunications in Commercial Buildings.
- .4 Installer of CAT-6e horizontal cabling system shall be manufacturer-certified and shall provide unconditional twenty-five year System Warranty for performance of entire cabling system. Submit qualification documentation with shop drawings.
- .5 All new data outlets shall be provided with minimum 3/4" conduit to ceiling space. All conduits shall be bonded.
- .6 Horizontal cabling above ceiling shall accomplished using J-hooks with minimum 48" spacing. Cabling shall be install parallel or perpendicular to building lines. Use only FT6 rated 1/2" or 3/4" Velcro cable ties or polyslings. Plastic tie-wraps will not be permitted.
- .7 Prior to system installation, submit shop drawings for all components of systems as well as outline drawings for complete cabling installation, including conduit sizes. As-built mark-up drawings shall document complete installation.
- .8 As noted in other areas of the Specifications, all wiring not required for final installation shall be removed. This shall apply to all wiring, in all areas of the project with no exceptions.

1.2 DATA WIRING

- .1 Cable shall be UTP Enhanced Category 6e, 4-pair 24 AWG solid, FT6 and shall be as manufactured by Belden or Hubbell. Install all cabling in conduit, utilizing Telecom Backbone System and providing additional conduit where required. Identify all cables at both ends. Terminate cables at outlets and at patch panels. Identify all ports.
- .2 Provide test reports showing conformance with EIA/TIA-568-A for all components of system. Testing shall be performed in accordance with TSB67 Category 6e standard using a Fluke DSP-100 CableMeter or equal. Provide current calibration certificate for meter with test reports. Tests must meet minimum standards. No conditional passes will be accepted.
- .3 Label all cables at both ends using Panduit adhesive, laser printed PLL series. Confirm labelling system with Computing Services.
- .4 Label work area outlets using laser printed 1375356-1 card stock labels and 1375345-1 plastic covers.
- .5 Label outlets at patch panels using laser printed 1375352-1 self-adhesive polyester labels. Labels to be installed on face of patch panel below outlets.
- .6 Unless otherwise indicated, all data cables shall terminate on existing patch panels mounted in the existing racks at the Communications Room. Coordinate with user for exact location of terminations.

1.1 GENERAL

- .1 Install raceways and boxes associated with the addition of door access control system as shown on electrical drawings (by Electrical Contractor).
- .2 Access control system is existing Honeywell Pro-Watch 4.0. Access control wiring and devices shall be supplied, installed and programmed by building security contractor Canem Systems Ltd. (604 273.1131).
- .3 Security Contractor shall coordinate installation with door hardware and general contractors on site.

END OF SECTION