Public Works and Government Services Canada

Travaux Publics et Services Gouvernmentaux Canada

Requisition No. EZ899-170216/A

DRAWINGS AND SPECIFICATION
For
CONVERT TEMPORARY DETENTION TO JUDICIAL CUSTODY UNIT
Abbotsford, BC
Matsqui Institution, Unit M2C & M2T1
33344 King Road

Project No.: R.077188.001
April 2016

APPROVED BY:

10 May 2016
Regional Manager, AES Date

2016-04-22
Construction Safety Coordinator Date

TENDER:

2016-06-04
Project Manager Date

Real Property Services Branch, Professional and technical Services, Pacific Region
Room 219 - 800 Burrard St, Vancouver, B.C. V6Z 0B9

INDEX

APRIL 20, 2016

REGISTERED ARCHITECT
JOSEPH K. T. YUEN
BRITISH COLUMBIA

Division 21 – Fire Protection

Division 22 – Plumbing

Division 23 – Heating, Ventilation & Air Conditioning

Division 24 to 25 N/A

Division 26 ELECTRICAL

Division 27 to 33 N/A

LIST OF DRAWINGS

Bound Separately

ARCHITECTURAL

MECHANICAL

ELECTRICAL

END OF INDEX

1 SUMMARY OF WORK

.1 Work covered by Contract Documents:

.1 Work under this Contract comprises interior renovation to convert existing classroom to interview rooms; including mechanical and electrical work and remedial work as indicated, at Matsqui Institution, 33344 King Rd., Abbotsford, BC.

.2 Contractor's Use of Premises:

.1 Contractor has controlled use of immediate construction area for Work, storage, and access as directed by the Departmental Representative.

.2 Use of areas inside Matsqui Institution, is controlled by the Departmental Representative.

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

.4 Matsui Institution site and adjoining areas outside the Work area will be operational during work of this Contract.

2 WORK RESTRICTIONS

.1 Where Work involves cutting openings in precast concrete walls for new Work, provide temporary dust barriers to approval of Departmental Representative. Coordinate Work affecting existing building operations.

.2 Protect duct systems to prevent dust and contaminants migrating outside of the Work area.

.3 Construct barriers in accordance with Temporary Barriers and Enclosures clause.

.4 Security Requirements: refer to Section 01 14 10 - Security requirements.

.5 Hours of work:

.1 Perform work during normal working hours of the site (0730 to 1600), Monday through Friday except holidays.

.2 Work may be performed after normal working hours of Institution, Monday through Friday, on weekends and holidays; with a minimum forty-eight (48) hours advance notice and approval of the Departmental Representative.

.3 Provide schedule for prior approval of Departmental Representative.

.4 Allow for delays due to security protocol when work interferes with Institution security operations.

.6 Access into Institution:

.1 Vehicular access through the Principal Entrance sally port will be restricted during the inmate "count" at breakfast, lunch and dinner hours.

.2 Confirm "count" times with Departmental Representative. Delays may occur when entering and exiting the Institution with Contractor and delivery vehicles during "count" times and due to security situations and heavy traffic.

.3 A construction escort will be provided by the Departmental Representative, at no cost to the Contract for access to site areas inside Institution. Notify Departmental Representative minimum 24 hours in advance of when Construction Escort is required.

3 CONSTRUCTION WORK SCHEDULE

.1 Commence work immediately upon official notification of acceptance of offer and complete the work within ten (14) weeks from the date of such notification.

.2 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Substantial Certificate and Final Certificate as defined times of completion are of essence of this contract.

.3 Submittals:

.1 Submit to Departmental Representative within five (5) working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of construction progress.

.2 Identify each trade or operation.

.3 Show dates for delivery of items requiring long lead time.

.4 Departmental Representative will review schedule and return one copy.

.5 Re-submit two (2) copies of finalized schedule to Departmental Representative within five (5) working days after return of reviewed preliminary copy.

.4 Project Scheduling Reporting:

.1 Update Project Schedule on monthly basis reflecting activity changes and completions, as well as activities in progress.

.2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

.5 Project Meetings:

.1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.

.2 Security protocol related delays with their remedial measures will be discussed and negotiated.

.3 Before submitting first progress claim submit breakdown of Contract price in detail as directed by Departmental Representative and aggregating contract price. After approval by Departmental Representative cost breakdown will be used as basis for progress payments.

4 SUBMITTAL PROCEDURES

.1 Administrative:

.1 Submit to Departmental Representative submittals listed for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work.

.2 Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

.3 Do not proceed with work affected by submittal, until review is complete.

.4 Present shop drawings in SI Metric units.

.5 Where items or information is not produced in SI Metric units converted values are acceptable.

.6 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.

.7 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.8 Verify field measurements and affected adjacent Work are coordinated.

.9 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative review of submittals.

.10 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.

.11 Keep one reviewed copy of each submission on site.

.2 Shop Drawings:

.1 Drawings to be originals prepared by Contractor, Subcontractor, Supplier or Distributor, which illustrate appropriate portion of work; showing fabrication, layout, setting or erection details as specified in appropriate sections.

.3 Product Data:

.1 Certain specification Sections specify that manufacturer's standard schematic drawings, catalogue sheets, diagrams, schedules, performance charts, illustrations and other standard descriptive data will be accepted in lieu of shop drawings, provided that the product concerned is clearly identified. Submit in sets, not as individual submissions.

.4 Samples:

.1 Submit samples in sizes and quantities specified.

.2 Where colour is criterion, submit full range of colours.

.3 Submit all samples as soon as possible after the contract is awarded, to facilitate production of complete colour scheme by the Departmental Representative.

.5 Mock-ups:

.1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of all Sections required to provide mock-ups.

.2 Construct in location as specified in specific Section .

.3 Prepare mock-ups for Departmental Representative' review with reasonable promptness and in an orderly sequence, so as not to cause any delay in Work.

.4 Failure to prepare mock-ups in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

.5 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

.6 Submission Requirements:

.1 Schedule submissions at least ten days before dates reviewed submissions will be needed.

.2 Submit number of copies of product data, shop drawings which Contractor requires for distribution plus four (4) copies which will be retained by Departmental Representative.

.3 Accompany submissions with transmittal letter in duplicate.

.4 Submit either bond copies or one (1) electronic pdf file of each shop drawing and product data as directed by Departmental Representative.

.7 Coordination of Submissions:
.1 Review shop drawings, product data and samples prior to submission.
.2 Coordinate with field construction criteria.
.3 Verify catalogue numbers and similar data.
.4 Coordinate each submittal with requirements of the work of all trades and contract documents.
.5 Responsibility for errors and omissions in submittals is not relieved by Departmental Representative's review of submittals.
.6 Responsibility for deviations in submittals from requirements of Contract documents is not relieved by Departmental Representative's review of submittals, unless Departmental Representative gives written acceptance of specified deviations.
.7 Notify Departmental Representative, in writing at time of submission, of deviations in submittals from requirements of Contract documents.
.8 Make any changes in submissions which Departmental Representative may require consistent with Contract Documents and re-submit as directed by Departmental Representative.
.9 After Departmental Representative's review, distribute copies.
.10 Shop Drawings Review:
.1 Review of shop drawings by Public Works and Government Services Canada (PWGSC) is for the sole purpose of ascertaining conformance with the general concept.
.2 The Departmental Representative's review does not mean that PWGSC approves the detail design inherent in the shop drawings, responsibility remains with the contractor submitting same, and such review will not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the construction and contract documents.
.3 Without restricting the generality of the foregoing, the Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation, and for co-ordination of the work of all subtrades.

5 HEALTH AND SAFETY

.1 Specified in Section 01 35 33 - Health and Safety Requirements.

6 ENVIRONMENTAL PROCEDURES

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

.2 Do not bury rubbish and waste materials on site.

.3 Do not dispose of waste or volatile materials such as oil, paint thinner or mineral spirits into waterways, storm or sanitary systems.

.4 Under no circumstances dispose of rubbish or waste materials on property or CSC waste bins.

7 REGULATORY REQUIREMENTS

.1 References and Codes:
.1 Perform Work in accordance with National Building Code of Canada (NBCC2010) including all amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.

.2 Meet or exceed requirements of:
.1 Contract documents.
.2 Specified standards, codes and referenced documents.

8 QUALITY CONTROL

.1 Inspection:
.1 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work.
.2 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
.3 Departmental Representative may order any part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.

.2 Rejected Work:
.1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
.2 Make good other Contractor's work damaged by such removals or replacements promptly.

.3 Reports:
.1 Submit (4) four copies or one scanned pdf copy of inspection and test reports to Departmental Representative.

.4 Equipment and Systems:
.1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems in accordance with Testing, Adjusting and Balancing Section 23 05 93 and note 3 on drawing E1.
.2 Refer to specific Sections for definitive requirements.

9 TEMPORARY UTILITIES

.1 Water Supply:
.1 Existing water supply system may be used for construction purposes provided that damaged components are replaced when damaged. Provide own supply lines from source.

.2 Temporary Ventilation:
.1 The existing air system will be in use during work of this contract inside existing building. Protect ducting system by filters inspected daily and replaced as necessary. During dust generating construction work block off all outlets and seal air tight.
.1 Before Substantial Completion comply with the following conditions:
.1 Remove all temporary duct covers.
.2 Temporary Ventilation:
.1 Prevent accumulations of dust, fumes, mists, vapours or gases in occupied areas during construction.
.2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.

.3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
.4 Ventilate work areas containing hazardous or volatile materials.
.5 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.

.3 Maintain strict supervision of operation of temporary ventilating equipment to:
.1 Conform with applicable codes and standards.
.2 Enforce safe practices.
.3 Prevent abuse of services.
.4 Prevent damage to finishes.

.4 Be responsible for damage to Work due to failure in providing adequate ventilation and protection during construction.

.3 Temporary Power and Light:
.1 Electrical power and lighting in existing building may be used for construction purposes at no extra cost, provided that electrical components used for temporary power are replaced when damaged.

.4 Temporary Communication Facilities:
.1 Temporary land line telephone and fax hook up are restricted on site. Conform to Section 01 14 10 Security Requirements for use of cell phones inside institution.

.5 Fire Protection:
.1 Provide and maintain temporary fire protection equipment during performance of Work required by governing codes, regulations and bylaws.

10 CONSTRUCTION FACILITIES

.1 Installation and Removal:
.1 Provide construction facilities in order to execute work expeditiously.
.2 Remove from site all such work after use.

.2 Scaffolding/mobile platforms:
.1 Design, construct and maintain scaffolding in rigid, secure and safe manner, in accordance with WCBBC regulations and Section 01 35 33.
.2 Erect scaffolding independent of walls. Remove promptly when no longer required.

.3 Hoisting:
.1 Provide, operate and maintain hoists required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for use thereof.
.2 Hoists to be operated by qualified operator.

.4 Site Storage/Loading:
.1 Do not unreasonably encumber premises with products.
.2 Do not load or permit to load any part of Work with a weight or force that will endanger the Work.

.5 Construction Parking:
.1 Parking space outside double fence and temporary parking for delivery vehicles at the construction site is available as directed by the Departmental Representative. Remove vehicles as directed.

.6 Contractor's Site Office:

.1 Provide office as required to accommodate Contractor's operations. Locate as directed by the Departmental Representative.

.2 Provide a clearly marked and fully stocked first-aid case in a readily available location in accordance with WCB requirements.

.7 Equipment, Tools and Material Storage:

.1 Provide and maintain, in a clean and orderly condition, lockable weatherproof sheds/trailers for storage of tools, equipment and materials.

.8 Sanitary Facilities:

.1 Local building sanitary facilities in vicinity are available for use by Contractor workers as directed by Departmental Representative. Maintain washroom facilities in clean condition.

11 TEMPORARY BARRIERS AND ENCLOSURES

.1 Enclosure of Work Area:

.1 Provide temporary dust and vapour tight hoarding protection for work areas until dust/vapour generating work is complete.

.2 Design enclosures to support it's own weight and fasten to existing walls/structure.

.3 Make good damage to existing construction cause by enclosure construction.

.2 Protection of Building Finishes:

.1 Provide protection for new and existing finished surfaces, partially finished building surfaces and equipment during performance of Work.

.2 Provide necessary screens, covers, and hoarding.

.3 Confirm with Departmental Representative locations and installation schedule 3 days prior to installation.

.4 Be responsible for damage incurred due to lack of or improper protection.

12 COMMON PRODUCT REQUIREMENTS

.1 Reference Standards:

.1 If there is a question as to whether any product or system is in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.

.2 Cost for such testing will be born by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

.3 Conform to latest date of issue of referenced standards in effect on date of submission of Bids, except where specific date or issue is specifically noted.

.2 Quality:

.1 Products, materials, equipment and articles (referred to as products throughout specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.

.2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

.3 Should any dispute arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
.4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
.5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms

.3 Storage, Handling and Protection:
.1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
.3 Store products subject to damage from weather in weatherproof enclosures.
.4 Store sheet materials, framing, on flat solid supports inside work area.
.5 Store and mix paints in ventilated space. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
.6 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative .
.7 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

.4 Transportation:
.1 Pay costs of transportation of products required in performance of Work.

.5 Manufacturer's Instructions:
.1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
.2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Departmental Representative may establish course of action.
.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in price to Contract.

.6 Quality of Work:
.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.
.2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.
.3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

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

.8 Remedial Work:

.1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Coordinate adjacent affected Work as required.

.2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

.9 Fastenings:

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

.2 Prevent electrolytic action between dissimilar metals and materials.

.3 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.

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

.5 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

.10 Protection of Work in Progress:

.1 Prevent overloading of any part of building. Do not cut, drill or sleeve any load bearing structural member, unless specifically indicated without written approval of Departmental Representative.

13 EXAMINATION AND PREPARATION

.1 Existing Utilities:

.1 Before commencing work, establish location and extent of service lines in areas of work and notify Departmental Representative of findings.

.2 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility. Adhere to approved schedule and provide notice to affected parties.

.3 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.

.4 Record locations of maintained and re-routed services lines.

.5 Remove redundant service lines where encountered, as directed and as indicated. Cap or otherwise seal lines at cut-off points as directed by Departmental Representative.

.2 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 of impending installation and obtain approval for actual location.

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

14 EXECUTION REQUIREMENTS

.1 Preparation:

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

.2 After uncovering, inspect conditions affecting performance of Work.
.3 Beginning of cutting or patching means acceptance of existing conditions.
.4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.
.5 Provide protection from elements for areas which may be exposed by uncovering work; maintain excavations free of water.

.2 Execution:
.1 Execute cutting, fitting, and patching, to complete Work.
.2 Fit several parts together, to integrate with other Work.
.3 Uncover Work to install ill-timed Work.
.4 Remove and replace defective and non-conforming Work.
.5 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
.6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
.7 Employ experienced installer to perform cutting and patching for sight-exposed surfaces.
.8 Cut rigid materials using purpose made masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
.9 Restore work with new products in accordance with requirements of Contract Documents.
.10 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
.11 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with fire-stopping material, full thickness of the construction element.
.12 Refinish surfaces to match adjacent finishes: For continuous surfaces refinish to nearest intersection; for an assembly, refinish entire unit.

15 CLEANING

.1 Project Cleanliness:
.1 Maintain Work in tidy condition, free from accumulation of waste products and debris.
.2 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site, unless approved by Departmental Representative.
.3 Provide on-site containers for collection of waste materials and debris.
.4 Provide and use clearly marked separate bins for recycling. Refer to-Construction/Demolition Waste Management And Disposal.
.5 Clean interior areas prior to start of finish work, and maintain areas free of dust and other contaminants during finishing operations.
.6 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
.7 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
.8 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
.9 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

.2 Final Cleaning:
.1 When Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

.2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
.3 Prior to final review, remove surplus products, tools, construction machinery and equipment.
.4 Remove waste products from site.
.5 Clean and polish glass, hardware, baked enamel. Replace broken, scratched or disfigured glass.
.6 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors.
.7 Clean lighting reflectors, lenses, and other lighting surfaces.
.8 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
.9 Wax or seal, seamless floor finishes, as recommended by manufacturer.
.10 Inspect finishes, and ensure specified workmanship and operation.
.11 Cleaning required in exterior areas as a result of Work of this Contract.
.1 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds resulting from work of this Contract.
.2 Remove dirt and other disfiguration from exterior surfaces as a result of Work.
.3 Sweep clean paved areas used during work of this contract.
.12 Clean or replace filters of mechanical equipment.

16 CONSTRUCTION/DEMOLITION WASTE MANAGEMENT AND DISPOSAL

.1 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and/or recyclable materials and waste. Separate non-salvageable materials from salvaged items. Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes. Transport and deliver non-salvageable items to licensed disposal facility.

.2 Provide containers to deposit reusable and/or recyclable materials. Locate containers in locations, to facilitate deposit of materials without hindering daily operations. Provide containers to deposit reusable and/or recyclable materials.

.3 Collect, handle, store on-site and transport off-site, salvaged materials in separate containers. Transport to approved and authorized recycling facility and/or users of material for recycling.

.4 Locate waste and salvage bins on site as directed by Departmental Representative.

17 CLOSEOUT PROCEDURES

.1 Inspection and Declaration:
.1 Contractor's Inspection: Conduct an inspection of Work with all subcontractors, identify deficiencies and defects, and repair as required to conform to Contract Documents.
.2 Notify Departmental Representative in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
.3 Request Departmental Representative's Inspection.

.2 Inspection: Departmental Representative and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.

.3 Substantial Completion: submit written certificate that following have been performed:
.1 Work has been completed and inspected for compliance with Contract Documents.
.2 Defects have been corrected and deficiencies have been completed.

.3 Equipment and systems have been tested, adjusted and balanced and are fully operational. Operation of systems have been demonstrated to Department's personnel.
.4 Fire alarm modifications have been tested and signed off by the fire alarm technician.
.5 Work is complete and ready for Final Inspection.

.4 Final Inspection: when items noted above are completed, request final inspection of Work by Departmental Representative. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request reinspection.

18 CLOSEOUT SUBMITTALS

.1 Record Drawings:
.1 As work progresses, maintain accurate records to show all deviations from the Contract Drawings. Note on as-built drawings as changes occur. At completion supply:
.1 Three (3) sets of CD's in AutoCad file format (version: 2007 or newer) with all asbuilt information on the diskettes. Retain original logo and title block on the as-built drawings. Contractor may place on the upper right-hand title block area a small company logo, the text "AS-BUILT" and the date.
.2 Three (3) sets of printed as-built drawings.
.3 On electrical as-builts include:
.1 Indicate conduit and cable runs, junction boxes and circuit numbers.
.2 Indicate communication voice/data outlet numbers.
.3 Additional record drawing requirements are included under various other electrical Sections.
.4 Convert reviewed as-built Autocad drawings and Shop Drawings, to PDF format for inclusion into electronic O&M manual.

.2 Maintenance data:
.1 On completion of project submit to Departmental Representative four (3) CD R/ disk copies and four paper (in loose leaf type binder) of Operations and Maintenance Manual, made up as follows:
.1 Provide maintenance manual, with as-built drawings, in O&M manual on CDs using pdf, or other approved format for descriptive writing, page size images and page size drawings. Organize manuals into industry standard maintenance manual tabs with links in index to each descriptive section describing the component or maintenance procedure etc.
.2 Organize files into CSI Masterformat numbering system or other approved descriptive titles.
.3 Label disk "Operation and Maintenance Data", project name, date, names of Contractor, subcontractors, consultants and subconsultants.
.4 Include scanned guarantees, diagrams and drawings.
.5 Organize contents into applicable sections of work to parallel project specification break-down. Mark each section by labeled tabs (navigational buttons).
.6 Drawings, diagrams and manufacturer's literature must be legible.
.7 Refer to:
.1 Section 23 05 00 Common Work Results - Mechanical clause 1.11 for specific operations and maintenance details and Section 26 05 00 Common Work Results - Electrical clause 1.6 for Record Drawings, specific to Electrical data.
.2 Section 23 05 93 Testing, Adjusting and Balancing for commissioning of Mechanical systems.

.3 Maintenance Materials, Special Tools and Spare Parts:

.1 Specific requirements for maintenance materials, tools and spare parts are specified in individual sections.

.1 Mechanical: Section 23 05 00 Common Work Results - Mechanical clause 1.8.

.2 Deliver maintenance materials, special tools and spare parts to Departmental Representative and store in designated area as directed by Departmental Representative.

.3 Prepare lists of maintenance materials, special tools and spare parts for inclusion in O&M Manual specified in Clause 18.2.

.4 Maintenance materials:

.1 Deliver wrapped, identify on carton or package, colour, room number, system or area as applicable where item is used.

.5 Special tools:

.1 Assemble as specified;

.2 Include identifications and instructions on intended use of tools.

.6 Spare parts:

.1 Assemble parts as specified;

.2 Include part number, identification of equipment or system for which parts are applicable;

.3 Installation instructions;

.4 Name and address of nearest supplier.

.4 Warranties and Bonds:

.1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing in maintenance manual.

.2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

.3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work.

.4 Except for items put into use with Departmental Representative's permission, leave date of beginning of time of warranty until the Date of Substantial Completion is determined.

.5 Verify that documents are in proper form, contain full information, and are notarized.

.6 Retain warranties and bonds until time specified for submittal.

19 DEMONSTRATION AND TRAINING

.1 Demonstration and Training:

.1 Demonstrate operation and maintenance of equipment and systems to maintenance personnel following Substantial Completion and prior to date of Final Certificate of Completion

.2 Departmental Representative will provide list of personnel to receive instructions, and will coordinate their attendance at agreed-upon times.

.3 Refer to Mechanical Section 23 05 00 Common Work Results - Mechanical, clause 1.8.

END OF SECTION

1 PURPOSE

.1 To ensure that both the construction project and the institutional operations may proceed without undue disruption or hindrance and that the security of the Institution is maintained at all times.

2 DEFINITIONS

.1 "Contraband" means:
.1 an intoxicant, including alcoholic beverages, drugs and narcotics
.2 a weapon or a component thereof, ammunition for a weapon, and anything that is designed to kill, injure or disable a person or that is altered so as to be capable of killing, injuring or disabling a person, when possessed without prior authorization,
.3 an explosive or a bomb or a component thereof,
.4 currency over any applicable prescribed limit, $25.00, and
.5 any item not described in paragraphs (.1 to .4) that could jeopardize the security of a Penitentiary or the safety of persons, when that item is possessed without prior authorization.

.2 "Unauthorized smoking and related Items" means all smoking items including, but not limited to, cigarettes, cigars, tobacco, chewing tobacco, cigarette making machines, matches and lighters.

.3 "Commercial Vehicle" means any motor vehicle used for the shipment of material, equipment and tools required for the construction project.

.4 "CSC" means Correctional Service Canada.

.5 "Director" means Director, Warden or Superintendent of the Institution as applicable.

.6 "Construction employees" means persons working for the general contractor, the sub-contractors, equipment operators, material suppliers, testing and inspection companies and regulatory agencies.

.7 "Departmental Representative" means the Public Works and Government Services Canada representative defined in General Conditions.

.8 "Perimeter" means the fenced or walled area of the institution that restrains the movement of the inmates.

.9 "Construction limits" means the area, as indicated in the contract documents, that the contractor will be allowed to work". This area may or may not be isolated from the security area of the institution. Limits to be confirmed at construction start-up meeting.

3 PRELIMINARY PROCEEDINGS

.1 At construction start-up meeting:
.1 Discuss the nature and extent of all activities involved in the Project.
.2 Establish mutually acceptable security procedures in accordance with this instruction and the institution's particular requirements.

.2 The contractors's responsibilities:
.1 Ensure that all construction employees are aware of the security requirements.
.2 Ensure that a copy of the security requirements is always prominently on display at the job site.
.3 Co-operate with institutional personnel in ensuring that security requirements are observed by all construction employees.

4 CONSTRUCTION EMPLOYEES

.1 Submit to the Departmental Representative a list of the names with date of birth of all construction employees to be employed on the construction site and a security clearance form for each employee.

.2 Allow 10 working days for processing of security clearances. Employees will not be admitted to the Institution without a valid security clearance in place and a recent picture identification such as a provincial driver's license. Security clearances obtained from other CSC institutions are not valid at this institution except as approved otherwise.

.3 The Director may require that facial photographs may be taken of construction employees and these photographs may be displayed at appropriate locations in the institution or in an electronic database for identification purposes. The Director may require that these Photo ID cards be provided for all construction workers. ID cards will then be left at the designated entrance to be picked up upon arrival at the Institution and be displayed prominently on the construction employees clothing at all times while employees are in the institution.

.4 Entry to Institutional Property will be refused to any person there may be reason to believe may be a security risk.

.5 Any person employed on the construction site will be subject to immediate removal from Institutional Property if they:
- .1 appear to be under the influence of alcohol, drugs or narcotics.
- .2 behave in an unusual or disorderly manner.
- .3 are in possession of contraband.

5 VEHICLES

.1 All unattended vehicles on CSC property must have windows closed; fuel caps locked, doors and trunks locked and keys removed. The keys must be securely in the possession of the owner or an employee of the company that owns the vehicle.

.2 The director may limit at any time the number and type of vehicles allowed within the Institution.

.3 Drivers of delivery vehicles for material required by the project will require security clearances and must remain with their vehicle the entire time that the vehicle is in the Institution. The director may require that these vehicles be escorted by Institutional staff or PWGSC Construction Escorts while in the Institution.

.4 If the Director permits trailers to be left inside the secure perimeter of the Institution, the trailer doors must be locked at all times. All windows must be securely locked bars when left unoccupied. Cover all windows with expanded metal mesh. When not in use lock all storage trailers located inside and outside the perimeter.

6 PARKING

.1 The parking area(s) to be used by construction employees will be designated by the Director. Parking in other locations will be prohibited and vehicles may be subject to removal.

7 SHIPMENTS

.1 To avoid confusion with the institution's own shipments, address all shipments of project material, equipment and tools in the Contractor's name and have a representative on site to receive any deliveries or shipments. CSC or PWGSC staff will **NOT** accept receipt of deliveries or shipments of any material equipment or tools.

8 TELEPHONES

.1 The installation of telephones, facsimile machines and computers with Internet connections is not permitted within the Institution perimeter unless prior approved by the Director.

.2 The Director will ensure that approved telephones, facsimile machine and computers with Internet connections are located where they are not accessible to inmates. All computers will have an approved password protection that will stop an Internet connection to unauthorized personnel.

.3 Wireless cellular and digital telephones, including but not limited to devices for telephone messaging, pagers, Blackberries, telephone used as 2-way radios are not permitted within the Institution unless approved by the Director. If wireless cellular telephones are permitted, the user will not permit their use by any inmate.

.4 The Director may approve but limit the use of 2-way radios.

9 WORK HOURS

.1 Conform to Division 1.

.2 Work is not permitted during weekends and statutory holidays without the permission of the Director. A minimum of seven days advance notice will be required to obtain the required permission. In case of emergencies or other special circumstances, this advance notice may be waved by the Director.

10 OVERTIME WORK

.1 Conform to Division 1.

.2 Provide 48 hours advance notice to Director for all work to be performed after normal working hours of the Institution. Notify Director immediately if emergency work is required, such as to complete a concrete pour or make the construction site safe and secure.

11 TOOLS AND EQUIPMENT

.1 Maintain a complete list of all tools and equipment to be used during the construction project. Make this inventory available for inspection when required by the Institution.

.2 Throughout the construction project maintain up-to-date the list of tools and equipment specified above.

.3 Keep all tools and equipment under constant supervision, particularly power-driven and cartridge-driven tools, cartridges, files, saw blades, rod saws, wire, rope, ladders and any sort of jacking device.

.4 Store all tools and equipment in approved secure locations.

.5 Lock all tool boxes when not in use. Keys to remain in the possession of the employees of the contractor. Secure and lock scaffolding when not erected and when erected Secure in a manner agreed upon with the Institution designate.

.6 Report all missing or lost tools or equipment immediately to the Departmental Representative/Director.

.7 The Director will ensure that the security staff members carry out checks of the Contractor's tools and equipment against the list provided by the Contractor. These checks may be carried out at the following intervals:

.1 At the beginning and conclusion of every work day or shift upon entering and exiting the Institution.

.2 At any time when contractor is on Institution property.

.8 Certain tools/equipment such as cartridges and hacksaw blades are highly controlled items. The contractor will be given at the beginning of the day, a quantity that will permit one day's work. Used blades/cartridges will be returned to the Director's representative at the end of each day. Maintain up to date inventory of all used blades/cartridges.

.9 If propane or natural gas is used for heating the construction, the institution will require that the contractor supervise the construction site during non-working hours.

12 KEYS

.1 Security Hardware Keys.

.1 Arrange with the security hardware supplier/installer to have the keys for the security hardware to be delivered directly to Institution, specifically the Security Maintenance Officer (SMO).

.2 The SMO will provide a receipt to the Contractor for security hardware keys.

.3 Provide a copy of the receipt to the Departmental Representative.

.2 Other Keys

.1 Use standard construction cylinders for locks for his use during the construction period.

.2 Issue instructions to employees and sub-trades, as necessary, to ensure safe custody of the construction set of keys.

.3 Upon completion of each phase of the construction, the CSC representative will, in conjunction with the lock manufacturer:

.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 and install the operational core in all locks.

.4 Upon putting operational security keys into use, the PWGSC construction escort shall obtain these keys as they are required from the SMO and open doors as required by the Contractor. The Contractor shall issue instructions to his employees advising them that all security keys shall always remain with the PWGSC construction escort.

13 SECURITY HARDWARE

.1 Turn over all removed security hardware to the Director of the Institution for disposal or for safekeeping until required for re-installation.

14 PRESCRIPTION DRUGS

.1 Employees of the contractor who are required to take prescription drugs during the workday shall obtain approval of the Director to bring a one day supply only into the Institution.

15 SMOKING RESTRICTIONS

.1 Smoking is not permitted inside correctional facilities or outdoors within the perimeter of a correctional facility and persons must not possess unauthorized smoking items within the perimeter of a correctional facility.

.2 Persons in violation of this policy will be requested to immediately cease smoking or dispose of any unauthorized smoking items and, if they persist will be directed to leave the Institution.

.3 Smoking is permitted outside the perimeter of a correctional facility in an area designated by the Director.

16 CONTRABAND

.1 Weapons, ammunition, explosives, alcoholic beverages, drugs and narcotics are prohibited on institutional property.

.2 The discovery of contraband on the construction site and the identification of the person(s) responsible for the contraband shall be reported immediately to the Director.

.3 Contractors should be vigilant with both their staff and the staff of their sub-contractors and suppliers that the discovery of contraband may result in cancellation of the security clearance of the affected employee. Serious infractions may result in the removal of the company from the Institution for the duration of the construction.

.4 Presence of arms and ammunition in vehicles of contractors, sub-contractors and suppliers or employees of these will result in the immediate cancellation of security clearances for the driver of the vehicle.

17 SEARCHES

.1 All vehicles and persons entering institutional property may be subject to search.

.2 When the Director suspects, on reasonable grounds, that an employee of the Contractor is in possession of contraband, he may order that person to be searched.

.3 All employees entering the Institution may be subject to screening of personal effects for traces of contraband drug residue.

18 ACCESS TO AND REMOVAL FROM INSTITUTIONAL PROPERTY

.1 Construction personnel and commercial vehicles will not be admitted to the institution after normal working hours, unless approved by the Director.

19 MOVEMENT OF VEHICLES

.1 Escorted commercial vehicles may not be allowed to enter or leave the institution through the vehicle access gate during the regular "inmate count" occurring at breakfast, lunch and dinner hour as established by the Institution. Confirm "count" times with Director or Departmental Representative to reduce down times for deliveries to Institution and movement of contractors vehicles through Institution vehicle access gate.

.2 Construction vehicles will not be allowed to leave the Institution until an inmate count is completed.

.3 The contractor shall advise the Director twenty four (24) hours in advance to the arrival on the site of heavy equipment such as concrete trucks, cranes, etc.

.4 Vehicles being loaded with soil or other debris, or any vehicle considered impossible to search, must be under continuous supervision by CSC staff or PWGSC construction escorts working under the authority of the Director.

.5 Commercial vehicles will only be allowed access to institutional property when their contents are certified by the Contractor or his representative as being strictly necessary to the execution of the construction project.

.6 Vehicles shall be refused access to institutional property if, in the opinion of the Director, they contain any article which may jeopardize the security of the institution. Arrange with Director for parking of contractor's vehicles at minimum security Institutions.

.7 Private vehicles of construction employees will not be allowed within the security wall or fence of medium or maximum security institutions without the permission of the Director.

.8 With prior approval of the Director, a vehicle may be used in the morning and evening to transport a group of employees to the work site. This vehicle will not remain within the Institution the remainder of the day.

.9 With the approval of the Director, certain equipment may be permitted to remain on the construction site overnight or over the weekend. This equipment must be securely locked, with the battery removed. The Director may require that the equipment be secured with a chain and padlock to another solid object.

20 MOVEMENT OF CONSTRUCTION EMPLOYEES ON INSTITUTIONAL PROPERTY

.1 Subject to the requirements of good security, the Director will permit the Contractor and his employees as much freedom of action and movement as is possible.

.2 However, notwithstanding paragraph above, the Director may:
.1 Prohibit or restrict access to any part of the institution.
.2 Require that in certain areas of the institution, either during the entire construction project or at certain intervals, construction employees only be allowed access when accompanied by a member of the CSC security staff.

.3 During the lunch and coffee/health breaks, all employees will remain within the construction site. Employees are not permitted to eat in the officer's lounge and dining room.

21 SURVEILLANCE AND INSPECTION

.1 Construction activities and all related movement of personnel and vehicles will be subject to surveillance and inspection by CSC security staff members to ensure that established security requirements are met.

.2 CSC staff members will ensure that an understanding of the need to carry out surveillance and inspections, as specified above, is established among construction employees and maintained throughout the construction project.

22 STOPPAGE OF WORK

.1 The director may request at any time that the contractor, his employees, sub-contractors and their employees not enter or leave the work site immediately due to a security situation occurring within the Institution. The contractor's site supervisor shall note the name of the staff member making the request and the time of the request and obey the order as quickly as possible.

.2 The contractor shall advise the Departmental Representative within 24 hours of this delay to the progress of the work.

23 CONTACT WITH INMATES

.1 Unless specifically authorized, it is forbidden to come into contact with inmates, to talk with them, to receive objects from them or to give them objects. Any employee doing any of the above will be removed from the site and his security clearance revoked.

.2 It is forbidden to take pictures of inmates, of CSC staff members or of any part of the Institution other than those required as part of this contract.

END OF SECTION

1 REFERENCES

.1 Government of Canada:
- .1 Canada Labour Code - Part II.
- .2 Canada Occupational Health and Safety Regulations.

.2 American National Standards Institute (ANSI):
- .1 ANSI A10.3-2006, – Safety Requirements for Powder-Actuated Fastening Systems ANSI for Construction and Demolition Operations

.3 Canadian Standards Association (CSA):
- .1 CSA Z797-2009 Code of Practice for Access Scaffold.

.4 National Fire Code of Canada (NFCC 2010):
- .1 FCC No. 301-1982, Standard for Construction Operations.
- .2 FCC No. 302-1982, Standard for Welding and Cutting.
- .3 Part 5 - Hazardous Processes and Operations & Division B.

.5 National Building Code of Canada (NBCC 2005):
- .1 Part 8, Safety Measures at Construction and Demolition Sites

.6 Province of British Columbia Building Code (BCBC 2006):
- .1 Part 8, Safety Measures at Construction and Demolition Sites.

.7 Province of British Columbia:
- .1 Workers Compensation Act Part 3 - Occupational Health & Safety.
- .2 Occupational Health & Safety Regulations.

2 RELATED SECTIONS

.1 Section 01 01 50 - General Instructions for; Submittals procedures, Section Temporary utilities, Construction facilities and Temporary barriers and enclosures.

.2 Section 02 41 19 - Demolition and Removal Work.

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.

4 COMPLIANCE WITH REGULATIONS

.1 PWGSC may terminate the Contract without liability to PWGSC where the Contractor, in the opinion of PWGSC, 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.

5 SUBMITTALS

.1 Make submittals in accordance with Section 01 01 50 General Instructions for Submittals.

.2 Submit the following:
.1 Health and Safety Plan.
.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 Materials Information System (WHMIS) requirements.
.5 Emergency Procedures.

.3 The Departmental Representative will review the Contractor's site-specific project Health and Safety Plan and emergency procedures, and provide comments to the Contractor within 5 days after receipt of the plan. Revise the plan as appropriate and resubmit to Departmental Representative for review.

.4 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.

.5 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.

6 RESPONSIBILITY

.1 Assume responsibility as the Prime Contractor for work under this contract and appoint a qualified coordinator for the purpose of ensuring the coordination of health and safety activities for the location in accordance with sections 118 and 119 of Part 3 of the Workers Compensation Act.

.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.

7 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.

8 GENERAL CONDITIONS

.1 Provide safety barricades and lights around work site as required to provide a safe working environment for workers and protection for pedestrian and vehicular traffic.

.2 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 after working hours in accordance with Section 01 14 10 - Security Requirements.

9 PROJECT/SITE CONDITIONS

.1 Work at site will involve:
.1 Working in areas where inmates may be present who are under supervision by CSC staff. Conform to Security Requirements Section 01 41 10 Contact With Inmates clause and other security requirements pertaining to a CSC institution.

10 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.

11 FILING OF NOTICE

.1 Submit a Notice of Project, form 52E49, to WorkSafeBC in accordance with OH&S Regulation 20.2, at least 24 hours before start of work.

.2 Submit copy to Departmental Representative.

12 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 recordkeeping procedures.

.2 Summary of health risks and safety hazards resulting from analysis of hazard 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 Public Works and Government Services Canada (PWGSC). PWGSC's review 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.

13 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.

.2 Include the following provisions in the emergency procedures:
.1 Notify workers 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 which may be affected if the risk extends beyond the workplace.
.6 Notify Departmental Representative.

.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.

14 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 in accordance with clause 5.2.4.

15 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.

16 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.

17 OVERLOADING

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

18 FALSEWORK

.1 Design and construct falsework in accordance with CSA S269.1.

19 SCAFFOLDING

.1 Design, construct and maintain scaffolding in a rigid, secure and safe manner, in accordance with CSA Z797-2009 Code of Practice for Access Scaffold and BC Occupational Health and Safety Regulations.

20 CONFINED SPACES

.1 Carry out work in confined spaces in compliance with provincial regulations.

21 POWDER-ACTUATED DEVICES

.1 Use powder-actuated devices in accordance with ANSI A10.3 only after receipt of written permission from the Departmental Representative.

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.

23 FIRE SAFETY REQUIREMENTS

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

24 FIRE PROTECTION AND ALARM SYSTEM

.1 Do not obstruct, shut-off or leave inactive at the end of a working day or shift, the fire protection and alarm systems.

.2 Do not use fire hydrants for purposes other than firefighting.

.3 Be responsible/liable for costs incurred from the fire department and the Departmental Representative, resulting from false alarms.

25 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.

26 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 plan(s).

.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.

.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.

27 MEETINGS

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

28 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 Contractor will be responsible for any costs arising from such a "stop work order".

END OF SECTION

1 General

1.1 RELATED WORK

.1 Section 01 01 50 - General Instructions: Hours and schedule of work, dust screens, waste management and safety barriers.

.2 Security Requirements - Section 01 14 10.

.3 Section 01 35 33 - Health and Safety Requirements.

1.2 REGULATORY REQUIREMENTS

.1 Comply with WCB Industrial Health and Safety Regulations and Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.3 REFERENCES

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

.2 Federal Legislation.
- .1 Canadian Environmental Assessment Act (CEAA), 2012, c. 37.
- .2 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
- .3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

1.4 EXISTING CONDITIONS

.1 Take over areas where demolition/removal work is indicated based on the condition at time of examination prior to tendering.

.2 Should unidentified Asbestos Containing Materials (ACM) or other hazardous substance encountered in course of removal work or cutting and boring activities, stop work, take preventative measures, and notify Departmental Representative immediately. Do not proceed until written instructions have been received from the Departmental Representative.

.3 Unidentified hazardous material removal is additional work and will be paid either as an extra to the contract price in accordance with General Conditions, or removed under a separate contract by the Departmental Representative.

.4 The existing building will be occupied and operational by the Institution during work of this Contract. Maintain building access around protected work areas.

1.5 PROTECTION

.1 Prevent movement, settlement or damage of services, adjacent parts of existing walls, ceilings and parts of building not being removed or altered.

.2 Protect adjoining floor areas from migrating dust and fumes from work area.

1.6 DEFINITIONS

.1 Alternate Disposal: reuse and recycling of materials by designated facility, user or receiving organization which has valid Certificate of Approval to operate alternative to landfill disposal .

.2 Hazardous Containing Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, including but not limited to: corrosive agents, flammable substances, asbestos containing materials, or other material that can endanger human health, well being or environment if handled improperly.

.3 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.

.4 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form.
.1 Recycling does not include burning, incinerating, or thermally destroying waste.

.5 Reuse: repeated use of product in same form but not necessarily for same purpose.

.6 Salvage: removal of materials from deconstruction/disassembly for purpose of reuse or recycling offsite.

.7 Source Separation: acts of keeping different types of waste materials separate, beginning from first time they became waste.

1.7 ENVIRONMENTAL PROTECTION

.1 Do not dispose of waste or volatile materials into watercourses, storm or sanitary sewers.

.2 Employ reasonable means necessary to protect salvaged materials from vandalism, theft, adverse weather, or inadvertent damage.

.3 Organize site and workers in manner which promotes efficient flow of materials through disassembly, processing, stockpiling, and removal.

.4 Remove and transport toxic or dangerous materials from site in accordance with provincial authority.

2 Products N/A

3 Execution

3.1 SITE VERIFICATION OF CONDITIONS

.1 Employ necessary means to assess site conditions to determine quantity and locations of hazardous materials.

.2 Investigate site and building to determine removal work, processing and storage logistics required prior to beginning of Work.

.3 Dismantle and remove parts of building as indicated or directed by Departmental Representative and dispose of removed material off property in accordance with local authorities having jurisdiction and in accordance with Section 01 01 50 General Instructions - Construction Waste Management and Disposal clause.

.4 Inspect work areas with Departmental Representative to verify extent and location of items designated for removal and disposal and items to remain.

.5 Locate and protect building systems. Preserve active systems in operating condition, serving remainder of site and building.

3.2 PREPARATION

.1 Conform to schedule for all removal work.

.2 Remove window at corridor wall along with drywall to expose masonry wall where new opening is required for salvaged door and frame relocation.

.3 Remove drapery and track, salvage for reuse.

.4 Provide for scanning of concrete floor in area where stud walls are fastened to floor, using approved sonar equipment, to locate any conduit, or rebar etc. Submit 2D and 3D pictures of encountered obstructions.

3.3 REMOVAL WORK

.1 At end of each day's work, leave work in safe and secure condition, clean up and remove debris and materials not being reinstalled.

3.4 SELECTIVE DEMOLITION

.1 Sawcut opening in precast concrete wall panel and CMU cavity wall at removed existing corridor window to facilitate the new location of salvaged door and frame assembly
.1 Remove existing lintel angle, clean out masonry joint in CMU, and install new steel lintel angle.
.2 Saw cut concrete curb at base of CMU wall.

.2 Remove suspended acoustic ceiling and metal suspension T-bars to facilitate the new work inside classroom area. Wire hangers suspending T-bars may be reused in new arrangement. Dispose of T-bars, wall angle and acoustic tile off site

.3 Remove a portion of suspended acoustic ceiling and t-bars at perimeter of work area outside existing classroom to accommodate construction of new perimeter wall. Salvage T-Bars and acoustic tile for reuse in modified arrangement. Dispose of wall angle and damaged components off site.

.4 Remove door, PS frame and hardware assembly and salvage for reuse at new location. Remove glass and PS frame window assembly and dispose of off site.

.5 Existing sheet flooring in all new rooms is to remain in place. Remove all rubber base and adhesive exposed in final assembly (inside existing classroom). Protect existing flooring in new room 166 from damage.

3.5 REPAIRS

.1 Patch and repair walls, and ceiling finishes damaged by demolition/removal work except where new finishes will cover or replace these areas as indicated.

.2 New materials to match existing in quality, colour and appearance except as specified otherwise. Reuse salvaged materials where noted.

.3 Install salvaged curtain and track at location indicated. Cut down track length to suit room length. Fasten curtain track to T-bar with screw fasteners at minimum 600 mm oc.

3.6 REMOVAL FROM SITE

.1 Dispose of removed materials, not reusable or salvageable, to approved disposal facilities in accordance with applicable provincial regulations.

END OF SECTION

1 General

1.1 RELATED WORK

.1 Section 01 01 50 - General Instructions.

.2 Section 07 52 10 - Existing SBS Roof Modifications.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
.1 CAN/CSA-O141-05(R2009), Softwood Lumber.

.2 National Lumber Grades Authority (NLGA)
.1 Standard Grading Rules for Canadian Lumber 2014.

.3 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

.4 AWPA M4-06 - Standard for the Care of Preservative -Treated Wood Products.

.5 AWPA P5-10: Standard for Waterborne Preservatives.

.6 American Society for Testing and Materials (ASTM)
.1 ASTM A123 / A123M - 13 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
.2 ASTM F1667 - 11AE1 Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

1.3 QUALITY ASSURANCE

.1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 01 50 - General instructions for Waste Management And Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.

.4 Divert unused wood materials from landfill to recycling composting facility approved by Departmental Representative.

2 Products

2.1 LUMBER MATERIAL

.1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% or less in accordance with following standards:
- .1 CAN/CSA-O141 Softwood lumber.
- .2 NLGA Standard Grading Rules for Canadian Lumber.

.2 Roof Curbs: S4S Hem-Fir or S-P-F species, NLGA No. 2 or better Grade:
- .1 Board sizes: "Standard" or better grade.
- .2 Dimension sizes: "Standard" light framing or better grade.

.3 All wood for exterior areas and lumber in contact with concrete, and flashing, pressure preservative treated .

2.2 ACCESSORIES

.1 Nails, spikes and staples: ASTM F1667, galvanized.

.2 Bolts: galvanized 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.

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

.4 Galvanizing: to ASTM A123 / A123M, use galvanized fasteners for exterior work and in pressure-preservative treated lumber. Screw fasteners with applied epoxy or polymer coating is acceptable.

2.3 WOOD PRESERVATIVE

.1 Pressure preservative treated lumber to AWPA P-5 indicate commodity standard number using CCA or other approved preservative to obtain minimum net retention of 6.4 kg/m^3 of wood.

.2 Treat material as indicated and as follows:
- .1 Roof curbs. in exterior elements in contact with, roof membranes and metal roofing/flashing.

3 Execution

3.1 INSTALLATION

.1 Comply with requirements of NBC, supplemented by the following paragraphs.

.2 Install roof curb framing members true to line, with top surface level, square and plumb.

.3 Install wood roof curbs, with top surface 200 mm above roof membrane, through bolted to roof using galvanized steel fasteners.

.4 Install two roof curbs to support mechanical condensing unit as indicated. Use solid plate nailers fastened to to roof deck with galvanized through bolts. Fasten wood curb secured to plate using galvanized or non corroding fasteners.

3.2 FIELD TREATMENTS OF PRESERVATIVE-TREATED PRODUCTS

.1 Comply with AWPA-M4.

.2 Re-treat surfaces of PT lumber exposed by cutting, trimming or boring with liberal brush application of preservative before installation.

.3 Use approved preservative to manufacturers instructions.

END OF SECTION

1 General

1.1 DESCRIPTION OF WORK

.1 Supply and install counter top unit and millwork trim.

1.2 REFERENCES

.1 Architectural Woodwork Institute / Architectural Wood Manufacturer's Association of Canada (AWI/AWMAC)
- .1 Architectural Woodwork Standards, 1st Edition, 2009.

.2 American Society for Testing and Materials (ASTM):
- .1 ASTM F1667 - 13 Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

.3 Canadian Standards Association (CSA):
- .1 CSA O115-M82(R2001), Hardwood and Decorative Plywood.
- .2 CAN/CSA O141-05, Softwood Lumber.
- .3 CSA-O112 Series M1977, Adhesive, Contact, Brushable.

.4 National Electrical Manufacturers Association (NEMA):
- .1 NEMA LD3-2005, High Pressure Decorative Laminates (HPDL).

.5 National Lumber Grades Authority (NLGA):
- .1 Standard Grading Rules for Canadian Lumber 2014.

.6 Environmental Choice Program (EPC):
- .1 CCD-046-95, Adhesives.
- .2 CCD-047-05, Architectural Surface Coatings.

1.3 SUBMITTALS

.1 Submit shop drawings, product data, samples and maintenance data in accordance with Section 01 01 50 General Instructions for submittal requirements:
- .1 Provide maintenance data for plastic laminate work for incorporation into manual.

1.4 PRODUCT HANDLING

.1 Cover finished surfaces with heavy kraft paper or put in cartons during shipment. Protect installed surfaces by approved means. Do not remove until immediately before final inspection.

.2 Do not store or install materials in areas where relative humidity is less than 25% or greater than 60% at 22°C.

2 Products

2.1 MATERIALS

.1 Hardwood plywood: to CSA O115-M of thickness indicated, rotary cut Baltic Birch species veneer of A-2 grade, with plywood core.

.2 Nails and staples: to ASTM F1667; plain finish.

.3 Wood screws: steel, electro-plated.

.4 Plastic Laminate:
.1 Based on solid colour range with selected texture finish conforming to the following:
.1 Laminated plastic for flatwork: to NEMA LD3 for thickness, performance properties and appearance:
.1 Horizontal and vertical Surfaces: Type HGS minimum 1.15 mm thick for horizontal surfaces.

.2 Core: Baltic Birch species, 18 mm thickness, double layer for countertop.
.3 Laminated plastic adhesive: Low VOC contact adhesive.
.4 Sealer: water resistant sealer or glue acceptable to laminate manufacturer.

.5 Applied finish: low VOC white lacquer, satin finish.

2.2 CASEWORK

.1 Fabricate caseworks to AWI/AWMAC custom quality grade.

.2 COUNTER
.1 AWMAC custom grade.
.2 Construction: Baltic Birch species plywood, 18 mm thickness .
.3 Counter top and integral surfaces: plastic laminate on two layers of 18 mm Baltic Birch species plywood.
.4 Exposed edge banding and front face and backsplash: plastic laminate.
.5 Support frame: Appearance grade D-Fir, 38 mm thickness, or double layer of birch plywood.

.3 RUNNING TRIM
.1 AWMAC custom grade.
.2 Material and finish: clear birch species.

2.3 COUNTER TOPS

.1 Laminated Plastic:
.1 Veneer laminated plastic to core material in accordance with adhesive manufacturer's instructions. Ensure core and laminate profiles coincide to provide continuous support and bond over entire surface. Use continuous lengths up to 3000 mm. P. Lam tops may be applied either in the shop or on site.

.2 Seal reverse side of plywood core of plastic laminate work.

2.4 EDGE BANDING

.1 Counter top and back splash: plastic laminate.

.2 Route edges of plywood exposed in final assembly.

2.5 FABRICATION

.1 Set nails and countersink screws, apply matching wood filler to indentations, sand smooth and leave ready to receive finish.

2.6 FINISHING

.1 Except as indicated otherwise Birch plywood surfaces at underside of counter top: factory applied, low VOC white lacquer in satin finish.

3 Execution

3.1 INSTALLATION OF CASEWORK AND TRIM

.1 Install millwork and casework at locations shown on reviewed shop drawings.

.2 Position accurately, shim level, plumb and straight.

.3 Fasten and anchor countertop securely to wall studs or plywood backing in wall.

.4 Scribe and cut as required to fit abutting walls and to fit properly into recesses and to accommodate projecting, intersecting or penetrating objects. Install trim to conceal spaces between walls and countertop.

3.2 STANDING AND RUNNING TRIM

.1 Install trim in single lengths without splicing.

3.3 PROTECTION

.1 Cover finished surfaces, susceptible to damage, with heavy kraft paper until ready for inspection. Do not remove until immediately before final cleaning.

3.4 CLEANING

.1 Perform cleaning after installation to remove construction and accumulated environmental dirt.

.2 Perform care and cleaning with CAN3-A172, Annex B.

.3 Remove traces of primer and filler materials; clean laminated plastic and millwork.

END OF SECTION

1 General

1.1 RELATED WORK

.1 Section 01 01 50 - General Instructions: Hours and schedule of work, waste management and safety barriers.

.2 Section 01 35 33 - Health and Safety Requirements.

.3 Section 06 10 11 - Rough Carpentry, for wood curbs.

1.2 WORK INCLUDED

.1 Work under this section includes the supply of all labour, materials, plant and services necessary to:
- .1 Modify the two ply modified bituminous membrane and install new roof flashing penetrations and roofing new wood curbs.

.2 Method of application for roof membrane assembly: by adhesive or torch-on method.

1.3 REFERENCE STANDARDS

.1 Roofing Contractors Association of British Columbia(RCABC)
- .1 RCABC Roofing Practices Manual - 2015.

.2 ASTM International:
- .1 ASTM D41 / D41M-11, Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
- .2 ASTM D 6164-11/D6164M-11, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.

.3 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

1.4 ENVIRONMENTAL REQUIREMENTS

.1 Stop work when temperature remains consistently below +5°C or when wind chill effect would tend to affect membranes or adhesives before proper adhesion takes place.

.2 Use only dry materials and apply only during weather that will not introduce moisture into roofing system.

.3 Conform to Manufacturer's application requirements and observe Manufacturer's recommendations.

1.5 WARRANTY

.1 Maintain existing *RCABC Guarantee*. Provide roof Inspection service and include costs.

1.6 QUALIFY ASSURANCE

.1 Perform Work in accordance with RCABC Roofing Specification Manual and manufacturer's written instructions.

.2 Installation of modified asphalt Roofing to be performed only by journeyman applicators holding either a *provincial Certificate of Qualification* or be registered as an apprentice in province for roofing. Installers must be manufacturer certified for installation of this type of membrane assembly.

1.7 COMPATIBILITY

.1 Compatibility between components of roofing system is essential. Materials to be incorporated into the system must be compatible with each other. Use materials of one manufacturer's system.

.2 Provide written declaration that components of roofing system are compatible.

1.8 FIRE PROTECTION

.1 Conform to all applicable codes and regulations of authorities having jurisdiction for roof assembly fire hazard and fire protection requirements.

.2 Provide suitable fire extinguishers in close proximity to work areas during application of roof membranes.

.3 Maintain fire watch for minimum two (2) hours following "torch-on" work.

2 Products

2.1 MEMBRANES

.1 Modified bituminous membranes: to ASTM D6164 described as follows:

.1 **Exposed roof:** two ply system of prefabricated SBS membranes with minimum 180 g/m² polyester reinforced base sheet and 180 g/m² polyester reinforced cap sheet. Base sheet of 3 mm minimum thickness and cap sheet 4 mm minimum thickness, with granule finish on cap sheet for heavy duty service. Base sheet and cap sheet torch applied. Material and colour to match existing membrane.

.2 **Membrane flashing/stripping**: same as for base and cap sheet except use polyester reinforcement of minimum 180 g/m² for base flashing and minimum 180 g/m² for cap sheet flashing. Cap sheet with granule finish for all exposed stripping plies. Base ply adhered to exposed wood surfaces using self adhered membrane and approved primer.

2.2 PRIMERS AND SEALERS

.1 Asphalt primer: to CGSB 37-GP-9Ma. Primer over new surfaces: in accordance with manufacturer's written instructions and RCABC requirements.

.2 Sealing compound: to CGSB CAN/CGSB-19.13.

2.3 ACCESSORIES

.1 AC line/ cable flashing: 26 ga stainless steel one piece slip over flashing with removable back, designed to watertight AC lines and cables. Acceptable Product SBC Industries, Versa Line Flashing, Model ML/D - SBC Flashing.com. Other purpose made flashings are acceptable provide they meet the intent of flashing specified as approved by Departmental Representative. Submit Product Data for review.

3 Execution

3.1 PROTECTION

.1 Protect building surfaces from damage due to Work and clean off drips and smears of asphalt and adhesive materials.

3.2 PREPARATION AND SBS MEMBRANE APPLICATION

.1 Cut back SBS cap sheet membrane minimum 600 mm back from new plumbing curbs and penetration flashing. Cut back base sheet 400 mm back from pipe/curb or of sufficient area to install wood curbs.

.2 Cut section of insulation and overlay board around plumbing vent pipe flange and install solid wood blocking in thickness equal to insulation thickness. Secure blocking to steel deck using galvanized through bolts.

.3 Apply SBS base sheet over wood curbs and lap over existing base sheet using adhesive or torch-on method to RCABC requirements.

.4 Install cable/AC line flashing on bed of mastic and screwed into wood blocking. Seal perimeter of flashing flange to base sheet using recommended mastic seal.

.5 Apply cap sheet over stack flashing flange by torch-on method and to base sheet, lapping over existing cap sheet minimum 100 mm. Embed granules (do not remove) prior to bonding onto granular surfaces. Follow membrane manufacturer's written instructions for application techniques. Seal membrane at stack flashing with mastic.

.6 Limit asphalt bleed-out at laps on granular surfaces to a maximum of 6 mm width. Conceal excessive bleed-out by broadcasting with matching loose granules from manufacturer.

.7 Check laps with round nosed roofing trowel as work proceeds, reseal unbonded areas and voids; repair punctures or tears with patches of same cap sheet material.

3.3 CLEAN-UP

.1 Remove all miscellaneous roofing and sheet metal flashing materials and waste from roof surfaces and site.

.2 Make good any damage to building caused by roofing work.

END OF SECTION

1 General

1.1 RELATED WORK

.1 Section 02 41 19 - Demolition and Removal Work

.2 Section 08 34 74 - Acoustic Door and Frame Assembly.

.3 Section 09 91 23 - Painting.

1.2 DESCRIPTION OF WORK

.1 Installation of salvaged door, frame and hardware.

2 Products

2.1 DOOR, FRAME AND HARDWARE ASSEMBLY

.1 Salvaged door, frame and hardware assembly removed under Section 02 41 19.

2.2 COMPONENTS

.1 Frames:
- .1 Reuse existing.
- .2 Provide temporary spreader at base of frame to maintain frame square.

.2 Doors:
- .1 Reuse existing.

.3 Door hardware:
- .1 Reuse existing door Hardware.
- .2 Threshold: extruded aluminum, low profile, minimum 200 mm width.

.4 Existing type anchors: provide new anchors with 9.5 mm φ x 127 long sleeve bolt and base anchor for door frames at masonry walls. Modify existing frame with c'sunk holes to suit existing type anchors.

3 Execution

3.1 FRAME INSTALLATION

.1 Set frames plumb, square, level and at correct elevation. Install door frames anchored to masonry walls in accordance with reviewed shop drawings. Mount frames to ensure 20 mm clearance under doors.

.2 Securely attach floor anchors to inside of each jamb profile.

.3 Locate anchors for frames in existing openings not more than 150 mm from top and bottom of each jambs and intermediate at 660 mm on centre maximum.

.4 Secure anchorages and connections to adjacent construction.

.5 Make allowance for deflection to ensure structural loads are not transmitted to frames.

3.2 DOOR INSTALLATION

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

.2 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows.
- .1 Hinge side: 1.0 mm.
- .2 Latch side and head: 1.5 mm.
- .3 Finished floor: 20 mm.

.3 Adjust operable parts for correct function.

.4 Install aluminum threshold to concrete floor. Cut to fit frame opening and profile.

END OF SECTION

1 General

1.1 WORK INCLUDES

.1 STC 46 rated acoustic pressed steel acoustic door and frame assemblies with integral perimeter and bottom acoustic seals and threshold.

1.2 RELATED WORK

.1 Section 07 92 10 - Caulking of joints between frames and other building components.

.2 Section 08 11 14 - Relocated Door and Frame

.3 Section 08 71 10 - Door hardware, excluding perimeter sound seals and threshold.

.4 Section 09 22 16 - Building-in frames in steel stud walls.

.5 Section 09 91 23 - Painting.

1.3 REFERENCES

.1 ASTM International (ASTM)
.1 ASTM A653/A653M-15 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
.2 ASTM E90-09 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
.3 ASTM E413-10 - Classification for Rating Sound Insulation.
.4 ASTM A 794/ 794M-12 - Standard Specification for Commercial Steel (CS), Sheet, Carbon (0.16 % Maximum to 0.25 % Maximum), Cold-Rolled.
.5 ASTM A659/659M-12 - Standard Specification for Commercial Steel (CS), Sheet and Strip, Carbon (0.16 Maximum to 0.25 Maximum Percent), Hot-Rolled.

.2 Canadian General Standards Board (CGSB):
.1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

.3 Canadian Steel Door Manufacturers' Association, (CSDMA):
.1 CSDMA, Specifications for Commercial Steel Doors and Frames, 2009.
.2 CSDMA, Recommended Selection and Usage Guide for Commercial Steel Doors, 2009.

.4 CSA International:
.1 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
.2 CSA W59-13, Welded Steel Construction (Metal Arc Welding) (Metric Version).

1.4 PERFORMANCE REQUIREMENTS

.1 Acoustic Performance: Minimum Sound Transmission Class (STC) 46 tested to ASTM E90. Label indicating sound transmission class shall be applied to the door and door frame assembly.

1.5 SUBMITTALS

.1 Section 01 01 50: General Instructions for Submission procedures clause.

.2 Product Data: Provide product data on door and frame construction.

.3 Shop Drawings: Indicate door and frame elevations, anchor types and closure methods and location of cut-outs for hardware.

.4 Test Data:
.1 Submit test data indicating compliance with the Sound Transmission Class (STC) requirements. Include laboratory name, test report number, and date of test.
.2 Submit certification from test laboratory qualified under the National Voluntary Accreditation Program (NVLAP) of the U.S. Bureau of Standards.

.5 Installation Instructions: Submit manufacturer's installation instructions.

1.6 QUALITY ASSURANCE

.1 Perform work to requirements of CSDMA (Canadian Steel Door Manufacturers Association), HMMA (Hollow Metal Manufacturers Association) standards.

.2 Manufacturer: Minimum 5 years documented experience manufacturing acoustic steel door and frame assemblies.

.3 Pre-installation Meeting: Convene a pre-installation meeting before start of installation of acoustic door and frame assemblies. Require attendance of parties directly affecting work of this section, including contractor, architect, installer, and manufacturer's representative. Review installation and coordination with other work.

1.7 DELIVERY, STORAGE AND PROTECTION

.1 Section 01 01 50: General Instructions for Transport, handle, store, and protect products.

.2 Comply with HMMA 840.

.3 Weld minimum two temporary jamb spreaders per frame prior to shipment.

.4 Remove doors and frames from wrappings or coverings upon receipt on site and inspect for damage.

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

.6 Store materials out of water and covered to protect from damage.

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

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 01 50 - General Instructions; Construction/Demolition Waste Management And Disposal clause.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.

.5 Divert unused wood materials from landfill to either recycling, reuse or composting facility.

1.9 WARRANTY

.1 Manufacturer's Limited Warranty: Five (5) years from date of supply, covering material and workmanship.

2 Products

2.1 ACCEPTABLE PRODUCTS

.1 AMBICO International Limited (Ambico.com)
1120 Cummings Avenue
Ottawa, Ontario, Canada K1J 7R8
Toll Free Phone: 888-423-2224

.2 Other products are acceptable provided they meet the requirements of this specification.

2.2 MATERIALS

.1 Sheet Steel:
.1 Galvanized steel to ASTM A653/A653M, ZF180 (A60).

.2 Reinforcement Channel: To CSA G40.20/G40.21, coating designation to ASTM A653/A653M, ZF75.

2.3 ACCESSORIES

.1 Hinges, lockset and door stops: specified in Section 08 71 10.

.2 Primer: Rust inhibitive zinc chromate.

.3 Threshold: Smooth and flush, to provide a seal for door in closed position.

.4 Perimeter and bottom acoustic seals: To provide a seal for door in closed position to meet STC 46.

2.4 FABRICATION

.1 Manufacture doors and frame assemblies to STC rating of 46, measured in accordance with ASTM E90.

.2 Steel Doors:
.1 Sheet steel faces, thickness, design, and core suitable to achieve specified STC performance.
.2 Acoustic core construction, longitudinal edges, mechanically inter-locked with visible edge seams.
.3 Reinforce doors where surface-mounted hardware is required.
.4 Drill and tap for mortised, templated hardware.
.5 Top and Bottom Channels: Inverted, recessed, welded steel channels.

.3 Steel Frames:
.1 Sheet steel, metal thickness and appropriate to maintain door STC, mitred corners, fully welded seams.
.2 Factory assemble and weld frames.

.4 Affix permanent metal nameplates to door and frame, indicating manufacturer's name, door tag, and STC rating where it shall be clearly visible.

2.5 FINISHES

.1 Factory Door Finish: Factory applied zinc chromate primer to be applied to all exposed surfaces.

3 Execution

3.1 INSTALLATION

.1 Install components to manufacturer's written instructions.

.2 Install steel doors and frames to CSDMA, HMMA 840 standards and in accordance with local authority having jurisdiction.

.3 Utilize welders certified by Canadian Welding Bureau (CWB) for field welding.

.4 Coordinate with masonry and gypsum board wall construction for anchor placement.

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

.6 Allow for deflection to ensure that structural loads are not transmitted to frame.

.7 Adjust operable parts for correct clearances and function.

.8 Install and adjust perimeter and bottom acoustic seals.

.9 Finish paint in accordance with Section 09 91 23.

3.2 ERECTION TOLERANCES

.1 Installation tolerances of installed frame for squareness, alignment, twist and plumbness are to be no more then ± 1.5mm in compliance with HMMA 841.

3.3 FIELD QUALITY CONTROL

.1 Provide qualified manufacturer's representative to instruct installers on the proper installation and adjustment of door assemblies.

.2 Provide manufacturer's representative to inspect door installation, and test minimum ten (10) cycles of operation. Correct any deficient doors.

3.4 SCHEDULE

.1 Acoustic Steel Door and Frame Assembly Schedule:

Dr #	Rm#	Nominal Size	Thick.	Mat'l	Glz	F/R	STC	Comments
166B	166B	914mm x 2133mm	44mm	GS	-	NFR	46	
166C	166C	914mm x 2133mm	44mm	GS	-	NFR	46	

- **Material types: GS = Galvanized Steel**
- **NFR= Non-fire rated**

END OF SECTION

1 General

1.1 RELATED WORK

.1 Supply of acoustic seals and threshold specified in :
.1 Section 08 34 74 - Acoustic Door and Frame Assembly.

1.2 REFERENCE STANDARDS

.1 Standard hardware location dimensions in accordance with the Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by the Canadian Steel Door and Frame Manufacturer's Association

.2 ANSI/BHMA A156.1-2013, Standard for Butts and Hinges.

.3 ANSI/BHMA A156.7-2014, Template Hinge Dimensions.

.4 ANSI/BHMA A156.13-2012 Standard for Mortised Locks and Latches Series 1000.

.5 ANSI/BHMA A156.16- 2013 Auxiliary Hardware.

.6 ANSI/BHMA A156.18-2012 Materials and Finishes.

1.3 MAINTENANCE DATA

.1 Brief maintenance staff regarding proper care, cleaning and general maintenance.

.2 Provide maintenance data, parts list, and manufacturer's instructions for each type door lockset, for incorporation into maintenance manual specified in Section 01 01 50.

1.4 DELIVERY AND STORAGE

.1 Store finishing hardware in locked, clean and dry area.

1.5 WASTE DISPOSAL AND MANAGEMENT

.1 Separate and recycle waste materials in accordance with Section 01 01 50 - General Instructions for Waste Management And Disposal clause.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Dispose of corrugated cardboard, polystyrene, plastic packaging material in appropriate on-site bin for recycling in accordance with site waste management program.

2 Products

2.1 HARDWARE ITEMS

.1 Only door hardware meeting the requirements of specified standards are acceptable for use on this project, except as specified otherwise.

.2 Use one manufacturer's products only for all similar items.

.3 Hardware material finish codes: ANSI/BHMA A156.18 as indicated.

2.2 DOOR HARDWARE

.1 Co-ordinate door hardware listing with Door, Frame and Hardware Schedule.

.2 Hinges and butts:
.1 Hinges: to ANSI/BHMA A156.1 type, numbers and sizes listed in hardware schedule, full mortise template hinges finished to 626.
.2 All heavy duty hinges for acoustic doors, with minimum leaf thickness of 4.57 mm, 5 knuckle and 4 ball bearing.
.3 Reuse existing hinges for door 166.

.3 Mortised Lock sets for doors 166B & 166C:
.1 Mortise locksets: to ANSI/BHMA A156.13, Series 1000 mortise lock, Grade 1 operational and security, function as noted in hardware schedule. Acceptable product: Stanley/Best Access 47H Series.
.2 Lever handles: forged.
.3 Escutcheons: rectangular.
.4 Normal strikes: box type, lip projection not beyond jamb.
.5 Cylinders: Best Access 7 pin.

.4 Reuse existing cylindrical lockset for door 166.

.5 Architectural door trim: (new)
.1 Door stops: to ANSI/BHMA A156.16, L02141 floor mounted, or L02101 wall mounted concealed fastening 626 or 630.

.6 Thresholds: to indicated width x full length of door opening, extruded aluminum with mill finish, fluted surface, fitted to door frame opening size and profile, one piece, maximum 12 mm rise.

2.3 KEYING

.1 Order all permanent cylinders for new locksets. Order key cylinders and keys from BEST ACCESS SYSTEMS, 7-pin removable core system to match keyway for Matsui Institution. Departmental Representative will arrange for installation of permanent cylinders after final completion of Contract. Include three keys with each permanent cylinder.
.1 Provide all new locksets with removable core construction cylinders or provide temporary locksets. Key all construction cores alike. Provide two keys to operate construction cores.

2.4 DOOR SCHEDULE

.1 Quantities shown in schedule are for one opening only. Include all commercial hardware for each door listed, except as noted. See drawings for door layout and arrangement:

Item	Door #	Rm to Rm	Door Type	Frame Type	Sound Rating	Hardware Description
1	166	Corridor to V&C Search Rm 166	Existing HM	Exist PS	-	Reuse Existing Hardware: 1 ½ - pair 114 x 104 mm template hinges 1 - cylindrical Best lockset New Hardware: 1 - door closer PA 1 - door stop floor mtd. 1 - alum. threshold
2	166B	Rm. 166A to Monitor Rm 166B	acoustic HM door	acoustic PS frame	STC 46	1 ½ - pair Template 4BB hinges 114 x 104 mm 1 - mortised lockset F13 function 1 - door stop floor mtd. Door seals and threshold specified in Section 08 34 74.
3	166C	Rm. 166A to Interview Rm 166C	acoustic HM door	acoustic PS frame	STC 46	1 ½ - pair Template 4BB hinges 114 x 104 mm 1 - mortised lockset F14 function 1 - door stop floor mtd. Door seals and threshold specified in Section 08 34 74.

3 Execution

3.1 INSTALLATION

.1 Install hardware in accordance with manufacturer's printed instructions.

.2 Re-adjust doors and hardware to function properly just prior to interim acceptance of building.

3.2 DEMONSTRATION

.1 Maintenance Staff Briefing:
- .1 Brief maintenance staff regarding:
  - .1 Proper care, cleaning, and general maintenance of projects complete hardware
  - .2 Description, use, handling, and storage of keys.
  - .3 Use, application and storage of wrenches for door closers, locksets, and power operating hardware.

.2 Demonstrate operation, operating components, adjustment features, and lubrication requirements.

3.3 CLEANING

.1 Perform cleaning after installation to remove construction and accumulated environmental dirt.

.2 Clean hardware with damp cloth and approved non-abrasive cleaner, and polish hardware in accordance with manufacture's instructions.

.3 Remove protective material from hardware items where present.

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

END OF SECTION

1 General

1.1 RELATED WORK

.1 Section 09 22 16 - Non-Structural Metal Framing

.2 Section 09 51 13 - Acoustic Ceilings.

1.2 REFERENCED STANDARDS

.1 ASTM International:

.1 ASTM C423 - 09a Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

.2 ASTM C475 / C475M - 15 Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

.3 ASTM C840 - 13 Standard Specification for Application and Finishing of Gypsum Board.

.4 ASTM C954 - 15 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.

.5 ASTM C1002 - 14 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.

.6 ASTM C1047 - 14a Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.

.7 ASTM C1396 / C1396M - 14a Standard Specification for Gypsum Board.

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

.2 CAN/ULC-S702-09 Amt1, Mineral Fiber Thermal Insulation for Buildings.

1.3 SUBMITTALS

.1 Submit samples and product data in accordance with Section 01 01 50 - General Instructions for Submittal Procedures.

.2 Submit samples and product data of corner and casing beads.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials in original packages, containers or bundles bearing manufacturers brand name and identification.

.2 Store materials inside, level, under cover. Keep dry. Protect from weather, other elements and damage from construction operations and other causes.

.3 Handle gypsum boards to prevent damage to edges, ends or surfaces. Protect metal accessories and trim from being bent or damaged.

1.5 SITE ENVIRONMENTAL REQUIREMENTS

.1 Ventilation: Ventilate building spaces as required to remove excess moisture that would prevent drying of joint treatment material immediately after its application.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse, recycling, composting and anaerobic digestion in accordance with Section 01 01 50 - General Instructions for waste management.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Divert unused gypsum from landfill to gypsum recycling facility for disposal approved by Departmental Representative.

.4 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.

.5 Divert unused wood materials from landfill to recycling, composting facility approved by Departmental Representative.

.6 Divert unused paint and caulking material from landfill to official hazardous material collections site approved by Departmental Representative.

2 Products

2.1 GYPSUM BOARD

.1 Standard board: to ASTM C1396/C1396M, regular 12.7 mm and Type X 15.9 mm thick, 1220 mm wide x maximum practical length, ends square cut, edges squared for bottom or base layer, beveled for top or finished layer, Ecologo certified minimum 25% recycled content.

2.2 FASTENINGS AND ADHESIVES

.1 Steel drill screws: to ASTM C 1002, ASTM C 954, plain finish.

.2 Stud adhesive: to CAN/CGSB 71.25M.

2.3 ACCESSORIES

.1 Acoustic sealant: one part silicone to ASTM C919 and ASTM C920, primerless, Type S, Grade NS, Class 25, SWRI validated, Ecologo certified, maximum VOC 60 g/L

.2 Gypsum board joint compound: ASTM C 475, asbestos-free.

.3 Casing beads, corner beads, control joints and edge trim: to ASTM C1047, metal, zinc-coated by hot-dip process, 0.5 mm base thickness, perforated flanges, one piece length per location.

.4 Drywall furring channels: 0.5 mm core thickness galvanized steel channels for screw attachment of gypsum board.

.5 Sound attenuation batts, Type 1, to CAN/ULC S702.2:

.1 Sound attenuation batt Insulation, self-supporting semi-rigid batts, to fit interior wall stud cavity, manufactured from basaltic rock with a melting point in excess of 1177°C.

.2 Surface burning characteristics; Flame Spread 5, Smoke Developed 0, when tested in accordance with CAN4-S102, ASTM E-84, and UL 723.

.3 Material listed as non-combustible by ULC and ULI; tested in accordance with CAN4-S114 and ASTM E-136.

.4 Acoustical performance: to ASTM C423: NRC 1.05 at 75 mm thickness.

3 Execution

3.1 SOUND INSULATION

.1 Install sound attenuation batts to all new wall spaces indicated. Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.

3.2 ERECTION

.1 Refer to drawings for wall and ceiling assemblies with gypsum board

.2 Do application and finishing of gypsum board in accordance with ASTM C 840 except where specified otherwise.

.3 Install gypsum board, tape and fill joints in accordance with manufacturer's instructions.

.4 Erect screw channels for framed gypsum board ceilings in accordance with ASTM C 840 except where specified otherwise.

.5 Install work level to tolerance of 1:1200.

.6 Frame with furring channels, perimeter of openings for access doors, light fixtures, diffusers, grilles. Check clearances with equipment suppliers.

.7 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.

.8 Install wall furring for gypsum board wall finishes in accordance with ASTM C 840, except where specified otherwise.

.9 Furr pipes and exposed services where indicated.

3.3 GYPSUM BOARD APPLICATION

.1 Do not apply gypsum board until framing and strapping, anchors, blocking, electrical and mechanical work are approved.

.2 Apply single or first layer of specified gypsum board to framing using screw fasteners at and stud adhesive. Reduce total number of screws, when using stud adhesive, as recommended by manufacturer

.3 Apply successive two layers using laminating compound and minimal screws as recommended by manufacturer. Stagger panel joints on successive layers. Ensure minimum number and spacing of screws meets manufacturer's requirements.

.4 Apply 12 mm diameter bead of acoustic sealant to all new walls, continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, ducts, pipes, in partitions where perimeter sealed with acoustical sealant. In addition to above, seal at each layer of gypsum board on walls and ceiling with multiple layer applications. Seal butt joints and corners of panels.

.1 Seal full perimeter of cut-outs around electrical boxes, ducts, pipes, in partitions where perimeter sealed with acoustical sealant.

.2 Seal butt joints and corners of concealed panels.

.3 Seal exposed joint at perimeter of structure/wall junction with an acoustic sealant.

3.4 ACCESSORIES

.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 oc.

.2 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated.

3.5 TAPING AND FILLING

.1 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.

.2 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with Association of the Wall and Ceiling Industries (AWCI) International Recommended Specification on Levels of Gypsum Board Finish:

.1 Level of finish for concealed surfaces:

.1 Level 1: Embed tape for joints and interior angles in joint compound. Surfaces to be free of excess joint compound; tool marks and ridges are acceptable.

.2 Level of finish for exposed painted surfaces:

.1 Level 4: Embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories.

.3 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.

.4 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for painting.

3.6 SCHEDULES

.1 Construct sound rated wall assemblies where indicated.

.1 STC 46 partition assembly (Wall Type T1):

.1 One layer 16 mm Type X gypsum board one side on metal studs.

.2 Sound Batt insulation in cavity.
.3 Three layers of 12.7 mm gypsum board on opposite side of metal studs.
.4 Acoustic caulking at perimeter of wall and at penetrations including in ceiling space.

.2 Acoustically treated wall at perimeter of Classroom (three sides of room):
.1 One layer 16 mm Type X gypsum board one side on metal studs.
.2 Sound Batt insulation in cavity.
.3 25 mm separation to existing wall
.4 Acoustic caulking at perimeter of wall and at penetrations including in ceiling space.

END OF SECTION

1 General

1.1 RELATED WORK

.1 Section 01 01 50 - General instructions for Waste Management And Disposal.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).
.1 ASTM C 645-14, Specification for Nonstructural Steel Framing Members.
.2 ASTM C 754-15, Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
.3 ASTM A 653/A653 M-13, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
.4 ASTM A1003 / A1003M - 15 Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.

1.3 SYSTEM REQUIREMENTS

.1 Performance Requirements: Fabricate and install systems as indicated but not less than that required to comply with ASTM C754 under the following conditions:
.1 Gypsum board partitions:
.1 Standard systems: Maximum deflection of l/240 of partition height.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 01 50 - General Instructions for Waste Management And Disposal, and with Waste Reduction Workplan.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.

2 Products

2.1 MATERIALS

.1 Non-loadbearing channel framing:
.1 Light duty interior studs: to ASTM A 653/A653M, grade D, ZF75 zinc coating designation, to depths indicated or scheduled, roll formed using minimum 0.5 mm nominal base metal thickness sheet steel, for attachment of gypsum board, knock-out service holes at 460 mm centers.
.2 Heavy duty interior studs: to ASTM A 653/A653M, grade D, ZF75 zinc coating designation, to depths indicated or scheduled, roll formed using minimum 1.0 mm base metal thickness sheet steel, for attachment of sheet steel by welding, knock-out service holes at 460 mm centers.

.2 Floor and top brackets:
.1 For all interior studs: to paragraph 2.1.1.1 and 2.11.2, metal thickness to match studs, widths to accept stud depths x 32 mm flange height.

.3 Metal channel stiffener: 19 mm size x 2 mm base metal thickness and as detailed 1.4 mm thick cold rolled steel channel profile coated with rust inhibitive coating.

.4 Fasteners:
.1 Hardened steel power driven nails or drilled in purpose made screws for fastening into concrete and masonry.
.2 Self drilling sheet metal screws with pan heads.

3 Execution

3.1 ERECTION

.1 Install metal framing systems to ASTM C 754. Restrain system to support gravity and lateral loads:

.2 Align partition tracks at floor and ceiling structure and secure at 610 mm o.c. maximum except as noted otherwise.

.3 Place studs, supporting gypsum board panels, vertically at 406 mm o.c. in top and bottom track, and not more than 50 mm from abutting walls, and at each side of openings and corners.
.1 Fasten bottom track to concrete using approved anchors, spaced 610 mm oc.
.2 Fit studs within top track allowing for 3 mm clearance for deflection.
.3 Fasten top track to structure.
.4 Fasten each stud to top and bottom tracks with screws, pop-rivets, by crimping or other approved method.

.4 Install nested heavy duty studs at each door jambs, full height.

.5 Erect studs to 1:1000 tolerance.

.6 Co-ordinate simultaneous erection of studs with installation of service lines grilles and access panels. When erecting studs ensure knock web openings are aligned.

.7 Co-ordinate erection of studs with installation of special supports or anchorage for work specified in other Sections.

.8 Install steel studs or furring channel between studs for attaching electrical and other device boxes.

3.2 CLEANING

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

END OF SECTION

1 General

1.1 RELATED WORK

.1 Section 01 01 50 - General instructions for Waste Management And Disposal.

.2 Section 09 21 16 - Gypsum Board Assemblies.

1.2 REFERENCE STANDARDS

.1 ASTM C635 / C635M - 13a Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

.2 ASTM C636/C636M-13 - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels

.3 ASTM E580 / E580M - 14 Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.

.4 CAN-ULC S102-10 - Standard Test Method for Burning Characteristics of Building Materials and Assemblies.

1.3 DESIGN CRITERIA

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

.2 Seismic Performance: Provide acoustical ceiling system that has been engineered by an independent party and found to be compliant with the NBCC Part 4 or to 2003 International Building Code, Seismic Category D.

1.4 SAMPLES

.1 Submit duplicate 300 x 300 mm samples of acoustical units in accordance with Section 01 01 50 - General Instructions submittals clause.

1.5 MAINTENANCE MATERIALS

.1 Deliver acoustical units for maintenance use amounting to 2% of gross ceiling area for each pattern and type required for project in accordance with Section 01 01 50 - General Instructions submittals clause Store where directed and identify contents.

.2 Maintenance materials to be same production run as installed materials.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 01 50 - General Instructions; Construction/Demolition Waste Management And Disposal clause.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.

.5 Divert unused wood materials from landfill to either recycling, reuse or composting facility.

2 Products

2.1 MATERIALS

.1 Intermediate duty system to ASTM C635.

.2 Basic materials for suspension system: commercial quality cold rolled steel zinc coated.

.3 Suspension system: non fire rated, made up as follows:
.1 Two directional exposed tee bar grid.

.4 Exposed tee bar grid components: shop painted satin sheen white. Components die cut. Main tee with double web, rectangular bulb and 25 mm rolled cap on exposed face. Cross tee with rectangular bulb; web extended to form positive interlock with main tee webs; lower flange extended and offset to provide flush intersection.

.5 Hanger wire: galvanized soft annealed steel wire, 2.6 mm diameter. Existing wire may be reused.

.6 Hanger inserts: purpose made.

.7 Accessories: splices, clips, wire ties, retainers and wall moulding flush reveal, to complement suspension system components, as recommended by system manufacturer.

.8 Acoustic units for suspended ceiling system, to ASTM 635:
.1 Type: IV, Form: 2, Pattern E, mineral fibre composition, wet formed with standard painted white finish.
.2 Flat smooth surface, no pattern, with square edge.
.3 Flame spread rating of 25 or less.
.4 Smoke developed 50 or less.
.5 Noise reduction coefficient (NRC) designation of minimum 0.80.
.6 CAC rating: 35.
.7 Light reflectance: minimum 0.86.
.8 Size: Imperial 610 x 1220 x 25 mm thick.

.9 Ruse salvaged ceiling tile and suspension members to rebuild removed ceiling in Visitor Lounge at perimeter of new wall.

3 Execution

3.1 ACOUSTICAL CEILING INSTALLATION

.1 Install suspension system to manufacturer's instructions and according to ASTM C636, and ASTM E580 for seismic restraint. Ensure that hangers do not obstruct or damage tile during removal and replacement of individual tiles.
.1 Rebuild ceiling in Visitor's Lounge where new wall was constructed. Install ceiling suspension, grid and ceiling panels using salvaged materials from removal work and supplemented with new components to match existing.

.2 Do not erect ceiling system until work above ceiling has been approved by Departmental Representative.

.3 Lay out system according to reflected ceiling plan.

.4 Ensure suspension system is co-ordinated with location of related components.

.5 Install wall mould to provide correct level ceiling heights.

.6 Completed suspension system to support super-imposed loads, such as lighting fixtures diffusers, grilles and speakers.

.7 Support light fixtures diffusers with additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.

.8 Frame openings for light fixtures, air diffusers, speakers and at changes in ceiling heights.

.9 Interlock cross members to main runners to provide rigid assembly.

.10 Make finished ceiling systems square to adjoining walls and level to tolerance of 1:1000.

.11 Install acoustical panels in ceiling suspension system.

.12 Scribe acoustical units to fit adjacent work. Butt joints tight, install wall mould at junction of acoustical ceilings and other construction to entire length of such junctions.

3.2 CLEANING

.1 Touch up scratches, abrasions, voids and other defects in system finish.

END OF SECTION

1 General

1.1 RELATED WORK

.1 Section 01 01 50 - General Instructions: Submittal Procedures clause and Construction/Demolition Waste Management And Disposal.

.2 Section 02 41 19 - Demolition and Removal Work.

.3 Section 09 69 50 - Carpet Tile

1.2 REFERENCE STANDARDS

.1 ASTM International:
.1 ASTM F1861 - 08(2012)e1 Standard Specification for Resilient Wall Base.

1.3 SUBMITTALS

.1 Provide maintenance data for resilient flooring for incorporation into maintenance manual specified in Section 01 01 50.

.2 Submit duplicate samples of resilient base for colour selection by Departmental Representative in accordance with Section 01 01 50.

1.4 ENVIRONMENTAL REQUIREMENTS

.1 Air temperature and structural base temperature at flooring installation area must be above 20°C for 72 h before, during and 48 h after installation.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 01 50 - General Instructions; Construction/Demolition Waste Management And Disposal clause.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.

2 Products

2.1 MATERIALS

.1 Resilient base: to ASTM F1861, Type I-Rubber Base, height as indicated, continuous, Style B-coved, preformed external corners at coved base. Colours as selected by Departmental Representative.

.2 Cement: type recommended by base manufacturer to suit substrate and installation, Ecologo certified.

3 Execution

3.1 INSPECTION

.1 Ensure walls are dry and acceptable to manufacturer's recommendations.

3.2 BASE APPLICATION

.1 Set wall base in adhesive tightly against wall and floor surfaces. Use lengths as long as practicable and not less than 500 mm long.

.2 Install straight and level to maximum variation of 1:1000.

.3 Scribe and fit to door frames and other obstructions. Cut end pieces flush with door frames.

.4 Miter internal corners. Use premoulded sections or special wrap around type base for external corners.

.5 Use coved type base as scheduled.

3.3 CLEANING

.1 Cleaning: Remove temporary coverings and protection of adjacent work areas.
.1 Repair or replace damaged installed products.

.2 Clean installed products in accordance with manufacturer's instructions prior to occupancy.

3.4 FLOORING AND BASE SCHEDULE

Base Type	Rooms
Applied rubber base	All walls in new rooms, 166, 166A, 166B, 166C, 166D and new wall in Visitor's Lounge

END OF SECTION

1 General

1.1 RELATED WORK

.1 Section 01 01 50 - General Instructions: Submittal Procedures clause and Construction/Demolition Waste Management And Disposal.

.2 Section 09 65 20 - Resilient Base.

1.2 REFERENCE STANDARDS

.1 ASTM International:
.1 ASTM E648 - 15e1 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
.2 ASTM E662 - 15a Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials

.2 ULC 102.2-10 Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies.

1.3 SAMPLES

.1 Submit full size carpet tile, edging specified for colour selection, in accordance with Section 01 01 50 - General Instructions, Submittal clause.

1.4 PRODUCT DATA

.1 Submit Product Data in accordance with Section 01 01 50 - General Instructions, Submittal clause.

.2 Data to clearly indicate floor preparation, tile installation and other details required by Departmental Representative to clarify work.

1.5 MAINTENANCE DATA

.1 Provide maintenance data for carpet tile for incorporation into Maintenance Manual specified in Section 01 01 50 - General Instructions, Submittal clause.

1.6 MAINTENANCE MATERIALS

.1 Deliver 10 tiles of carpet tile required for this project for maintenance use. Store where directed. Clearly identify box.

.2 Maintenance materials to be same production run as installed materials.

1.7 ENVIRONMENTAL CONDITIONS

.1 Ensure that air temperature is maintained between 10°-20°C in floor area and carpet tile materials for minium 48 hours before installation.

2 Products

2.1 MATERIALS

.1 Carpets required by NBCC 2010 to have flame spread rating or smoke developed classification accordance with CAN/ULC S102.2 for floor surface covering.

.2 Carpet tile:

.1 Pile fibre: 100% BCF type 6 solution dyed, from recycled content nylon, manufactured with 25% Pre-Consumer Recycled Content and 100% recyclable.

.2 Backing: proprietary backing system manufactured from 40% post consumer recycled content measured as a percentage total carpet tile weight, reinforced resilient synthetic composition, dimensionally stable, to manufacturer's standard with anti-microbial and odour treatment and 100% recyclable.

.3 Carpet tile size: approximately 50 x 50 cm square.

.4 Construction: tufted patterned scroll loop in multi colour blend and meeting the following minimum physical requirements:

- .1 Face pile weight: 623 g/m².
- .2 Average Density 6492 (UM 44D)
- .3 Soil/Stain treatment. Commercial anti-soil protection.
- .4 Anti-microbial treatment: Commercial anti-microbial protection.
- .5 Yarn system: Type 6 SD nylon.
- .6 Pile thickness: 3.1 mm minium.
- .7 Stitches: 10 SPI / 1/12 machine gauge.
- .8 Total thickness: 6 mm minimum.

.5 Smoke and flame:

- .1 Radiant Panel to ASTM E648: .>0.45, Class 1.
- .2 Smoke Density to ASTM E-662: <450.

.6 Electrostatic:

- .1 Propensity: AATCC - 134: <3.5 KV.

.7 Colour as selected by Departmental Representative.

.3 Edging: matching colour, vinyl or rubber extrusion of type recommended by carpet tile manufacturer.

.4 Adhesive: release type with Eco Logo Certification, of brand recommended by carpet tile manufacturer.

.5 Subfloor filler: white premix latex requiring only water to produce cementitious paste or type recommended by carpet tile manufacturer.

3 Execution

3.1 WORKMANSHIP

.1 Install carpet tile over existing commercial sheet vinyl flooring, after finishing work is completed, using release adhesive or tape system.

.2 Finish installation to present smooth wearing surface free from raised corners or edges.

.3 Ensure colour, pattern and texture match within any one area.

3.2 SUB-FLOOR TREATMENT

.1 Clean and prepare existing flooring to receive carpet tiles in accordance with carpet manufacturer's instructions.

.2 Remove ridges and bumps. Fill low spots, cracks, joints, holes and other defects as recommended by installer.

3.3 CARPET TILE INSTALLATION

.1 Lay out guide lines on floor in accordance with manufacturer's instructions adhesive to entire floor areas designated for carpet tile. Install carpet tile as scheduled.

.2 Install carpet tiles in accordance with manufacturer's strict instructions in random pattern.

.3 Lay flooring with joints parallel to room lines to produce symmetrical tile pattern. Border tiles minimum half tile width.

.4 Lay flooring tight to non-removable built-in fixtures without interrupting floor pattern.

.5 Terminate flooring at centerline of door in openings where adjacent floor finish is dissimilar. Install edge strips at unprotected or exposed edges where carpet tile terminates.

3.4 PROTECTION OF FINISHED WORK

.1 Vacuum carpet tile clean.

END OF SECTION

1 General

1.1 RELATED WORK

.1 Section 01 01 50 - Submittal Procedures, Waste Management And Disposal.

1.2 DESCRIPTION OF WORK

.1 Refer to notes and finish schedule on drawings for finishing of new work and existing surfaces.

1.3 REFERENCES

.1 American Society for Testing and Materials (ASTM):
.1 ASTM D 3960-05(2013), Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings.

.2 Architectural Painting Specifications Manual, Master Painters Institute (MPI).

.3 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings) of the Environmental Protection Agency (EPA).

.4 National Fire Code of Canada.

1.4 QUALITY ASSURANCE

.1 Qualified journeymen who have a "Tradesman Qualification Certificate of Proficiency" shall be engaged in painting work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with trade regulations.

.2 Conform to latest MPI requirements for interior painting work including preparation and priming.

.3 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) shall be in accordance with MPI Painting Specification Manual "Approved Product" listing and shall be from a single manufacturer for each system used.

.4 Standard of Acceptance:
.1 Walls: No defects visible from a distance of 1000 mm at 90° to surface.
.2 Bulkheads/Ceilings: No defects visible from at 45° to surface when viewed using final lighting source.
.3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

1.5 SAMPLES

.1 Submit sample colours of each paint type specified in accordance with Section 01 01 50.

.2 Submit duplicate mm sample panels of each paint, stain, clear coating, special finish, type colour texture specified.

.3 Submit full range of available colours where colour availability is restricted.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 01 50.

.2 Labels shall clearly indicate:
- .1 Manufacturer's name and address.
- .2 Type of paint or coating.
- .3 Compliance with applicable standard.
- .4 Colour number in accordance with established colour schedule.

.3 Remove damaged, opened and rejected materials from site.

.4 Observe manufacturer's recommendations for storage and handling.

.5 Store materials and supplies away from heat generating devices.

.6 Store materials and equipment in a well ventilated area with temperature range 7° C to 30° C.

.7 Store temperature sensitive products above minimum temperature as recommended by manufacturer.

.8 Remove paint materials from storage only in quantities required for same day use.

.9 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.

.10 Fire Safety Requirements:
- .1 Provide one 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.
- .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
- .3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

1.7 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

.1 Provide paint products meeting MPI "Environmentally Friendly"E2, E3 rating based on VOC (EPA Method 24) content levels.

1.8 SITE REQUIREMENTS

.1 Heating, Ventilation and Lighting:
- .1 Ventilate enclosed spaces in accordance with Section 01 01 50.
- .2 Perform no painting work unless adequate and continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above 10 ° C for 24 hours before, during and after paint application until paint has cured sufficiently.
- .3 Coordinate use of existing ventilation system with Departmental Representative and ensure its operation during and after application of paint as required.
- .4 Perform no painting work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted. Adequate lighting facilities is provided by General Contractor.

.2 Temperature, Humidity and Substrate Moisture Content Levels:

.1 Unless specifically pre-approved by the specifying body, Paint Inspection Agency and the applied product manufacturer, perform no painting work when:

.1 Ambient air and substrate temperatures are below 10 ° C.

.2 Substrate temperature is over 32 ° C unless paint is specifically formulated for application at high temperatures.

.3 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.

.2 Perform no painting work when the maximum moisture content of the substrate exceeds:

.1 15% for wood.

.2 12% for gypsum board.

.3 Conduct moisture tests using a properly calibrated electronic Moisture Meter.

.4 Test concrete, masonry and plaster surfaces for alkalinity as required.

.3 Surface and Environmental Conditions:

.1 Apply paint finish only in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.

.2 Apply paint only to adequately prepared surfaces and to surfaces within moisture limits noted herein.

.3 Apply paint only when previous coat of paint is dry or adequately cured.

.4 Additional Interior Application Requirements:

.1 Apply paint finishes only when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.

.2 Schedule operations to approval of Departmental Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.

1.9 SCHEDULING OF WORK

.1 Submit work schedule for various stages of painting to Departmental Representative for approval. Submit schedule minimum of 48 hours in advance of proposed operations.

.2 Obtain written authorization form Departmental Representative for any changes in work schedule.

.3 Schedule painting operations to prevent disruption of occupants in and about the occupied building.

1.10 WASTE MANAGEMENT

.1 Separate and recycle waste materials in accordance with Section 01 01 50 - Waste Management And Disposal.

.2 Non-water based opaque and transparent finishes and related materials (thinners, solvents, etc.,) 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.

.3 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.

.4 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.

.5 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into ground the following procedures shall be strictly adhered to:
.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 an approved legal manner in accordance with hazardous waste regulations.
.5 Empty paint cans are to be dry prior to disposal or recycling (where available).

.6 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.

.7 Set aside and protect surplus and uncontaminated finish materials: Deliver to or arrange collection by employees, individuals, or organizations for verifiable re-use or re-manufacturing.

2 Products

2.1 MATERIALS

.1 Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.

.2 Paint materials for paint systems shall be products of a single manufacturer.

.3 Only qualified products with E2, E3 "Environmentally Friendly" rating are acceptable for use on this project.

.4 Water-borne paints and stains, recycled water-borne surface coatings and water borne varnishes must meet a minimum "Environmentally Friendly" E2 rating.

2.2 COLOURS

.1 Departmental Representative will provide Colour Scheme after Contract award.

.2 Where specific products are available in a restricted range of colours, selection will be based on the limited range.

.3 Second coat in a three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.

2.3 MIXING AND TINTING

.1 Perform colour tinting operations prior to delivery of paint to site. On-site tinting of painting materials is allowed only with Departmental Representative's written permission.

.2 Paste, powder or catalyzed paint mixes shall be mixed in strict accordance with manufacturer's written instructions.

.3 Where thinner is used, addition shall not exceed paint manufacturer's recommendations. Do not use kerosene or any such organic solvents to thin water-based paints.

.4 Thin paint for spraying according in strict accordance with paint manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to Departmental Representative.

.5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

2.4 GLOSS/SHEEN RATINGS

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

loss Level	Description	Units @ 60 degrees	Units @ 85 degrees
G1	Matte or Flat finish	0 to 5	10 max.
G2	Velvet finish	0 to 10	10 to 35
G3	Eggshell finish	10 to 25	10 to 35
G4	Satin finish	20 to 35	35 min.
G5	Semi-Gloss finish	35 to 70	
G6	Gloss finish	70 to 85	
	High-Gloss finish	> 85	

.2 Gloss level ratings of painted surfaces as specified.

2.5 INTERIOR PAINTING SYSTEMS

.1 Concrete & Masonry Surfaces:
- .1 Prepare existing surfaces to manufacturer's instructions.
- .2 INT 4.2D High performance architectural latex G4 finish.

.2 Gypsum Board wall and bulkhead surfaces:
- .1 INT 9.2A Latex G3 finish (over latex sealer).

.3 Metal doors, frames and miscellaneous metal:
- .1 INT 5.1R High performance architectural latex coating G5 semigloss finish.

.4 Existing surfaces:
- .1 Prepare existing surfaces to manufacturer's instructions.
- .2 INT 5.1R High performance architectural latex coating G4 satin finish.

3 Execution

3.1 GENERAL

.1 Perform preparation and operations for interior painting in accordance with MPI Painting Specifications Manual except where specified otherwise.

.2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.2 EXISTING CONDITIONS

.1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Departmental Representative damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.

.2 Conduct moisture testing of surfaces to be painted using a properly calibrated electronic moisture meter. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

.3 Maximum moisture content as follows:
.1 Gypsum Board: 12%.
.2 Wood: 15%.

3.3 PROTECTION

.1 Protect interior building surfaces not to be painted from paint spatters, markings and other damage. If damaged, clean and restore such surfaces as directed by Departmental Representative.

.2 Cover or mask windows and other ornamental hardware adjacent to areas being painted to prevent damage and to protect from paint drops and splatters. Use non-staining coverings.

.3 Protect items that are permanently attached such as Fire Labels on doors and frames.

.4 Protect factory finished products and equipment.

.5 Remove electrical cover plates, light fixtures, surface hardware on doors, accessories and other surface mounted equipment, fittings and fastenings prior to undertaking any painting operations by General Contractor. Securely store and re-install items after painting is completed by General Contractor.

.6 As painting operations progress, place "WET PAINT" signs in all areas to approval of Departmental Representative.

3.4 CLEANING AND PREPARATION

.1 Clean and prepare surfaces in accordance with MPI Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
.1 Remove dust, dirt, and other surface debris by vacuuming, wiping with dry, clean cloths.
.2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.

.3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
.4 Allow surfaces to drain completely and allow to dry thoroughly.
.5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.
.6 Use trigger operated spray nozzles for water hoses.
.7 Many water-based paints cannot be removed with water once dried. However, minimize the use of kerosene or any such organic solvents to clean up water-based paints.

.2 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.

.3 Where possible, prime surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.
.1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas.
.2 Apply wood filler to nail holes and cracks.
.3 Tint filler to match stains for stained woodwork.

.4 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.

.5 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes, or vacuum cleaning.

.6 Touch up of shop primers with primer as specified in applicable section. Major touch-up including cleaning and painting of field connections, welds, rivets, nuts, washers, bolts, and damaged or defective paint and rusted areas, shall be by supplier of fabricated material.

.7 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, airless sprayer. Conform to manufacturer's application instructions unless specified otherwise.

.2 Brush and Roller Application:
.1 Apply paint in a uniform layer using brush and/or roller of types suitable for application.
.2 Work paint into cracks, crevices and corners.
.3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
.4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces shall be free of roller tracking and heavy stipple unless approved by Departmental Representative.
.5 Remove runs, sags and brush marks from finished work and repaint.

.3 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access and only when specifically authorized by Departmental Representative.

.4 Apply coats of paint as a continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.

.5 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.

.6 Sand and dust between coats to remove visible defects.

.7 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.

3.6 MECHANICAL/ELECTRICAL EQUIPMENT

.1 Unless otherwise specified, paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as noted otherwise.

.2 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.

.3 Do not paint over nameplates.

.4 Keep sprinkler heads and stainless work free of paint.

.5 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matt black paint.

3.7 RESTORATION

.1 Clean and re-install all items that were removed before undertaking painting operations.

.2 Remove protective coverings and warning signs as soon as practical after operations cease.

.3 Remove paint splashings on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.

.4 Protect 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.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1 Section 01 01 50 — General Instructions

.2 Section 01 35 33 — Health and Safety Requirements

.3 Section 23 05 00 — Common Work Results – Mechanical

1.2 References

.1 American National Standards Institute/National Fire Prevention Association (ANSI/NFPA)

.1 ANSI/NFPA 10-2013, Standard for Portable Fire Extinguishers.

.2 ANSI/NFPA 13-2013, Installation of Sprinkler Systems.

.3 ANSI/NFPA 25-2014, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.3 Underwriter's Laboratories of Canada (ULC).

.4 Fire Commissioner of Canada FC 403, "Sprinkler System".

1.3 Design Requirements

.1 Design and provide automatic wet pipe fire suppression sprinkler systems in accordance with required and advisory provisions of NFPA 13 for uniform distribution of water over design area.

.2 The "Authority Having Jurisdiction" will be designated by the Departmental Representative.

.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 sprinkler systems.

.6 Design systems for earthquake protection for buildings in seismic zone applicable.

.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.

.9 Sprinkler drawings and specifications are to give the bidder concept of the work involved. The design intent shall not be changed. Significant design features such as the location of exposed pipes and the method of zoning the sprinkler system may not be changed without prior discussion and approval by the Departmental Representative. Field changes may be

required to accommodate lighting, and hidden obstructions. Possible additional sprinkler heads may be required if blind spaces and ceiling drops have not been noted.

.10 The contractor shall make access to blind spaces in a professional manner. Honeycombing required to establish joist locations and/or similar endeavours to establish sound pipe hangers, are acceptable.

1.4 Submittals

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 01 50 – General Instructions.

.2 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 01 50 – General Instructions.

.2 Shop Drawings:

.1 Submit shop drawings in accordance with Section 01 01 50 – General Instructions.

.2 Shop drawings: submit drawings stamped sealed and signed by professional engineer registered or licensed in Province of British Columbia. Indicate:

.1 Materials.

.2 Finishes.

.3 Method of anchorage

.4 Number of anchors.

.5 Supports.

.6 Reinforcement.

.7 Assembly details.

.8 Accessories.

.3 Drawings: Sprinkler heads and piping system layout.

.1 Prepare detail working drawings of system layout in accordance with NFPA 13 using full size contract drawings.

.2 Show data essential for proper installation of each system.

.3 Show details, plan view, elevations, and sections of systems supply and piping.

.4 Show piping schematic of systems supply, devices, valves, pipe, and fittings.

.4 Design Data:

.1 Indicate type and design density of each system.

.3 Assurance of Professional Design and Commitment for Field Review.

.1 Provide Assurance commitment letters (Schedules B-1 and B-2) at the commencement of the project, in accordance with the building code and for submission to the Departmental Representative and review by the Authority Having Jurisdiction.

.2 Provide Assurance of Professional Field Review and Compliance (Schedule C-B) at the completion of the project.

.4 Closeout Submittals:

.1 Submit maintenance and engineering data for incorporation into manual specified in Section 01 01 50 – General Instructions in accordance with ANSI/NFPA 13.

.2 Manufacturer's Catalog Data, including specific model, type, and size for:

.1 Pipe and fittings.

.2 Sprinkler heads.

.3 Pipe hangers and supports.

.4 Mechanical couplings.

.3 Field Test Reports:

.1 Preliminary tests on piping system.

.2 Formal tests and inspections

.4 Records:

.1 As-built drawings of each system.

.1 After completion, but before final acceptance, submit complete set of as-built drawings (prints) of each system for record purposes.

.2 Submit drawings in digital file versions with title block similar to full size contract drawings.

.5 Operation and Maintenance Manuals:

.1 Provide maintenance data for incorporation into manual specified in Section 01 01 50 – General Instructions.

1.5 Quality Assurance

.1 Qualifications:

.1 Installer: company or person specializing in sprinkler systems with documented experience.

.2 All work shall be carried out by Sprinkler Pipe Fitters who carry a "Certificate of Qualification" for this trade as issued by the Ministry of Labour.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

.3 Inspections and Tests:

.1 All inspections, examinations and tests required by the "Authorities and Agencies having jurisdiction" specified shall be arranged and paid for by the fire protection contractor, as necessary to obtain complete and final acceptance of the fire protection system.

.2 Provide Contractor's Material and Test Certificates and all required test papers as may be requested by all parties having jurisdiction and duly witnessed by Departmental Representative.

.3 Provide the services of the Professional Engineer who designed the fire protection systems for "Field Review" of the installation. Construction period review reports shall be submitted during the construction period.

.4 If welding is required, the Contractor shall submit a copy of the welder's certification to the Sprinkler Engineer for Record purposes prior to starting work.

1.6 Delivery, Storage and Handling

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 01 50 – General Instructions.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Storage and Protection:

.1 Store materials indoors in dry location.

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

.3 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 01 50 – General Instructions.

PART 2 PRODUCTS

2.1 Pipe, Fittings & Valves

.1 Pipe:

.1 Piping shall meet or exceed one of the following standards:

.1 Black and Hot-Dipped Galvanized Welded and Seamless Steel Pipe – ASTM A795

.2 Welded and Seamless Steel Pipe – ANSI/ASTM A53

.3 Wrought Steel Pipe – ANSI B36.19M

.4 Elec.-Resistance Welded Steel Pipe – ASTM A135

.2 All thickness for pressures up to 2070 kPa (300 psi) shall be as follows:

.1 Joined by shop welding or roll grooving:

.1 Up to and incl. 125mm (5") – Schedule 10

.2 150mm (6") – 3.40mm (0.134)

.3 200mm, 250mm (8", 10") – 4.78mm (0.188")

.2 Joined by threaded fittings or cut grooves:

.1 Up to 200mm (8") – Schedule 40

.2 200mm (8") and larger – Schedule 30

.2 Fittings and joints to ANSI/NFPA 13:

.1 Ferrous: screwed, welded, flanged or roll grooved.

.2 Copper tube: screwed, soldered, brazed. Not permitted in any inmate areas.

.3 System piping 50mm (2") and smaller shall be Schedule 40 and threaded joints, or Schedule 10 lightwall with grooved joints, material and IPS dimensions conforming to NFPA 13. Larger sizes shall be Schedule 10 and joined by welding or groove joining methods in accordance with NFPA 13.

.4 All grooved products shall be of one manufacturer. All grooved end fittings shall be of "full flow" design and manufactured from ductile iron conforming to ASTM A-536. Grooved coupling shall be designed with angle bolt pads to provide a rigid joint except where flexibility is required. "Flush cap" or "flush seal" gaskets shall be used with couplings in dry pipe systems.

.5 Cast iron floor and ceiling plates with set screws shall be provided whenever pipe passes through walls, floors and partitions. In finished areas, plates shall be chrome plated.

.6. CPVC piping is not acceptable for this project.

.3 Pipe hangers:

.1 ULC listed for fire protection services.

.2 Hanger standards shall conform to Section 3-10 of NFPA 13. Use "C" clamps complete with lock nuts and restraining straps. Hangers shall be supplied and installed in accordance with NFPA 13. C-type clamps used to attach hangers to the building structure shall be equipped with lock nuts and retaining straps.

.3 Sway bracing shall be installed as per Section 3-5.3.5 of NFPA 13.

2.3 Pipe Sleeves

.1 Provide pipe sleeves where piping passes through walls, floors, and roofs.

.2 Secure sleeves in position and location during construction.

.3 Provide sleeves of sufficient length to pass through entire thickness of walls, floors, and roofs.

.4 Provide 2.5 cm minimum clearance between exterior of piping and interior of sleeve or core-drilled hole.

.1 Firmly pack space with mineral wool insulation.

.2 Seal space at both ends of sleeve or core-drilled hole with plastic waterproof cement which will dry to firm but pliable mass, provide mechanically adjustable segmented elastomeric seal.

.3 In fire walls and fire floors, seal both ends of pipe sleeves or core-drilled holes with ULC listed fill, void, or cavity material.

.5 Sleeves in Masonry and Concrete Walls, Floors, and Roofs:

.1 Provide hot-dip galvanized steel, ductile-iron, cast-iron sleeves.

.2 Core drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in core-drilled hole are completely grouted smooth.

.6 Sleeves in other than Masonry and Concrete Walls, Floors, and Roofs:

.1 Provide 0.61 mm thick galvanized steel sheet.

2.4 Escutcheon Plates

.1 Provide split hinged type metal plates for piping passing through walls, floors, and ceilings in exposed spaces.

.2 Provide polished chromium-plated finish on copper alloy plates in finished spaces.

.3 Provide paint finish on metal plates in unfinished spaces.

PART 3 EXECUTION

3.1 Manufacturer's Instruction

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

3.2 Above Ground Piping Systems

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

.1 Make changes in piping sizes through tapered reducing pipe fittings, bushings will not be permitted.

.2 Perform welding in shop; field welding will not be permitted.

.3 Conceal piping in areas with suspended ceiling.

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 Quality Control

.1 Site Test, Inspection:

.1 Perform test to determine compliance with specified requirements in presence of the Sprinkler Engineer of Record.

.2 Test, inspect, and approve piping before covering or concealing.

.3 Altered and relocated sprinkler system to be inspected and tested in conformance with NFPA.

3.5 Placing In Service

.1 When the entire fire protection system has been completed to the satisfaction of the Departmental Representatives and when operating and maintenance instructions have been provided, the Fire Protection Contractor shall, in the presence of the Sprinkler Engineer of Record, demonstrate the complete operation and maintenance required to the operating personnel. A complete operational test conducted on the entire installation for the purpose of verification of compliance with all applicable standards and codes shall be carried out.

.2 Operating manual shall include the following:

.1 Warranties and certificates.

.2 Manufacturer's operating and maintenance manuals.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1	Section 01 01 50	General Instructions
.2	Section 01 35 33	Health and Safety Requirements
.3	Section 23 05 00	Common Work Results for Mechanical
.4	Section 23 05 05	Installation of Pipework
.5	Section 23 05 29	Hangers & Supports for Piping & Equipment
.6	Section 23 07 19	Thermal Insulation for Piping

1.2 References

.1 American Society for Testing and Materials International, (ASTM).

- .1 ASTM B32-08, Standard Specification for Solder Metal.
- .2 ASTM B306-13, Standard Specification for Copper Drainage Tube (DWV).
- .3 ASTM C564-12, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

.2 Canadian Standards Association (CSA International).

- .1 CAN/CSA-B70-12, Cast Iron Soil Pipe, Fittings and Means of Joining.
- .2 CSA-B125-12, Plumbing Fittings.

1.3 Submittals

.1 Submittals in accordance with Section 01 01 50 – General Instructions.

.2 Provide maintenance data for incorporation into manual specified in Section 01 01 50 – General Instructions.

1.4 Health and Safety

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.5 Waste Management and Disposal

.1 Separate waste materials for reuse and recycling in accordance with Section 01 01 50 – General Instructions.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Place materials defined as hazardous or toxic in designated containers.

.4 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.

.5 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan

.6 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 PRODUCTS

2.1 Copper Tube and Fittings

.1 Above ground sanitary, storm and vent, Copper Type DWV to: ASTM B 306.

.1 Fittings.

.1 Cast brass: to CAN/CSA-B125.

.2 Wrought copper: to CAN/CSA-B125.

.2 Solder: tin-lead, 50:50, type 50A or lead free, tin-copper alloy 95:5, type TA to ASTM B 32.

PART 3 EXECUTION

3.1 Installation

.1 Install in accordance with Section 23 05 05 - Installation of Pipework, and Section 23 05 29 – Hangers & Supports for Piping & Equipment.

.2 Install in accordance with National Plumbing Code and local authority having jurisdiction.

.3 Install above ground piping parallel and close to walls and ceilings to conserve headroom and space, and to grade as indicated.

.4 Insulate condensate drain line in accordance with Section 23 07 19 – Thermal Insulation for Piping.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1 This Section specifies the common work results for the Mechanical Divisions, including:

.1 Division 21 Fire Protection

.2 Division 22 Plumbing

.3 Division 23 Heating Ventilation & Air Conditioning

.2 Read Division 1 General Requirements in conjunction with the specifications for Mechanical Divisions. Division 1 and this Section shall form a part of and shall apply to all Mechanical Divisions. The most stringent requirements of this and other Mechanical Sections must be adhered to.

.3 The Mechanical work shall consist of the supply and installation of complete and operable mechanical systems and shall include all necessary labour, plant, materials, and incidentals for the work involved as listed in the Mechanical Divisions. All sections in the Mechanical Divisions specifications are related sections and shall be read in conjunction with each other, whether or not "Related Sections" are explicitly mentioned under each section.

1.2 Submittals

.1 Submittals: in accordance with Section 01 01 50 – General Instructions.

.2 Shop drawings to show:

.1 Mounting arrangements.

.2 Operating and maintenance clearances.

.3 Shop drawings and product data accompanied by:

.1 Detailed drawings of bases, supports, and anchor bolts.

.2 Acoustical sound power data, where applicable.

.3 Points of operation on performance curves.

.4 Manufacturer to certify current model production.

.5 Certification of compliance to applicable codes.

.4 In addition to transmittal letter referred to in Section 01 01 50 – General Instructions: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

.5 Closeout Submittals:

.1 Provide operation and maintenance data for incorporation into manual specified in Section 01 01 50 – General Instructions.

.2 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection. Also see "Mandatory Requirements for O&M Manuals" this in Section.

.3 Operation data to include:

.1 Control schematics for systems including environmental controls.

.2 Description of systems and their controls.

.3 Description of operation of systems at various loads together with reset schedules and seasonal variances.

.4 Operation instruction for systems and component.

.5 Description of actions to be taken in event of equipment failure.

.6 Valves schedule and flow diagram.

.7 Colour coding chart.

.4 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.

.5 Performance data to include:

.1 Equipment performance verification test results.

.2 Special performance data as specified.

.3 For each fan and pump installed, provide performance data in "Curve" or multi rating table.

.4 For each plumbing fixture, floor and roof drain installed, provide manufacturer's "cut" of that item and "cuts" of associated brass goods.

.6 Approvals:

.1 Submit 1 copy of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.

.2 Make changes as required and re-submit as directed by Departmental Representative.

.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.

.2 Copies of extended guarantees and warranties for equipment items such as hot water tanks and heat exchangers shall be included in a separate section of the manual.

.8 Site records:

.1 Departmental Representative will provide 1 set of mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.

.2 Transfer information weekly to site mechanical drawings. Update drawings to show work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

.5 The drawings shall indicate the inverts and dimensioned locations of all services at the property line and where they penetrate the building perimeter.

.9 As-built drawings:

.1 Contractor shall provide mark-up as-built to Departmental Representative who will arrange for production of CAD as-built drawings. Contractor shall be responsible for providing copies electronic (CD's) and hard copies with Operating and Maintenance Manuals in accordance with Division 1.

1.3 Regulations

.1 Comply with most stringent requirements of NBC, Provincial and Municipal regulations and by-laws, specified standards, codes and this specification. Practices contained in these standards or standards suggested or recommended by reference organizations, are to be taken as minimum requirements.

.2 Furnish certificates confirming work installed conforms to requirements of authorities having jurisdiction.

.3 Drawings and specifications should not conflict with these Regulations but where there are apparent discrepancies, notify the Departmental Representative in writing and obtain clarifications before proceeding with the work.

1.4 Quality Assurance

.1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.5 Guarantee Warranty

.1 Correct promptly at own expense, defects or deficiencies in the work in accordance with the Warranty requirements of the Contract.

.2 The Departmental Representative shall be the judge as to whether the failure is due to defective workmanship, improper usage or ordinary wear and tear.

.3 Make good any damage resulting from defective materials or workmanship.

.4 Rectify any deficiencies or omissions in respect to plans or Specifications which may appear during the guarantee period even though work has been accepted as complete.

1.6 Definitions

.1 Definitions used in this Division will have the following meaning:

.1 "Concealed": pipes, ducts, etc., in trenches, chases, furred spaces, pipe shafts, or hung ceilings.

.2 "Exposed": regarding insulation and painting of piping, ducts, etc., will mean that they are not "concealed", as defined herein.

.3 "Piping": includes, in addition to pipe, all fittings, valves, hangers, other accessories which comprise a system.

.4 "Provide": to supply and install, complete and ready for use.

1.7 Drawings

.1 Drawings:

.1 Are not intended to show structural details or architectural features.

.2 Are not to be scaled.

.3 Except where dimensioned, indicate general mechanical layouts only.

.4 The drawings are mainly schematic and do not attempt to show all offsets. Make such offsets at no additional cost to contract. Offset angles shall be as small as possible.

.5 All figured dimensions shall have precedence over scale. Detail drawings shall have precedence over small scale drawings; any difference between same shall be decided upon by the Departmental Representative.

.2 Provide field (shop) drawings to indicate relative position of various services when required by Departmental Representative and obtain approval before commencing work.

.3 Shop drawing review by Departmental Representative is for the sole purpose of ascertaining conformance with the general design concept. This review shall not mean that Departmental Representative approves the detail design inherent in the shop drawings, responsibility for which shall remain with 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 quantities and dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for coordination of the work of all sub-trades.

1.8 Maintenance

.1 Furnish spare parts in accordance with Section 01 01 50 – General Instructions as indicated in the detailed product specification clauses.

.2 Provide access doors for concealed expansion joints, traps, strainers, cleanouts, balance dampers, fire dampers, other parts requiring accessibility for operating and maintenance.

.3 In suspended panel ceilings, use panel in place of access door; provide in such panel a button or other means of identification and easy removal when necessary.

1.9 Delivery, Storage and Handling

.1 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 01 50 – General Instructions.

1.10 Discrepancies and Omissions

.1 Bidders finding discrepancies in, or omissions from, Drawings, Specifications, or other documents, or having any doubt as to the meaning or intent of any part thereof, shall at once notify the Departmental Representative, who will send explanatory written instructions to all bidders. No verbal information will be considered valid.

.2 Should there be conflict(s) within or between the Specifications and/or Drawings, the most stringent or higher quality requirement shall apply.

1.11 Mandatory Requirements for O&M Manuals

.1 Hard Copy Requirements:

.1 Hard copies shall be placed in D-ring binders with clear overlay on front and spine with labels inserted on front cover and spine. Labels shall include the following information: Front cover label shall include the project name, project location, owner, architect, mechanical consultant, general contractor, mechanical contractor, firm preparing the manuals, and the month and year that the manuals were prepared. It shall also bear the label "Operating & Maintenance Manual for Mechanical Systems".

.2 Spine label shall include the project name, project location, and the year that the manuals were prepared. It shall also bear the label "Operating & Maintenance Manual for Mechanical Systems".

.3 Indicate Volume X of Y if more than one volume is required.

.4 Insert a Title page and Table of Contents in clear plastic covers.

.5 Title page shall include the project name, project location, as well as the name, address, phone number of the owner, architect, mechanical consultant, general contractor, mechanical contractor, firm preparing the manuals, and the month and year that the manuals were prepared. It shall also bear the label "Operating & Maintenance Manual For Mechanical Systems".

.6 Index the binder according to the following system:

Tab 1.1 Mechanical Drawing Schedule

Tab 1.2 Description of Systems

- Provide a schematic drawing and component description for each major mechanical system including air handling systems, boiler and hot water heating piping distribution systems and (where applicable) water chillers and chilled water distribution systems. The schematic drawing shall identify each component with a letter designation corresponding to a description briefly explaining the purpose of each component and how it relates to the other components, and be

presented in a current version of AutoCAD or similar computer aided drafting program.

- The component description shall be clearly written in a language that may be easily understood by the building operators and maintainers who will be using them.

Tab 1.3 Operating Division

Provide the following:

- Specific operating instructions for each major item of equipment, including air handling systems, pumps, boilers, chillers, etc.
    - Ventilation requirements, Energy considerations, Automatic temperature control settings, Information regarding air filters and pressure drops for clean and dirty conditions.
    - Trouble Shooting Procedure Guide in spreadsheet form with the most likely causes and recommended actions for all foreseeable problems. Trouble Shooting Procedure guides are required for all the major items of equipment including air handling systems, exhaust fans, circulating pumps, mechanical cooling equipment, etc.
    - Mechanical Equipment Starting Procedures.

Tab 1.4 Maintenance and Lubrication Division

Tab 1.5 Equipment Supplier and Contractor Schedule

- Provide a list of Equipment Suppliers and Contractors and include their address, telephone number.
- Provide the Equipment Make/Manufacturer

Tab 2.0 Guarantees, Certificates and Reports

- Including assurance letters, balancing and commissioning reports

Tab 2.1 Valve Tag Schedule

Tab 2.2 Labeling and Identification Schedule

- Piping colour code schedules
- Access panel identification schedules

Tab 2.3 Chemical Cleaning and Treatment

- Chemical cleaning shop drawings, water treatment data

Tab 3.0 Equipment Shop Drawings and Maintenance Data

- Organize this section into numbered tabs.
- Insert final shop drawings that have been reviewed and as-built control schematics.
- For each fan and pump installed, provide performance curves indicating the design point of intersection and the actual operating point.
- For each plumbing fixture, floor and roof drain installed, provide manufacturer's "cut" of that item and "cut" of associated brass goods.
- In addition to the shop drawings provided for the various items of mechanical equipment, this section shall also include the Manufacturers' Literature on:
    - Operating and maintenance instructions
    - Spare parts lists
    - Trouble Shooting information

Tab 4.0 Balance Report

The divider tabs shall be custom laminated mylar plastic and shall be in accordance with the following colour scheme:

- Tabs 1.1 to 1.5 – Orange
- Tabs 2.0 to 2.3 – Green
- Tab 3.0 – Yellow

.7 Furnish sufficient copies of equipment manufacturer's literature, a set of drawings, approved shop drawings, and Mechanical Specification to the company preparing the O&M manuals to meet the above requirements.

.2 Digital Manual Requirements

.1 The digital version of the manuals and the hard cover version shall be prepared by the same company.

.2 In addition to the operating and maintenance manuals provided in hard covered binders, two copies of all information shall be provided in digital format as follows:

.3 The information shall be organized into sections in a user-friendly format to make it easy to search for specific information. An indexing system shall be

included that remains on an expandable portion of the screen that allows the end user to scroll through the manual information that appears on the main portion of the screen. The digital version content and organization for each manual shall be arranged in a manner identical to the hard copy version. The specific requirements are listed below:

.1 Utilize Adobe Acrobat PDF format.

.2 If there is more than one volume of manual, indicate "Volume X of Y" for each volume.

.3 Include a copy of the latest Adobe Acrobat Reader.

.4 The final Digital copies are to be copied to CDR with a custom CDR label. The custom CDR label shall include: Project Name, Location of Project, Date of Assembly, name of Mechanical Consultant, and shall be titled "Operating & Maintenance Manual for Mechanical Systems".

.5 The Digital Manual shall be enhanced with the following features: Bookmarks, Thumbnails, Internet Links, Internal Document Links and Optical Character Recognition (OCR). Refer to Scanning Requirements and Organizational Requirements listed below.

.4 Scanning Requirements:

.1 All pages contained within the hard copy manual are to be scanned and/or digitized to Adobe Acrobat PDF format.

.2 Provide a minimum 300 DPI for all scanned pages.

.3 All scanned shop drawings may be searched for text with minimum 75% Optical Character Recognition (OCR).

.4 All shop drawings are to be scanned to a minimum 8.5"X11" size. If the original page size is 11"X17", the digital copy shall also be 11"X17". Page sizes exceeding 11"X17" may be shrunk down to 11"X17".

.5 Rotation of scanned page images/texts shall be displayed within +/- 20 degrees.

.5 Organizational Requirements:

.1 Digital Manual shall be organized in the same manner as the approved Hard Copy Manual. (e.g. Tabs 1.1, 1.2, 1.3, 1.4, 1.5, 2.0, 3.0, 4.0, etc).

.2 Bookmark all major tabs and subsections.

.3 Bookmark each set of shop drawings (Section 3.0).

.4 Link the Table of Contents page to the referenced sections.

.5 Insert an introduction/summary page for Sections 1.2, 1.3, 1.4, and 3.0 indicating major subsections. Link these pages to their referenced sections.

.6 Link the system descriptions to the referenced schematic drawings contained in section 1.2.

.7 Insert Internet Links and Internal Document Links from Section 1.5 to Mechanical Equipment Manufacturers/Suppliers/Contractors official websites.

.8 Mechanical Equipment Shop Drawings located in Section 3.0.

.6 Use the following colour code for links contained in Sections 1.2, 1.3, 1.4, and 1.5.:

.1 Internet Links (light blue with underline).

.2 Internal Document Link (dark blue) (excludes AutoCAD schematic links).

.7 Insert a title page for each major piece of equipment located in Section 3.0. The title page shall include the Shop Drawing name, and a link (dark blue in colour) to Section 1.5.

.8 It is the responsibility of the Mechanical Trade to provide high quality documentation for scanning.

.9 Digital Manual shall be reviewed by the Departmental Representative for content and layout prior to final submission.

1.12 Security Fasteners

.1 Fasteners used in areas accessible by inmates shall be TORX with pin, stainless steel screws, which require a special tool to remove the fasteners.

.2 Use fasteners compatible with material through which they pass.

.3 Submit plan showing location of each penetration and product data to indicate type of firestopping being installed at each location.

PART 2 PRODUCTS

2.1 Access Doors

.1 Access door size shall be as indicated and where not indicated, make 305mm x 406mm [12" x 16"] minimum or 610mm x 457mm [24" x 18"] where persons have to enter. For acoustical ceilings, conform to architectural panel pattern.

.2 Unless otherwise indicated, access doors shall be hinged, flush type, steel framed panel, 14 gauge minimum, satin finished galvanized steel or type 304 stainless steel, with anchor straps for wet areas, washrooms, and all walls finished in ceramic tile.

.3 Hinges shall be concealed, spring hinge to allow door to open 175°. Locking devices shall be flush cam type, screwdriver operated, doors and frames shall have prime coated rust inhibiting paint, unless made of stainless steel.

.4 Where doors are required in fire rated walls, access doors shall be uninsulated and for all fire rated ceilings and walls where maximum temperature rise limitation is applicable, shall be insulated. All fire rated access doors shall have Warnock Hersey or ULC listed 2 hour fire rating and shall be installed in accordance with NFPA 80 and manufacturer's installation instructions.

PART 3 EXECUTION

3.1 Installation

.1 Coordinate work with work of other sections to avoid conflict.

.2 Locate distribution systems, equipment, and materials to provide minimum interferences and maximum usable space.

.3 Where interference occurs, Departmental Representative shall approve relocation of equipment and materials, regardless of installation sequence.

.4 Provide tamperproof screws for new and relocated equipment located in inmate accessible areas.

3.2 Cleaning

.1 Proceed in accordance with Section 01 01 50 – General Instructions.

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

.3 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

3.3 Cutting and Patching

.1 Make arrangements with General Contractor for all cutting and patching in this work.

.2 Minimize cutting and patching. Set sleeves and mark openings in concrete or masonry.

.3 Conduct ground penetrating radar (GPR) scans prior to coring or cutting existing concrete structure.

3.4 Waterproofing

.1 Where any work pierces waterproofing including waterproofing concrete, the method of installation shall be as approved by the Departmental Representative before the work is done. Supply and install all necessary sleeves, caulking, roof curbs, and flashing required and make the openings watertight.

3.5 Protection of Work

.1 Protect equipment and material during construction from the weather, moisture, dust, painting, plastering and physical damage. Clean and return to "as new" condition.

.2 Mask or grease and cover machined surfaces. Firmly secure covers over equipment openings and open ends of piping, conduit and ductwork as work progresses. Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

.3 Any equipment that has operating parts, bearings or machined surfaces that show signs of rusting, pitting or physical damage will be rejected.

.4 Refinish damaged or marred factory finishes to the satisfaction of the Departmental Representative, using equal quality materials.

3.6 Field Quality Control

.1 Site Tests: conduct following tests in accordance with Section 01 01 50 – General Instructions and submit report as described in PART 1 - SUBMITTALS.

.2 Manufacturer's Field Services:

.1 Where specified, obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.7 Demonstration and Operating Instructions

.1 Departmental Representative may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 Provide training to Departmental Representative for the controls and operation of mechanical equipment and systems installed and/or modified as part of this project.

.3 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.4 Use operation and maintenance manual and as-built drawings as part of instruction materials.

.5 Instruction duration time requirements as specified in appropriate sections.

.6 During substantial performance review of the work the Mechanical Contractor, together with the Departmental Representative, Controls Contractor, and other Subcontractors designated by the Departmental Representative, shall instruct the Owner's operating personnel in the proper operation and maintenance of all systems and equipment installed under the contract.

.7 It shall be the Mechanical Contractor's responsibility to have the specified equipment manuals prepared, previously approved by the Departmental Representative, and ready for presentation to the Owner at this meeting.

.8 Convene the meeting with the aforementioned parties at the time called for in the substantial performance review. The arrangements shall include written notices to all the parties concerned. Should the equipment manuals, or system installation not be complete

and operable at the proper time, he shall then convene the operating instruction meeting at a later date and pay any additional costs including time and travelling expenses for the personnel involved which are attributable to the delay.

.9 Keeping a sign-in sheet is mandatory for the demonstration and training session. Submit a copy of the sign-in sheet to Departmental Representative for record.

3.8 Access Doors

.1 Furnish access doors for concealed expansion joints, traps, strainers, cleanouts, balance dampers, fire dampers, other parts requiring accessibility for operating and maintenance. Access doors shall be provided to General Contractor for installation and shall be coordinated.

.2 In suspended panel ceilings, use panel in place of access door; provide in such panel a button or other means of identification and easy removal when necessary.

3.9 Halocarbons Management

.1 Comply with all of:

.1 Federal Halocarbon Regulations, 2003;

.2 Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems (the Environment Canada "Refrigeration Code of Practice") Cat. No.: En14-207/2015E-PDF, April, 2015.

.2 Work on Halocarbon Systems includes installation, servicing, leak testing or charging of a refrigeration system or an air-conditioning system or doing any other work on the system that may result in the release of a halocarbon.

.3 All work on Halocarbon Systems shall be carried out only by a "Certified Person" as defined by the Federal Halocarbon Regulations 2003.

.1 Provide copies of all technicians' certificates to the Departmental Representative.

.4 Halocarbons listed under Item 1 through 10 of Schedule 1 of Federal Halocarbon Regulations, 2003 (SOR/2003-289) are not acceptable refrigerants.

.5 Document **all** work on Halocarbon Systems using CSCs halocarbon form "**Information Required for Refrigeration Systems at Federal Correctional Facilities**". Obtain the latest form from Departmental Representative. Affix the completed form to equipment, and submit a copy of the form to Departmental Representative.

.6 Comply with the following timelines:

.1 Upon delivery of halocarbon-containing equipment to site, submit the following information to Departmental Representative within 24 hours of service;

.1 Make

.2 Model

.3 Serial number

.4 Type of halocarbon

.5 Halocarbon charging capacity of system (kg or lbs)

.6 Factory Halocarbon Charge (kg or lbs)

.7 Cooling capacity (kW, Btuh, or Tons)

.2 Leak-test factory-charged halocarbon-containing equipment containing over 10kg of refrigerant in accordance with the Refrigeration Code of Practice within one week of equipment delivery to site.

.3 Leak-test field-charged halocarbon-containing equipment in accordance with Section 4.4 of the Refrigeration Code of Practice at the time of field charging of system.

.4 For all work on Halocarbon Systems, submit forms to Departmental Representative within 48 hours of work.

.5 For release of halocarbons >10 kg and <100 kg, submit forms to Departmental Representative within 24 hours of discovery of release.

.6 For release or potential release of halocarbons > 100 kg, submit forms to Departmental Representative **immediately**.

.7 Conduct annual leak tests of halocarbon-containing equipment with 19kW (5.4 tons) or greater cooling capacity in accordance with the Federal Halocarbon Regulations, 2003 until such time as Interim Certificate of Completion is issued.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1 Section 01 01 50 — General Instructions

.2 Section 23 05 00 — Common Work Results – Mechanical

.3 Section 23 05 29 — Hangers & Support for Piping & Equipment

.4 This Section applies to all related work under Divisions 22 and 23.

1.2 References

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.181-1999, Ready-Mixed Organic Zinc-Rich Coating.

1.3 Waste Management and Disposal

.1 Separate and recycle waste materials in accordance with Section 01 01 50 – General Instructions.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.

PART 2 PRODUCTS

2.1 Not Used

.1 Not Used

PART 3 EXECUTION

3.1 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.

3.2 Clearances

.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer.

.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer or as indicated (whichever is greater) without interrupting operation of other system, equipment, or components.

3.3 Pipework Installation

.1 Protect openings against entry of foreign material.

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

.3 Assemble piping using fittings manufactured to ANSI standards.

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

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

.6 Valves:

.1 Install in accessible locations.

.2 Remove interior parts before soldering.

.3 Install with stems above horizontal position unless otherwise indicated.

.4 Valves accessible for maintenance without removing adjacent piping.

.5 Install globe valves in bypass around control valves.

.6 Use chain operators on valves NPS 2-1/2 and larger where installed more than 2,400mm above floor in Mechanical Rooms.

.7 Install dielectric coupling between dissimilar metals.

.8 Install in accordance with Section 23 05 29 – Hanger & Support for Piping & Equipment.

3.4 Sleeves

.1 General: Install where pipes pass through masonry, concrete structures, fire rated assemblies (where steel sleeves are part of the listed assemblies), and elsewhere as indicated.

.2 Material: Schedule 40 black steel pipe.

.3 Construction: Foundation walls and where sleeves extend above finished floors to have annular fins continuously welded on at mid-point.

.4 Sizes: 6 mm minimum clearance between sleeve and un-insulated pipe or between sleeve and insulation.

.5 Installation:

.1 Concrete, masonry walls, concrete floors on grade: Terminate flush with finished surface.

.2 Other floors: Terminate 25mm above finished floor.

.6 Sealing:

.1 Foundation walls and below grade floors: Fire retardant, waterproof non-hardening mastic.

.2 Elsewhere: Provide space for firestopping. Maintain fire rating integrity.

.3 Sleeves installed for future use: Fill with lime plaster or other easily removable filler.

.4 Ensure no contact between copper pipe or tube and sleeve.

3.5 Escutcheons

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

.2 Construction: One piece type with set screws. Chrome or nickel plated brass or type 304 stainless steel.

.3 Sizes: Outside diameter to cover opening or sleeve. Inside diameter to fit around pipe.

3.6 Cleaning of Piping Systems

.1 Proceed in accordance with Section 01 01 50 – General Instructions.

END OF SECTION

PART 1 GENERAL

1.1 Related Section

.1 Section 01 01 50 General Instructions

.2 Section 01 35 33 Health and Safety Requirements

.3 Section 23 05 00 Common Work Results – Mechanical

.4 Section 23 05 48 Vibration & Seismic Control for Ductwork, Piping and Equipment

.5 All work installed under Divisions 22 and 23 shall conform to this Section.

1.2 References

.1 American National Standards Institute / Sheet Metal and Air Conditioning Contractors National Association (ANSI/SMACNA):

.1 ANSI/SMACNA 001-2008, Seismic Restraint Manual, Guidelines for Mechanical Systems, 3rd Edition.

.2 American Society of Mechanical Engineers (ASME):

.1 ASME B31.1-12, Power Piping.

.3 American Society for Testing and Materials (ASTM):

.1 ASTM A125-96(2013)e1, Standard Specification for Steel Springs, Helical, Heat-Treated.

.2 ASTM A307-12, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

.3 ASTM A563-07a, Standard Specification for Carbon and Alloy Steel Nuts.

.4 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS):

.1 MSS SP58-2009, Pipe Hangers and Supports - Materials, Design and Manufacture.

.2 MSS SP69-2003, Pipe Hangers and Supports - Selection and Application.

.3 MSS SP89-2003, Pipe Hangers and Supports - Fabrication and Installation Practices.

.5 National Plumbing Code 2010.

1.3 System Description

.1 Design Requirements:

.1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.

.2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP58.

.3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.

.4 Design hangers and supports to support systems under all conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.

.5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment to be in accordance with MSS SP58.

.2 Performance Requirements:

.1 Design supports and hangers to withstand seismic events as specified Section 23 05 48 – Vibration & Seismic Control for Ductwork, Piping and Equipment.

1.4 Submittals

.1 Submittals: in accordance with Section 01 01 50 – General Instructions.

.2 Submit shop drawings and product data for following items:

.1 Bases, hangers and supports.

.2 Connections to equipment and structure.

.3 Structural assemblies.

.3 Quality assurance submittals: submit following in accordance with Section 01 01 50 – General Instructions.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

.4 Closeout Submittals:

.1 Provide maintenance data for incorporation into manual specified in Section 01 01 50 – General Instructions.

1.5 Quality Assurance

.1 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.6 Delivery, Storage and Handling

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 01 50 – General Instructions.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 01 50 – General Instructions.

PART 2 PRODUCTS

2.1 Design Requirements:

.1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.

.2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP58.

.3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.

.4 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.

.5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP58.

2.2 General

.1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1 and MSS SP58.

.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

2.3 Upper Attachment

.1 Steel Joist:

.1 Cold piping NPS 2 and under: steel washer plate with double locking nuts.

.2 Cold piping NPS 2-1/2 and larger and all hot piping: steel washer plates with double locking nut, carbon steel clevis and malleable iron socket - Grinnell/Anvil: washer plate, fig. 60; clevis, fig. 66; socket, fig. 290.

.2 Steel Channel or Angle (bottom):

.1 Cold piping NPS 2 and under; malleable iron C clamp - Grinnell/Anvil fig. 86.

.2 Cold piping NPS 2-1/2 and larger and all hot piping; universal channel clamp - Grinnell/Anvil fig. 226.

.3 Steel Channel or Angle (top):

.1 Cold piping NPS 2 and under: malleable iron "top of beam" C clamp - Grinnell/Anvil fig. 61.

.2 Cold piping NPS 2-1/2 and larger and all hot piping: steel jaw, hook rod with nut, spring washer and plain washer - Grinnell/Anvil fig. 227.

2.4 Middle Attachments (Rod)

.1 Carbon steel black (electro-galvanized/cadmium plated for mechanical rooms) continuous threaded rod - Grinnell/Anvil fig. 146.

.2 Ensure that hanger rods are subject to tensile loading only.

2.5 Pipe Attachments

.1 Piping with less than 25 mm [1"] horizontal movement, NPS 2 and under: adjustable swivel ring hanger - Grinnell/Anvil fig. 69.

.2 Piping with less than 25 mm [1"] horizontal movement, NPS 2-1/2 and over: adjustable clevis hanger - Grinnell/Anvil fig. 260.

.3 Perforated band iron, wire or chain hangers will not be approved.

.4 All hangers for copper pipe shall be copper, copper clad, felt lined or use plastic tape wrapped pipe at hanger.

PART 3 EXECUTION

3.1 Installation

.1 Install in accordance with:

.1 Manufacturer's instructions and recommendations.

3.2 Hanger Spacing

.1 HVAC piping: in accordance with table below.

.2 Plumbing piping: in accordance with the most stringent requirements of the table below as well as the following:

.1 National. Plumbing Code.

.2 Authority Having Jurisdiction.

.3 Pipe hanger rods shall be sized in accordance to SMACNA Seismic Restraint Manual based on Seismic Hazard Level (SHL). For SHL, see Section 23 05 48 – Vibration and Seismic Controls for Ductwork, Piping and Equipment.

MAXIMUM HANGER SPACING						
PIPE DIA. NPS	STEEL SCH.40	COPPER L,K Hard Drawn	CAST.I STD.	GLASS	ABS/PVC	PEX
1/2	1.8 m [6'-0"]	1.8 m [6'-0"]			1.2 m [4'-0"]	0.8 m [2'-6"]
3/4 & 1	2.4 m [8'-0"]	2.4 m [8'-0"]			1.2 m [4'-0"]	0.8 m [2'-6"]
1-1/4	2.4 m [8'-0"]	3.0 m [10'-0"]			1.2 m [4'-0"]	0.8 m [2'-6"]
1-1/2 & 2	2.4 m [8'-0"]	3.0 m [10'-0"]	3.0 m [10'-0"]		1.2 m [4'-0"]	0.8 m [2'-6"]
2-1/2, 3, 4 & 5	2.4 m [8'-0"]	3.0 m [10'-0"]	3.0 m [10'-0"]	2.4 m [8'-0"]	1.2 m [4'-0"]	0.8 m [2'-6"]
6 & 8	3.0 m [10'-0"]	3.0 m [10'-0"]	3.0 m [10'-0"]	2.4 m [8'-0"]	1.2 m [4'-0"]	0.8 m [2'-6"]

3.3 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.

3.4 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 13mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.5 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.

3.6 Cleaning

.1 Proceed in accordance with Section 01 01 50 – General Instructions.

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

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1 Section 01 01 50 — General Instructions

.2 Section 23 05 00 — Common Work Results – Mechanical

.3 This Section applies to all related work under Divisions 22 and 23.

1.2 References

.1 National Building Code of Canada (NBC)

.2 American National Standards Institute / Sheet Metal and Air Conditioning Contractors National Association (ANSI/SMACNA):

.1 ANSI/SMACNA 001-2008, Seismic Restraint Manual, Guidelines for Mechanical Systems, 3rd Edition.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01 01 50 – General Instructions.

.2 Provide vibration isolation systems shop drawings complete with performance and product data. Shop drawings shall demonstrate compliance with the National Building Code and shall bear the seal of a Professional Engineer.

.3 Provide detailed drawings of all seismic restraint systems for piping and equipment.

1.4 Waste Management and Disposal

.1 Separate and recycle waste materials in accordance with Section 01 01 50 – General Instructions.

.2 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative.

.3 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.4 Dispose of packaging material in appropriate on-site bin for recycling in accordance with site waste management program.

PART 2 PRODUCTS

2.1 Vibration Isolation System – General

.1 Performance of vibration isolation systems shall be designed by manufacturer specializing in vibration isolation materials and devices.

.2 Size and shape of bases type shall be coordinated with submitted equipment.

.3 Products shall of the same manufacturer unless otherwise noted.

2.2 Elastomeric Pads

.1 Type EP1 - neoprene waffle or ribbed; 9 mm [3/8"] minimum thick; 50 durometer; maximum loading 350 kPa [50 psi].

2.3 Seismic Control Measures

.1 General:

.1 Design anchorage and attachment methods for all systems and/or equipment as specified herein.

.2 Seismic control systems to work in all directions.

.3 Fasteners and attachment points to resist same maximum load as seismic restraint.

.4 Drilled or power driven anchors and fasteners not permitted.

.5 No equipment, equipment supports or mounts to fail before failure of structure.

.6 Supports of cast iron or threaded pipe not permitted.

.7 Seismic control measures not to interfere with integrity of firestopping.

.8 For equipment mounted on housekeeping pad, specify the minimum distance between anchor bolt and edge of housekeeping pad.

.2 Static equipment:

.1 Anchor equipment to equipment supports. Anchor equipment supports to structure.

.2 Suspended equipment:

.1 Use one or more of following methods depending upon site conditions or as indicated:

.1 Install tight to structure.

.2 Cross brace in every direction.

.3 Brace back to structure.

.4 Cable restraint system.

.2 Seismic restraints:

.1 Cushioning action to be gentle and steady.

.2 Shall never reach metal-like stiffness.

.3 Ductwork systems:

.1 Diffusers, Grilles and Registers:

.1 Diffusers, grilles and registers installed in a suspended grid ceiling shall be provided with wire retainers or duct straps connecting the fixture at diagonally opposite corners to the building structure.

.4 Bracing methods:

.1 Approved by Departmental Representative.

.2 Structural angles or channels.

.3 Cable restraint system incorporating grommets, shackles and other hardware to ensure alignment of restraints and to avoid bending of cables at connection points. Incorporate neoprene into cable connections to reduce shock loads.

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 Seismic control measures to meet requirements of NBC.

.2 Install vibration isolation equipment in accordance with manufacturer's instructions and adjust mountings to level equipment.

.3 Ensure piping, ducting and electrical connections to isolated equipment do not reduce system flexibility and that piping, conduit and ducting passage through walls and floors do not transmit vibrations.

3.3 Field Quality Control

.1 Provide the services of the Professional Engineer(s) who designed the restraint systems for "Field Review" of the installed components, and submit the following to the Departmental Representative:

.1 Schedule B, signed and sealed; provided at the commencement of the project.

.2 Signed and sealed shop drawings of seismic restraints for equipment, piping and ductwork; provided prior to installation.

.3 Typewritten inspection reports; provided during the construction period.

.4 Schedule C-B, signed and sealed; provided after performing "Field Review".

3.4 Cleaning

.1 Proceed in accordance with Section 01 01 50 – General Instructions.

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

END OF SECTION

PART 1 - GENERAL

1.1 Related Sections

.1 Section 01 01 50 — General Instructions

.2 Section 01 35 33 — Health and Safety Requirements

.3 Section 23 05 00 — Common Work Results – Mechanical

.4 This Section applies to all related work under Divisions 21, 22 and 23.

1.2 References

.1 Canadian Standards Association (CSA International):

.1 CAN/CSA B149.1, Natural Gas and Propane Installation Code.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.60, Interior Alkyd Gloss Enamel.

.2 CAN/CGSB-24.3, Identification of Piping Systems.

.3 National Fire Protection Association (NFPA)

.1 NFPA 13, Standard for the Installation of Sprinkler Systems.

.2 NFPA 14, Standard for the Installation of Standpipe and Hose Systems.

1.3 Quality Assurance

.1 Quality assurance submittals: submit following in accordance with Section 01 01 50 – General Instructions.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.4 Delivery, Storage, and Handling

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 01 50 – General Instructions.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 01 50 – General Instructions.

.2 Dispose of unused paint and coating material at official hazardous material collections site approved by Departmental Representative.

.3 Do not dispose of unused paint and coating material into sewer system, into streams, lakes, onto ground or in locations where it will pose health or environmental hazard.

PART 2 - PRODUCTS

2.1 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:

	Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	11 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.

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 Nameplates

.1 Locations:

.1 In conspicuous location to facilitate easy reading and identification from operating floor.

.2 Standoffs:

.1 Provide for nameplates on hot and/or insulated surfaces.

.3 Protection:

.1 Do not paint, insulate or cover.

3.3 Cleaning

.1 Proceed in accordance with Section 01 01 50 – General Instructions.

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

END OF SECTION

PART 1 - GENERAL

1.1 General

.1 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 Company

.1 Testing and balancing shall be performed by an agency that specializes in this type of work.

.2 All work shall be performed by persons with proven ability and thoroughly versed in the type of testing and balancing. Submit names, complete with experience, record and references for review by the Departmental Representative prior to work being carried out.

.3 TAB: performed in accordance with the requirements of standard under which TAB Firm's qualifications are approved:

.1 Associated Air Balance Council, (AABC) National Standards for Total System Balance, MN-1-2002.

.2 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems-1998.

.3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing-2002.

.4 Recommendations and suggested practices contained in the TAB Standard: mandatory.

.5 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.

.6 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.

.7 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.

.8 TAB Standard quality assurance provisions such as performance guarantees form part of this contract.

.1 For systems or system components not covered in TAB Standard, use TAB procedures developed by TAB Specialist.

.2 Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used (AABC, NEBB, or TABB), requirements and recommendations contained in these procedures and requirements are mandatory.

1.3 Purpose of TAB

.1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads

.2 Adjust and regulate installed equipment and systems so as to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.

.3 Balance systems and installed 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 be to satisfaction of authority having jurisdiction.

1.5 Coordination

.1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule so as to ensure completion before acceptance of project.

.2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

1.6 Pre-TAB Review

.1 Review contract documents before project construction is started. Confirm in writing to Departmental Representative adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.

.2 Review specified standards and report to Departmental Representative in writing all proposed procedures which vary from standard.

.3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

1.7 Start-Up

.1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.

.2 Follow special start-up procedures specified elsewhere in Division 23.

1.8 Operation of Systems During TAB

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

1.9 Start of TAB

.1 Notify Departmental Representative 7 days prior to start of TAB.

.2 Start TAB when building is essentially completed, including:

- .1 Installation of ceilings, doors, windows, other construction affecting TAB.
- .2 Application of weather-stripping, sealing, caulking.
- .3 All pressure, leakage, other tests specified elsewhere Division 23.
- .4 All provisions for TAB installed and operational.

.3 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 Filters in place, clean.
  - .2 Duct systems clean.

.3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.

.4 Correct fan rotation.

.5 Fire, smoke, volume control dampers installed and open.

.6 Coil fins combed, clean.

.7 Access doors, installed, closed.

.8 Outlets installed, volume control dampers open.

1.10 Application Tolerances

.1 Do TAB to following tolerances of design values:

.1 HVAC systems: plus 5%, minus 5%.

1.11 TAB Report

.1 Format to be in accordance with Associated Air Balance Council Manual.

.2 TAB report to show results in SI units and to include:

.1 Project record drawings.

.3 Include final TAB report in O&M manual. Provide one (1) copy of final TAB Report to Departmental Representative.

1.12 Verification

.1 Reported results subject to verification by Departmental Representative.

.2 Provide manpower and instrumentation to verify up to 30% of reported results.

.3 Number and location of verified results to be at discretion of Departmental Representative.

.4 Pay costs to repeat TAB as required to satisfaction of Departmental Representative.

1.13 Settings

.1 After TAB is completed to satisfaction of Departmental Representative, replace drive guards, close access doors, lock devices in set positions, ensure sensors are at required settings.

.2 Permanently mark settings to allow restoration at any time during life of facility. Markings not to be eradicated or covered in any way.

1.14 Completion of TAB

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

1.15 Air Systems

.1 Standard: TAB to be to most stringent of this section or TAB standards of AABC, NEBB, SMACNA and ASHRAE.

.2 Locations of systems measurements to include, but not be limited to, following as appropriate: Main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

PART 2 - PRODUCTS

2.1 Not Used

.1 Not used.

PART 3 - EXECUTION

3.1 General

.1 Test and balance new/existing equipment and systems serving the new / renovated areas and buildings.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1	Section 01 01 50	General Instructions
.2	Section 01 35 33	Health and Safety Requirements
.3	Section 23 05 00	Common Work Results - Mechanical
.4	Section 23 05 29	Hangers and Supports for HVAC Piping and Equipment

1.2 References

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE),

.1 ANSI/ASHRAE/IESNA 90.1-2013; Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 American Society for Testing and Materials International, (ASTM)

.1 ASTM B209M-10, Specification for Aluminum and Aluminum Alloy Sheet and Plate (Metric).

.2 ASTM C335/C335M-10e1, Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.

.3 ASTM C411-11, Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.4 ASTM C449-07(2013), Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.5 ASTM C547-12, Standard Specification for Mineral Fiber Pipe Insulation.

.6 ASTM C553-13, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

.7 ASTM C612-14, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

.8 ASTM C795-08(2013), Standard Specification for Thermal Insulation for Use with Austenitic Stainless Steel.

.9 ASTM C921-10, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.3 Canadian General Standards Board (CGSB)

.1 CGSB 51-GP-52Ma-1989, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.4 South Coast Air Quality Management District (SCAQMD), California State

.1 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.

.5 Thermal Insulation Association of Canada (TIAC):

.1 Mechanical Insulation Best Practice Guide, 2013.

.6 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S102-07, Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC-S701-11, Standard for Thermal Insulation Polyotrene, Boards and Pipe Covering.

.7 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

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 defined herein.

.2 TIAC Codes:

.1 CRD: Code Round Ductwork,

.2 CRF: Code Rectangular Finish.

1.4 Submittals

.1 Submittals: in accordance with Section 01 01 50 – General Instructions.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 01 50 – General Instructions. Include product characteristics, performance criteria, and limitations.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 01 50 – General Instructions.

.3 Shop Drawings:

.1 Submit shop drawings in accordance with Section 01 01 50 – General Instructions.

.4 Quality assurance submittals: submit following in accordance with Section 01 01 50 – General Instructions.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

1.5 Quality Assurance

.1 Qualifications:

.1 Installer: specialist in performing work of this Section, and have at least 3 years successful experience in this size and type of project, qualified to standards of TIAC.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.6 Delivery, Storage and Handling

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 01 50 – General 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.

.3 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 01 50 – General Instructions.

.2 Place excess or unused insulation and insulation accessory materials in designated containers.

.3 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.

.4 Dispose of unused adhesive material at official hazardous material collections site approved by Departmental Representative.

PART 2 PRODUCTS

2.1 Fire and Smoke Rating

.1 In accordance with CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 Insulation

.1 Mineral fibre as specified herein includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C mean temperature when tested in accordance with ASTM C 335.

.3 TIAC Code C-1: Rigid mineral fibre board to ASTM C612. Provide factory applied vapour retarder jacket to CGSB 51-GP-52Ma as scheduled in PART 3 of this Section.

.4 TIAC Code C-2: Mineral fibre blanket to ASTM C553. Provide factory applied vapour retarder jacket to CGSB 51-GP-52Ma as scheduled in PART 3 of this section.

.1 Mineral fibre: to ASTM C553.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: to ASTM C553.

.5 Evidence shall be provided to the Departmental Representative on the site of ULC listings of all products being used. Duct insulation adhesives and coatings shall be non-toxic as defined by WCB Regulations.

2.3 Accessories

.1 Vapour retarder lap adhesive:

.1 Water based, fire retardant type, compatible with insulation.

.2 Indoor Vapour Retarder Finish:

.1 Vinyl emulsion type acrylic, compatible with insulation.

.3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C449.

.4 Tape: self-adhesive, aluminum, reinforced, 50 mm wide minimum.

.5 Contact adhesive: quick-setting

.1 Maximum VOC limit 80 g/L to SCAQMD Rule 1168.

.6 Facing: 25 mm stainless steel hexagonal wire mesh stitched on one face of insulation.

.7 Fasteners: 2 mm diameter pins with 35 mm square clips, length to suit thickness of insulation.

PART 3 EXECUTION

3.1 Manufacturer's Instructions

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

3.2 Pre-Installation Requirement

.1 Pressure testing of ductwork systems complete, witnessed and certified.

.2 Surfaces clean, dry, free from foreign material.

3.3 Installation

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturer's instructions and as indicated.

.3 Use two layers with staggered joints when required nominal thickness exceeds 75 mm.

.3 Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging.

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.1 Hangers, supports to be outside vapour retarder jacket.

.5 Seal vapor barrier penetrations with vapor barrier adhesive.

.6 Supports, Hangers in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

.1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.

.7 Fasteners: At 300 mm oc in horizontal and vertical directions, minimum two rows each side.

.8 All ductwork exposed to weather shall have waterproof seams for weathertight construction. Ductwork exposed to weather which are not insulated or finish painted, shall be coated with two applications of bitumastic waterproofing compound to prevent corrosion. Exposed ducts, which are insulated, shall have aluminum jacket.

3.4 Duct Insulation Schedules

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

	TIAC Code	Vapour Retarder	Thickness (mm)
Rectangular, cold, dual temperature supply air ducts	C-1	Yes	50
Round, cold, dual temperature supply air ducts	C-2	Yes	50
Rectangular, warm air ducts	C-1	No	25
Round, warm air ducts	C-2	No	25

.2 Finish: Conform to following table:

	TIAC Code	
	Rectangular	Round
Indoor, concealed	None	None

3.5 Cleaning

.1 Proceed in accordance with Section 01 01 50 – General Instructions.

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

END OF SECTION

PART 1 - GENERAL

1.1 Related Sections

.1	Section 01 01 50	General Instructions
.2	Section 01 35 33	Health and Safety Requirements
.3	Section 23 05 00	Common Work Results - Mechanical
.4	Section 23 05 05	Installation of Pipe Work.
.5	Section 23 05 29	Hangers and Supports for Piping and Equipment

1.2 References

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

- .1 ANSI/ASHRAE/IESNA 90.1-2013; Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 American Society for Testing and Materials International, (ASTM)

- .1 ASTM B209M-10, Specification for Aluminum and Aluminum Alloy Sheet and Plate (Metric).
- .2 ASTM C335/C335M-10e1, Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
- .3 ASTM C411-11, Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
- .4 ASTM C449-07(2013), Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
- .5 ASTM C547-12, Standard Specification for Mineral Fiber Pipe Insulation.
- .6 ASTM C553-13, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- .7 ASTM C612-14, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
- .8 ASTM C795-08(2013), Standard Specification for Thermal Insulation for Use with Austenitic Stainless Steel.
- .9 ASTM C921-10, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.3 Canadian General Standards Board (CGSB)

- .1 CGSB 51-GP-52Ma-1989, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.4 Thermal Insulation Association of Canada (TIAC):

- .1 Mechanical Insulation Best Practice Guide, 2013.

.5 South Coast Air Quality Management District (SCAQMD), California State

.1 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.

.6 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S102-07, Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC-S701-11, Standard for Thermal Insulation Polyotrene, Boards and Pipe Covering.

.7 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

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 defined herein.

.2 TIAC Codes:

.1 CRF: Code Rectangular Finish.

.2 CPF: Code Piping Finish.

1.4 Submittals

.1 Submittals: in accordance with Section 01 01 50 – General Instructions.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 01 50 – General Instructions. Include product characteristics, performance criteria, and limitations.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 01 50 – General Instructions.

.3 Shop Drawings:

.1 Submit shop drawings in accordance with Section 01 01 50 – General Instructions.

.4 Quality assurance submittals: submit following in accordance with Section 01 01 50 – General Instructions.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

1.5 Quality Assurance

.1 Qualifications:

.1 Installer: specialist in performing work of this Section, and have at least 3 years successful experience in this size and type of project, qualified to standards of TIAC.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.6 Delivery, Storage and Handling

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 01 50 – General 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.

.3 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 01 50 – General Instructions.

.2 Place excess or unused insulation and insulation accessory materials in designated containers.

.3 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.

.4 Dispose of unused adhesive material at official hazardous material collections site approved by Departmental Representative.

PART 2 - PRODUCTS

2.1 Fire and Smoke Rating

.1 In accordance with CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 Insulation

.1 Mineral fibre as specified herein includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C mean temperature when tested in accordance with ASTM C335.

.3 TIAC Code A-1: Rigid molded mineral fibre without factory applied vapour retarder jacket.

.1 Mineral fibre: to CAN/CGSB-51.9 / ASTM C547.

.2 Maximum "k" factor: to CAN/CGSB-51.9.

.4 TIAC Code A-2: Rigid molded calcium silicate without factory applied vapour retarder jacket.

.1 Calcium silicate: to CAN/CGSB-51.2 / ASTM C533.

.2 Maximum "k" factor: to CAN/CGSB-51.2.

.5 TIAC Code A-3: Rigid molded mineral fibre with factory applied vapour retarder jacket.

.1 Mineral fibre: to CAN/CGSB-51.9 / ASTM C547.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: to CAN/CGSB-51.9 / ASTM C547.

.6 TIAC Code C-2: Mineral fibre blanket faced with factory applied vapour retarder jacket (as scheduled in PART 3 of this section).

.1 Mineral fibre: to CAN/ULC-S702 / ASTM C553.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: to CAN/ULC-S702 / ASTM C553.

.6 TIAC Code A-6: Flexible unicellular tubular elastomer.

.1 Insulation: flexible closed-cell elastomer to ASTM C534.

.2 Jacket: to CGSB 51-GP-52Ma. Required for outdoor application.

.3 Maximum "k" factor: 0.27.

.4 Vapour transmission: 0.08 perm-inch.

.5 To be certified by manufacturer to be free of potential stress corrosion cracking corrodants.

.7 To be formaldehyde free, low VOC; resists mold and mildew.

.8 Evidence shall be provided to the Engineer on the site of ULC listings of all products being used. Duct insulation adhesives and coatings shall be non-toxic as defined by WCB Regulations.

2.3 Insulation Securement

.1 Tape: Self-adhesive, aluminum, reinforced, 50mm wide minimum.

.2 Contact adhesive: Quick setting.

.1 Maximum VOC limit 80 g/L to SCAQMD Rule 1168.

.3 Canvas adhesive: Washable.

.1 Maximum VOC limit 250 g/L to SCAQMD Rule 1168.

.4 Tie wire: 1.5mm diameter stainless steel.

.5 Bands: Stainless steel, 19mm wide, 0.5mm thick.

2.4 Cement

.1 Thermal insulating and finishing cement:

.1 To CAN/CGSB-51.12.

.2 Hydraulic setting or Air drying on mineral wool, to ASTM C 449.

2.5 Vapour Retarder Lap Adhesive

.1 Water based, fire retardant type, compatible with insulation.

2.6 Indoor Vapour Retarder Finish

.1 Vinyl emulsion type acrylic, compatible with insulation.

2.7 Jackets

.1 Aluminum:

.1 To ASTM B 209 with and without moisture barrier as scheduled in PART 3 of this section.

.2 Thickness: 0.50 mm sheet.

.3 Finish: Stucco embossed.

.4 Jacket banding and mechanical seals: 19 mm wide, 0.5 mm thick stainless steel.

PART 3 - EXECUTION

3.1 Pre-Installation Requirement

.1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.

.2 Surfaces to be clean, dry, free from foreign material.

3.2 Installation

.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 75mm.

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.1 Hangers, supports to be outside vapour retarder jacket.

.5 Supports, hangers:

.1 Apply high compressive strength insulation, suitable for service, at oversized pipe supports, saddles and shoes. See Section 23 05 29 – Hangers and Supports for Piping and Equipment.

.6 Seal vapor barrier penetrations with vapor barrier adhesive.

3.3 Installation of Elastomeric Insulation

.1 Insulation to remain dry at all times. Overlaps to manufacturer's instructions. Ensure tight joints.

.2 Provide vapour retarder as recommended by manufacturer.

3.4 Piping Insulation Schedules

.1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.

.2 TIAC Code: A-1.

.1 Securements: SS Bands at 300mm on centre.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code 1501-H.

.3 TIAC Code: A-2.

.1 Securements: SS Bands at 300mm on centre.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code 1501-H.

.4 Direct contact with pipe and hanger is not acceptable. Install hanger outside of sheet metal protection shield covering an insert section of high density calcium silicate insulation.

.4 TIAC Code: A-3.

.1 Securements: SS Bands at 300mm on centre.

.2 Seals: VR lap seal adhesive, VR lagging adhesive.

.3 Installation: TIAC Code: 1501-C.

.5 TIAC Code: A-6.

.1 Seals: lap seal adhesive, lagging adhesive.

.2 Installation: TIAC Code: 1501-CA; per manufacturer's recommendation.

.6 TIAC Code: C-2 with vapour retarder jacket.

.1 Insulation securements: SS Bands at 300mm on centre.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code: 1501-C.

.7 Thickness of insulation to be as listed in following table.

.1 Run-outs to individual units and equipment not exceeding 4000mm long.

.2 Do not insulate exposed run-outs to plumbing fixtures, chrome plated piping, valves, fittings.

Application	Temp °C	TIAC Code	Run out	To NPS1	1 ¼-2	2 ½-4	5-6	8 & over
Refrigerant	4 – 13	A-6	25	25	25	25	25	25
Cooling Coil Condensate Drain		C-2	25	25	25	25	25	25

.7 Finishes:

.1 Exposed indoors: Canvas or PVC jacket.

.2 Exposed indoor in Service Rooms: Canvas or PVC jacket.

.1 Service Rooms include but are not limited to mechanical equipment rooms, electrical equipment rooms, telecom/LAN rooms, janitor rooms.

.3 Concealed, indoors: ASJ, no further finish.

.4 Exposed outdoors: Aluminum jacket.

3.5 Cleaning

.1 Proceed in accordance with Section 01 01 50 – General Instructions.

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

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1	Section 01 01 50	General Instructions
.2	Section 01 35 33	Health and Safety Requirements
.3	Section 01 91 00	Commissioning
.4	Section 23 05 29	Hangers & Supports for Piping & Equipment
.5	Section 23 05 48	Vibration & Seismic Controls for Ductwork, Piping & Equipment
.6	Section 23 07 19	Thermal Insulation for Piping
.7	Section 23 08 00	Commissioning of Mechanical Systems

1.2 References

.1 American Society of Mechanical Engineers (ASME)

- .1 ASME B16.22-2013, Wrought Copper and Copper Alloy Solder - Joint Pressure Fittings.
- .2 ASME B16.24-2011, Cast Copper Pipe Flanges and Flanged Fittings: Class 150, 300, 400, 600, 900, 1500 and 2500.
- .3 ASME B16.26-2013, Cast Copper Alloy Fittings for Flared Copper Tubes.
- .4 ASME B31.5-2013, Refrigeration Piping and Heat Transfer Components.

.2 American Society for Testing and Materials International (ASTM)

- .1 ASTM A 307-2012, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 ASTM B 280-2013, Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

.3 Canadian Standards Association (CSA International)

- .1 CSA B52-2009, Mechanical Refrigeration Code.

.4 Environment Canada (EC)

- .1 EPS 1/RA/1-[96], Environmental Code of Practice for the Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.

.5 Health Canada / Workplace Hazardous Materials Information System (WHMIS)

- .1 Material Safety Data Sheets (MSDS).

.6 Federal Halocarbon Regulations, 2003.

1.3 Submittals

.1 Product Data:

- .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Shop Drawings, Product Data and Samples. Include product characteristics, performance criteria, and limitations.

.2 Shop Drawings:

.1 Submit shop drawings and product data in accordance with Section 01 01 50 – General Instructions.

.2 The Refrigeration contractor shall prepare and include the coil and condensing unit balance curves detailing the S.S. temperature, the estimated line loss, and the system balance point that meets the required total and sensible cooling capacities at the specified ambient temperatures. A refrigerant piping schematic, showing refrigerant pipe sizes, lengths, and refrigerant receiver size requirement, shall also be submitted to confirm installation is in accordance with manufacturer's recommendations, and does not contravene warranty requirements

.3 Quality assurance submittals: submit following in accordance with Section 01 01 50 – General Instructions.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.4 Closeout Submittals:

.1 Provide maintenance and engineering data for incorporation into manual specified in Section 01 01 50 – General Instructions.

.2 Provide halocarbons documentations in accordance with Section 23 05 00 – Common Works Results – Mechanical.

1.4 Quality Assurance

.1 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.5 Delivery, Storage and Handling

.1 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 01 50 – General Instructions.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal packaging material in appropriate on-site bins for recycling.

.4 Divert unused materials from landfill to recycling facility as approved by Departmental Representative.

PART 2 PRODUCTS

2.1 Tubing

.1 Processed for refrigeration installations, deoxidized, dehydrated and sealed.

.1 Hard copper: to ASTM B 280, type ACR.

.2 Annealed copper, Type L: to ASTM B 280, with minimum wall thickness as per CSA B52 and ASME B31.5. .

2.2 Fittings

.1 Service: design pressure 2070 kPa and temperature 121 degrees C.

.2 Brazed:

.1 Fittings: wrought copper to ASME B16.22.

.2 Joints: silver solder, 15% Ag-80% Cu-5%P or copper-phosphorous, 95% Cu-5%P and non-corrosive flux.

.3 Flanged:

.1 Bronze or brass, to ASME B16.24, Class 150 and Class 300.

.2 Gaskets: suitable for service.

.3 Bolts, nuts and washers: to ASTM A 307, heavy series.

.4 Flared:

.1 Bronze or brass, for refrigeration, to ASME B16.26.

2.3 Pipe Sleeves

.1 Hard copper or steel, sized to provide 6 mm clearance around between sleeve and uninsulated pipe or between sleeve and insulation.

2.4 Valves

.1 22 mm and under: Class 500, 3.5 Mpa, globe or angle non-directional type, diaphragm, packless type, with forged brass body and bonnet, moisture proof seal for below freezing applications, brazed connections.

.2 Over 22 mm: Class 375, 2.5 Mpa, globe or angle type, diaphragm, packless type, back-seating, cap seal, with cast bronze body and bonnet, moisture proof seal for below freezing applications, brazed connections.

PART 3 EXECUTION

3.1 Installation

.1 Install in accordance with CSA B52, EPS1/RA/1 and ASME B31.5 Section 23 05 05 - Installation of Pipework.

.2 The installation shall be completed in compliance with Federal Halocarbon Regulations, 2003.

3.2 Brazing Procedures

.1 Bleed inert gas into pipe during brazing.

.2 Remove valve internal parts, solenoid valve coils, sight glass.

.3 Do not apply heat near expansion valve and bulb.

3.3 Piping Installation

.1 General:

.1 Soft annealed copper tubing: bend without crimping or constriction.

.2 Hard drawn copper tubing: do not bend.

.3 Minimize use of fittings.

.2 Hot gas lines:

.1 Pitch at least 1:240 down in direction of flow to prevent oil return to compressor during operation.

.2 Provide trap at base of risers greater than 2400 mm high and at each 7600 mm thereafter.

.3 Provide inverted deep trap at top of risers.

.4 Provide double risers for compressors having capacity modulation.

.1 Large riser: install traps as specified.

.2 Small riser: size for 5.1 m/s at minimum load. Connect upstream of traps on large riser.

.5 Insulation

.1 Insulate with vapour-sealed elastomeric insulation in accordance with Section 23 07 19 – Thermal Insulation for Piping.

.2 Insulation shall be sealed at seams and butt joints with adhesive.

.3 Outdoor exposed piping shall be finished with aluminum jacket in accordance with Section 23 07 19 – Thermal Insulation for Piping.

3.4 Pressure and Leak Testing

.1 Close valves on factory charged equipment and other equipment not designed for test pressures.

.2 Leak test to CSA B52 before evacuation to 2MPa and 1MPa on high and low sides respectively.

.3 Test Procedure: build pressure up to 35 kPa with refrigerant gas on high and low sides. Supplement with nitrogen to required test pressure. Evacuate the system down to 500 microns and shall certify the system stayed at 500 microns for 1/2 hour after shutting off the vacuum pump and connection line. Test for leaks with electronic or halide detector. Repair leaks and repeat tests.

3.5 Start-up and Commissioning

.1 Charge refrigerant, start-up, commission system, and submit written report to Departmental Representative.

.2 Halocarbons Management:

.1 In accordance with Section 23 05 00 – Common Works Results – Mechanical.

3.6 Cleaning

.1 Proceed in accordance with Section 01 01 50 – General Instructions.

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

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1	Section 01 01 50	General Instructions
.2	Section 01 35 33	Health and Safety Requirements
.3	Section 23 05 00	Common Work Results - Mechanical
.4	Section 23 05 48	Vibration and Seismic Controls for Ductwork, Piping and Equipment
.5	Section 23 07 13	Thermal Insulation for Ducting

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 A653/A653M-2013, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

.3 Department of Justice Canada (Jus).

.1 Canadian Environmental Protection Act (CEPA), 1999, c. 33 .

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Material Safety Data Sheets (MSDS).

.5 National Fire Protection Agency (NFPA)

.1 NFPA 90A-2012, Standard for the Installation of Air-Conditioning and Ventilating Systems.

.2 NFPA 90B-2012, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.

.6 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

.1 ANSI/SMACNA 006-2006, HVAC Duct Construction Standards, Metal and Flexible, 3rd Edition.

.2 IAQ Guideline for Occupied Buildings Under Construction 1995, 1st Edition.

.7 Transport Canada (TC).

.1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

.8 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S102-07, Surface Burning Characteristics of Building Materials and Assemblies.

.9 South Coast Air Quality Management District (SCAQMD), California State

.1 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.

1.3 Submittals

.1 Submit shop drawings and product data in accordance with Section 01 01 50 – General Instructions.

.2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets for the following:

.1 Sealants.

.2 Adhesive

.3 Duct tape.

.4 Duct liners.

1.4 Quality Assurance

.1 Certification of Ratings:

.1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.5 Delivery Storage and Handling

.1 Protect on site stored or installed absorptive material from moisture damage.

.2 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 01 50 – General Instructions.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.

.4 Separate for reuse and recycling and place in designated containers in accordance with Waste Management Plan.

.5 Place materials defined as hazardous or toxic in designated containers.

.6 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.

.7 Fold up metal and plastic banding, flatten and place in designated area for recycling.

PART 2 PRODUCTS

2.1 Seal Classification

.1 Classification as follows:

Pressure Class	Maximum Pressure (Pa)	SMACNA Seal Class
Low Pressure	500	[B]

.2 Seal classification:

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

.2 Class B: longitudinal seams, transverse joints and connections made airtight with sealant.

2.2 Ductwork - General

.1 Duct dimension noted on drawings are clear inside dimensions. Insulation thickness shall be as noted on the drawings.

.2 All seams, joints and raw edges shall be sealed and covered with glassfab.

.3 Insulation shall be applied with mechanical fasteners and suitable adhesives. Duct insulation adhesive and coatings shall be non-toxic as defined by WCB Regulations.

.4 Round duct: with spiral seams. Sections shall be joined with a RT1 slip joint, screw fastened and sealed with no visible duct sealant to interfere with finish painting.

.5 Exposed round duct shall be installed in a neat workmanlike manner parallel to building walls and roof with no sags or misalignment, and shall be true and round.

.6 Ductwork shall be constructed to 500 Pa low pressure duct.

2.3 Fittings

.1 Fabrication: to SMACNA. Fittings shall be 2 gauges heavier than connecting ductwork.

.2 Radius elbows:

.1 Rectangular: Centre-line radius equal to 1.5 times width of duct, with single thickness turning vanes.

.2 Round: Centre-line radius equal to 1.5 times diameter. 5-gore for 300mm [12"] and larger; die-stamped for 254mm [10"] and smaller.

3 Mitered elbows, rectangular:

.1 To 400mm [16"]: with single thickness turning vanes.

.2 Over 400mm [16"]: with double thickness turning vanes.

.4 Branches:

.1 Rectangular main and branch: 45° entry on branch.

2 Round main and branch: enter main duct at 45° or with conical connection. The use of spin-in collars is not acceptable.

.5 Transitions:

.1 Diverging: 20° maximum angle.

.2 Converging: 30° maximum angle.

.6 Offsets: full radius elbows.

.7 Obstruction deflectors: maintain full cross-sectional area.

2.4 Galvanized Steel

.1 Lock forming quality: to ASTM A653, Z90 zinc coating.

.2 Thickness, fabrication and reinforcement: to SMACNA.

.3 Joints: to SMACNA.

.4 Applications:

.1 All supply and exhaust ductwork unless otherwise noted.

2.7 Hangers and Supports

.1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct. Maximum size duct supported by strap hanger: 500mm [20"].

.2 Hangers, hanger configuration and attachment to structure: to SMACNA.

2.8 Duct Liner

.1 Fibrous glass duct liner: air stream side faced with FSK facing.

.2 Rigid:

.1 Use on flat surfaces.

.2 25mm [1"] or 50mm [2"] thick fibrous glass rigid board duct liner.

.3 Density: 36 kg/m^3 [2.2 lb/ft^3].

.4 Thermal resistance: RSI-0.76 [R-4.3] for 25mm [1"], RSI-1.53 [R-8.7] 50mm [2"].

.3 Flexible:

.1 Use on round or oval surfaces.

.2 25mm [1"] or 50mm [2"] thick fibrous glass blanket duct liner as indicated.

.3 Density: 24 kg/m^3 [1.5 lb/ft^3].

.4 Thermal resistance: RSI-0.74 [R-4.2] for 25mm [1"], RSI-1.47 [R-8.3] 50mm [2"].

.4 Fasteners shall be weld pins with metal retaining clips and square head.

.5 Flame and smoke ratings:

.1 In accordance with CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.9 Sealant

.1 For indoor and outdoor applications:

.1 Water based, fiber reinforced, non-toxic, elastomeric duct sealant. Suitable for indoor and outdoor use, non-sagging, non-cracking, UV resistant, freeze/thaw stable, paintable. Temperature range of -32°C to 99°C [-26°F to 210°F]. ULC listed and comply with NFPA 90A and NFPA 90B.

.2 Flame and smoke ratings:

.1 In accordance with CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

.2 Maximum VOC limit 420 g/L to SCAQMD Rule 1168 and SMACNA Technical Resource Bulletin (TRB) #9-09.

2.10 Adhesive

.1 Water-based vinyl copolymer adhesive. Temperature range of -23°C to 71°C [-10°F to 160°F]. ULC listed and comply with NFPA 90A and NFPA 90B. Adhesive shall be non-toxic as defined by WorksafeBC Regulations.

.2 Flame and smoke ratings:

.1 In accordance with CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

.3 Maximum VOC limit 80 g/L to SCAQMD Rule 1168.

2.11 Duct Tape System

.1 Two part system combined of treated woven fibreglass tape and liquid sealant/adhesive. ULC listed and comply with NFPA 90A and NFPA 90B.

.2 Flame and smoke ratings:

.1 In accordance with CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

PART 3 EXECUTION

3.1 General

.1 Do work in accordance with NFPA 90A, NFPA 90B, ASHRAE, SMACNA, and as indicated.

.2 Do not break continuity of insulation vapour barrier with hangers or rods.

.3 Support risers in accordance with SMACNA.

.4 Install breakaway joints in ductwork on sides of fire separation.

.5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.

.6 Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining.

.7 All openings in ductwork shall be sealed with temporary duct cover during construction. Failure to maintain duct cleanliness will require the inside of all air ducts, plenums and equipment in the air stream to be cleaned with an industrial vacuum cleaner before system balancing is started.

.8 Apply protective galvanize coating to galvanized ductwork and accessories which have been welded.

.9 Apply duct sealer to all joints of metal ducts, connections to diffusers, plenums and flexible duct.

.10 The use of plastic duct tape is not permitted.

.11 Thermal insulation to Section 23 07 13 – Thermal Insulation for Ducting.

3.2 Hangers

.1 Strap hangers: Install in accordance with SMACNA.

.2 Rectangular duct: Extend strap hanger down on both sides of duct, turn under bottom 25mm [1"] minimum. On each strap provide two sheet metal screws on the side and one in the bottom.

.3 Angle hangers: complete with locking nuts and washers.

.4 Hanger spacing: to SMACNA.

.5 Seismic restraint to Section 23 05 48 – Vibration and Seismic Controls for Ductwork, Piping and Equipment.

3.3 Duct Liner

.1 Install in accordance with manufacturer's recommendations, and as follows:

.1 Fasten to interior sheet metal surface with 100% coverage of adhesive.

.2 In addition to adhesive, install weld pins not less than 2 rows per surface and not more than 425mm on centres.

.3 Acoustically lined round ducts shall have perforated inner metal liner.

.2 Line inside of ducts where indicated.

.3 Duct dimensions, as indicated, are clear inside duct lining.

.4 Seal butt joints, exposed edges, weld pin and clip penetrations and damaged areas of liner with joint tape and sealer. Install joint tape in accordance with manufacturer's written recommendations, and as follows:

.1 Bed tape in sealer.

.2 Apply two coats of sealer over tape.

.5 Replace damaged areas of liner.

.6 Protect leading and trailing edges of duct sections with sheet metal nosing having 15mm [1/2"] overlap and fastened to duct.

.7 Provide 50mm [2"] liner for ductwork exposed to weather which is not insulated.

3.4 Sealing and Taping

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

.2 Bed tape in sealant and recoat with minimum of one coat of sealant to manufacturers recommendations.

3.5 Cleaning

.1 Perform cleaning operations as specified in Section 01 01 50 – General Instructions.

.2 All air systems and ductwork installed by this contract and existing air systems serving the area of work shall be cleaned with high capacity cleaning equipment.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1	Section 01 01 50	General Instructions
.2	Section 01 35 33	Health and Safety Requirements
.3	Section 23 05 00	Common Work Results - Mechanical

1.2 References

.1 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

- .1 ANSI/SMACNA 006-2006, HVAC Duct Construction Standards, Metal and Flexible, 3rd Edition.

.2 National Fire Protection Association (NFPA)

- .1 NFPA 90A-2012, Standard for the Installation of Air-Conditioning and Ventilating Systems.
- .2 NFPA 90B-2012, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.

.3 Underwriter's Laboratories of Canada (ULC)

- .1 CAN/ULC-S110-07, Standard Method of Tests for Air Ducts.
- .2 UL 181-2013, Standard for Factory-Made Air Ducts and Air Connectors.

1.3 Submittals

.1 Submittals in accordance with Section 01 01 50 – General Instructions.

.2 Product Data:

- .1 Submit manufacturer's printed product literature, specifications and data sheet. Indicate the following:
  - .1 Flexible ducts.
  - .2 Flexible duct connectors.
  - .3 Duct access doors.
  - .4 Turning vanes.
  - .5 Instrument test ports.

.3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

- .1 Certification of ratings: catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Instructions: submit manufacturer's installation instructions.

.6 Manufacturer's Field Reports: manufacturer's field reports specified.

.7 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 01 50 – General Instructions.

1.4 Quality Assurance

.1 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 33 – Health and Safety Requirements.

1.5 Delivery, Storage and Handling

.1 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 01 50 – General Instructions.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

PART 2 PRODUCTS

2.1 General

.1 Manufacture in accordance with SMACNA - HVAC Duct Construction Standards.

2.2 Flexible Duct

.1 General:

.1 UL-181 listed and labeled as Class I air duct, and complies with NFPA 90A and 90B.

.2 Non-metallic, Insulated:

.1 Constructed of CPE liner duct permanently bonded to a spring steel wire helix and with factory applied fibreglass insulation, lower permeability vapour barrier and laminate jacket for low and medium pressure systems.

.2 Maximum rated pressure: 1,000Pa [4" w.g.] positive, 250Pa [1" w.g.] negative.

.3 Operating temperature: -29 to 121 °C [-20 to 250 °F].

.4 Thermal resistance: RSI-0.74 [R-4.2].

.5 Application: cold air supply duct.

.3 Non-metallic, un-insulated:

.1 Constructed of supporting helix of coated spring steel wire permanently bonded to a coated woven fiberglass.

.2 Maximum rated pressure: 2,500Pa [10" w.g.] positive, 250Pa [1" w.g.] negative.

.3 Operating temperature: -18 to 121 °C [-0 to 250 °F].

.4 Application: warm air supply duct.

2.3 Flexible Duct Connectors

.1 Frame: galvanized sheet metal frame 0.66mm [24 gauge] thick with fabric clenched by means of double locked seams.

.2 Fabric:

.1 Indoor: Fire resistant, self extinguishing, neoprene coated fibreglass fabric, temperature rated at -40°C to 90°C [-40°F to 200°F], thickness of 0.63mm [0.025"].

2.4 Access Doors in Ducts

.1 Non-insulated ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6mm [24 gauge] thick complete with sheet metal angle frame.

.2 Insulated ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6mm [24 gauge] thick complete with sheet metal angle frame and 25mm [1"] thick rigid fibreglass insulation.

.3 Gaskets: neoprene.

.4 Hardware:

.1 Up to 300 x 300 mm: two sash locks complete with safety chain.

.2 301 to 450 mm: four sash locks complete with safety chain.

.3 451 to 1000 mm: piano hinge and minimum two sash locks.

.4 Doors over 1000 mm: piano hinge and two handles operable from both sides.

2.5 Turning Vanes

.1 Factory-made, single or double thickness as specified elsewhere, with trailing edge. Vanes shall be constructed of same material as duct, 0.55mm [26 gauge].

.2 Rails shall be fabricated of same material as duct, 0.66m [24 gauge]. Vanes shall be attached to rails using fasteners.

2.6 Instrument Test Ports

.1 Alloy casting with screw-in cap, neoprene gasket, 18 mm [3/4"] inside diameter opening for pitot tube or velometer.

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 Duct

.1 Provide flexible duct connecting air outlets as indicated. Flexible duct with integral volume damper is not acceptable.

.2 Install flexible duct fully extended, without tight bends and kinks. The radius at the centre-line shall not be less than one duct diameter. Do not install in compressed state.

.3 Length of flexible duct shall within 1,500mm to 2,100mm (5'-0" to 7'-0").

.4 Provide support for flexible duct at 1,200mm (4'-0") on centre. Maximum permissible sag is 42 mm/m (1/2 inch per foot) of spacing between support. A connection to a rigid duct or equipment shall be considered a support joint.

.5 Sheet metal strap for flexible duct support shall be minimum 38mm (1-1/2") wide.

.6 Sheet metal collars to which the flexible ducts are attached shall be minimum 50mm (2") in length.

.7 Repair torn or damaged vapour barrier jackets approved duct tape. If the internal core is penetrated, replace the flexible duct.

.8 Do not use flexible duct for connecting mixing box and air terminal unit inlets.

.9 Do not use flexible duct on return and exhaust ductwork.

.2 Flexible Duct Connectors

.1 Install in following locations:

.1 Inlets and outlets to supply air units and fans.

.2 Inlets and outlets of exhaust and return air fans.

.3 As indicated.

.2 Length of connection: 100mm [4"].

.3 Minimum distance between metal parts when system in operation: 75mm [3"].

.4 Install in accordance with recommendations of SMACNA.

.5 When fan is running:

.1 Ducting on sides of flexible connection to be in alignment.

.2 Ensure slack material in flexible connection.

.6 Flexible duct connector exposed to weather shall have a sheet metal shield for additional UV protection.

.3 Access Doors in Ducts

.1 Size:

.1 610mm x 1520 mm [24"x60"] for person size entry.

.2 460mm x 460 mm [18"x18"] for service.

.3 300mm x 200mm [12"x8"] for cleaning.

.4 As indicated.

.2 Locations:

.1 Fire dampers and smoke dampers.

.2 Control dampers.

.3 Devices requiring maintenance.

.4 Required by code.

.5 Reheat coils.

.6 On both sides of turning vanes.

.7 At the base of all duct risers.

.8 At 12,000m [40'-0"] intervals in all duct systems, and 6,000mm [20'-0"] intervals in horizontal exhaust ducts for cleaning purposes.

.4 Instrument Test Ports

.1 Install in accordance with manufacturer's instructions.

.2 Locate to permit easy manipulation of instruments.

.3 Locations:

.1 For traverse readings:

.1 Ducted inlets to roof and wall exhausters.

.2 Inlets and outlets of other fan systems.

.3 Main and sub-main ducts.

.4 And as indicated.

.5 Turning Vanes

.1 Install in accordance with manufacturer's recommendations.

3.3 Cleaning

.1 Proceed in accordance with Section 01 01 50 – General Instructions.

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

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1	Section 01 01 50	General Instructions
.2	Section 01 35 33	Health and Safety Requirements
.3	Section 23 05 00	Common Work Results – Mechanical
.4	Section 23 33 00	Air Duct Accessories

1.2 References

.1 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

.1 ANSI/SMACNA 006-2006, HVAC Duct Construction Standards, Metal and Flexible, 3rd Edition.

.2 SMACNA – Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems, 2002.

.2 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S112-10, Standard Method of Fire Test of Fire Damper Assemblies.

.2 CAN/ULC-S112.2-07, Standard Method of Fire Test of Ceiling Firestop Flap Assemblies.

.3 ULC-S505-1974, Standard for Fusible Links for Fire Protection Service.

.3 National Fire Protection Agency (NFPA)

.1 NFPA 90A-2012, Standard for the Installation of Air-Conditioning and Ventilating Systems.

1.3 Submittals

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 01 50 – General Instructions. Include product characteristics, performance criteria, and limitations.

.1 Indicate the following:

.1 Volume dampers.

.2 Backdraft dampers.

.2 Quality assurance submittals: submit following in accordance with Section 01 01 50 – General Instructions.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

1.4 Quality Assurance

.1 Health and Safety Requirements:

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.5 Delivery, Storage and Handling

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 01 50 – General Instructions.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 01 50 – General Instructions.

PART 2 PRODUCTS

2.1 General

.1 Manufacture to SMACNA standards.

2.2 Single Blade Volume Dampers

.1 Blade: Of same material as duct. Two gauges heavier than duct but not less than 0.6mm [24 gauge], stiffened.

.2 Maximum dimension: 305mm [12"] height for rectangular ducts.

.3 Axles: 9.5mm [3/8"] continuous square rod up to 457mm [18"] wide duct, and 13mm [1/2"] continuous square rod up to 1,219mm [48"] wide duct.

.4 Linkage: shaft extension with locking quadrant and position indicator.

.5 Bearings: bronze oilite.

.6 Frame: of the same material as duct. Complete with angle stop for rectangular duct.

2.3 Backdraft Dampers

.1 Multi-blade, gravity-operated, centre pivoted, constructed of same material as duct with nylon bearings.

PART 3 EXECUTION

3.1 General

.1 Install where indicated.

.2 Install in accordance with recommendations of SMACNA and manufacturer's instructions.

3.2 Volume Damper

.1 For supply, return and exhaust systems, locate balancing dampers in each branch duct.

.2 Run-outs to registers and diffusers: install single blade damper located as close as possible to main ducts.

.3 All dampers to be vibration free.

.4 Attach fluorescent tape to regulator handle for concealed volume dampers.

3.3 Cleaning

.1 Proceed in accordance with Section 01 01 50 – General Instructions.

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

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1	Section 01 01 50	General Instructions
.2	Section 01 35 33	Health and Safety Requirements
.3	Section 23 05 00	Common Work Results – Mechanical
.4	Section 23 05 48	Vibration & Seismic Controls for HVAC Piping & Equipment

1.2 System Description

.1 Performance Requirements:

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

1.3 Submittals

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 01 50 – General Instructions. Include product characteristics, performance criteria, and limitations.

.2 Indicate following:

.1 Capacity.

.2 Throw and terminal velocity.

.3 Noise criteria.

.4 Pressure drop.

.5 Neck velocity.

.2 Quality assurance submittals: submit following in accordance with Section 01 01 50 – General Instructions.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

1.4 Quality Assurance

.1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.5 Delivery, Storage and Handling

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 01 50 – General Instructions.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 01 50 – General Instructions.

PART 2 PRODUCTS

2.1 General

.1 Size as indicated.

.2 Capacity, pressure drop, terminal velocity, throw, noise level, neck velocity shall conform to intended performances of specified materials.

.3 Frames:

.1 Full perimeter gaskets.

.2 Plaster frames where set into plaster or gypsum board and as specified on architectural reflected ceiling plans.

.3 Concealed fasteners.

.4 Where balancing damper is scheduled, damper shall be of opposed blade type.

.5 Diffusers, grilles and registers in areas with high humidity shall be of aluminum construction.

.6 Provide neck transition as required.

2.2 Manufactured Units

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

2.3 Supply Grilles and Registers

.1 Supply grille, Type SG-1: fixed louvre, steel, 32 mm border, 19 mm o.c. blade spacing, double deflection, front blades parallel to long dimension. Finish: silver baked enamel.

2.4 Return, Exhaust, and Transfer Grilles and Registers

.1 Return air transfer grille, Type RTG-2: egg crate, steel, 13 mm x 13 mm x 13 mm aluminum grid core, surface mounted. Finish: white baked enamel.

2.5 Diffusers

.1 Supply diffuser, Type SD-1: square cone diffuser, 3-cones, four-way throw, steel, having fixed pattern, round inlet collar, lay-in or with dry-wall ceiling frame. Finish: white baked enamel.

PART 3 EXECUTION

3.1 Manufacturer's Instructions

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

3.2 Installation

.1 Install in accordance with manufacturer's instructions.

.2 Install with flat head screws in countersunk holes where fastenings are visible.

.3 Paint matte black behind all diffusers, grilles and registers so that no metallic part will be visible from the exposed side.

.4 Provide seismic restraint in accordance with Section 23 05 48 – Vibration and Seismic Controls for Ductwork, Piping and Equipment.

3.3 Cleaning

.1 Proceed in accordance with Section 01 01 50 – General Instructions.

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

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1	Section 01 01 50	General Instructions
.2	Section 01 35 33	Health and Safety Requirements
.3	Section 01 91 00	Commissioning
.4	Section 23 05 13	Common Motor Requirements for Mechanical Equipment
.5	Section 23 05 48	Vibration & Seismic Controls for Ductwork, Piping & Equipment
.6	Section 23 23 00	Refrigerant Piping

1.2 References

.1 Air-Conditioning and Refrigeration Institute (ARI)

.1 ARI 210/240-2008, Standard for Unitary Air Conditioning and Air-Source Heat Pump Equipment.

.2 Canadian Standards Association (CSA International)

.1 CAN/CSA-C656-14, Performance Standard for Split-System and Single Package Central Air Conditioners and Heat Pumps.

.3 Environment Canada, (EC)/Environmental Protection Services (EPS)

.1 EPS 1/RA/2-1996, Code of Practice for Elimination of Fluorocarbons Emissions from Refrigeration and Air Conditioning Systems.

.2 Environment Canada-1994, Ozone-Depleting Substances Alternatives and Suppliers List.

.4 Federal Halocarbon Regulations, 2003.

1.3 System Description

.1 Performance Requirements:

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

.2 Performance ratings: based on tests performed in accordance with ANSI/AMCA/ARI 210.

1.4 Submittals

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Shop Drawings, Product Data and Samples. Include product characteristics, performance criteria, and limitations.

.2 Shop Drawings:

.1 Submit shop drawings and product data in accordance with Section 01 01 50 – General Instructions.

.3 Quality assurance submittals: submit following in accordance with Section 01 01 50 – General Instructions.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

.4 Closeout Submittals:

.1 Provide operation and maintenance data for incorporation into manual specified in Section 01 01 50 – General Instructions.

.2 Provide halocarbons documentations in accordance with Section 23 05 00 – Common Works Results – Mechanical.

1.5 Delivery, Storage And Handling

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 01 50 – General Instructions.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 01 50 – General Instructions.

PART 2 PRODUCTS

2.1 Split System Heat Pump Unit

.1 General:

.1 Indoor, wall-mounted, DX fan coil with matching heat pump condensing unit.

.2 For use with R-410A refrigerant.

.2 Evaporator:

.1 Indoor, DX, concealed fan coil. Complete with coil, fan, fan motor, duct collars, piping connection, electrical controls, drain pan, condensate drain pump.

.2 Unit cabinet: constructed of high-impact polystyrene; fully insulated.

.3 Fan: direct-drive centrifugal blower.

.4 Coil: Aluminum fins mechanically bonded to copper tubing.

.5 Motor: open drip-proof, permanently lubricated ball bearing. Fan motor shall be 3-speed.

.6 Controls: microprocessor-based control for space temperature, fan speed and self diagnostics.

.7 Filters: cleanable.

.8 Electrical: Power is supplied from condensing unit.

.9 Accessories: condensate pump, hardwired remote controller.

.3 Condensing unit:

.1 Factory assembled air-cooled heat pump condensing unit. Complete compressor, outdoor coil, fan, metering devices, controls and full charge of refrigerant.

.2 Cabinet: constructed of galvanized steel, bake-enamel finish. Removable access panels. Outdoor compartment shall be isolated and acoustically lined

.3 Fan: propeller, direct-driven from factory lubricated, inherently protected, resiliently mounted motor.

.4 Compressor: swing type or rotary type. Complete with oil system, operating oil charge, overload protection. Compressor assembly shall be installed on rubber vibration isolators. Inverter technology.

.5 Outdoor coil: Aluminum plate fins mechanically bonded to copper tubing.

.6 Refrigeration components: service valves with gage ports on both liquid and suction lines, accumulator, pressure relief, fully charge of refrigerant.

.7 Controls and safety: operating controls and safeties shall be factory assembled and tested. Include high-pressure and low-pressure switches, outdoor fan motor protection, system diagnostics, compressor motor current and temperature overload protection, high pressure relief.

.8 Electrical: single point connection.

PART 3 EXECUTION

3.1 Installation

.1 Install where indicated and in accordance with manufacturer's instructions.

.2 Install outdoor units. For flashing, roofing, weatherproofing, refer to Architectural drawings.

.3 Size anchor bolts to withstand seismic acceleration and velocity forces as specified in Section 23 05 48 – Vibration and Seismic Controls for Ductwork, Piping and Equipment.

.4 Make duct connections through flexible connections.

.5 Level unit with fans running. Align ductwork. flexible connections. Misalignment with fan stopped not to strain or damage flexible connection.

.6 Make piping connections.

.7 Nothing to obstruct ready access to components or to prevent removal of components for servicing.

.8 The installation shall be completed in compliance with Federal Halocarbon Regulations, 2003.

.9 Install refrigerant piping in accordance with Section 23 23 00 – Refrigerant Piping.

.10 Provide interlock wiring between indoor / outdoor units and hardwired remote controller in strict accordance with manufacturer's installation instructions. All low voltage and control wiring shall be in metal conduits.

3.2 Start-up and Commissioning

.1 Charge refrigerant, start-up, commission system, and submit written report to Departmental Representative.

.2 Halocarbons Management:

.1 In accordance with Section 23 05 00 – Common Works Results – Mechanical.

3.3 Cleaning

.1 Proceed in accordance with Section 01 01 50 – General Instructions.

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

END OF SECTION

1.1 GENERAL

.1 This Section covers items common to Section of Division 26, and 27. This section supplements requirements of Division 01.

1.2 CODES AND STANDARDS

.1 Do complete installation in accordance with Canadian Electrical Code, CSA C22.1-2012.

.2 Comply with CSA Certification Standards and Electrical Bulletins in force at time of tender at time of tender submission.

.3 Perform work in accordance with CSA Z426 - Workplace Electrical Safety and Worksafe BC.

1.3 PERMITS, FEES

.1 Submit to Electrical Inspection Department necessary number of drawings and specifications for examination and approval prior to commencement of work.

.2 Pay associated fees.

.3 Obtain and pay for an electrical permit to cover all electrical system work.

.4 Submit a copy of electrical permit to the Departmental Representative prior to commencement of work on site.

.5 Departmental Representative will provide drawings and specifications required by Electrical Inspection Department at no cost.

.6 Notify Departmental Representative of changes required by Electrical Inspection Department prior to making changes.

.7 Furnish Certificates of Acceptance from Electrical Inspection Department on completion of work to Departmental Representative.

1.4 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

.1 Submit shop drawings, product data and samples in accordance with Section 01 01 50 – General Instructions.

.2 Indicate details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment or material.

.3 Where applicable, include wiring, single line and schematic diagrams.

.4 Include wiring drawings or diagrams showing interconnection with work of other Sections.

1.5 OPERATION AND MAINTENANCE DATA

.1 Provide operation and maintenance data for incorporation into operation and maintenance manual specified in Section 01 01 50 – General Instructions.

.2 Include in operations and maintenance data:

.1 Details of design elements, construction features, component function and maintenance requirements, to permit effective start-up, operation, maintenance, repair, modification, extension and expansion of any portion or feature of installation.

.2 Technical data, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items, and parts lists. Advertising or sales literature not acceptable.

.3 Wiring and schematic diagrams and performance curves.

.4 Names and addresses of local suppliers for items included in maintenance manuals.

.5 Copy of reviewed shop drawings.

1.6 CARE, OPERATION AND START-UP

.1 Instruct departmental representative and operating personnel in the operation, care and maintenance of equipment.

.2 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

1.7 VOLTAGE RATINGS

.1 Operating voltages: to CAN3-C235-83 (R1996).

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.8 MATERIALS AND EQUIPMENT

.1 Equipment and material to be new and CSA certified, and manufactured to standard quoted.

.2 Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Inspection Department.

1.9 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates as follows:

.2 Nameplates:
.1 Lamicoid 3 mm thick plastic engraving sheet, white face and black core, self adhesive unless specified otherwise.

NAMEPLATE SIZES

Size 1 10 x 50 mm 1 line 3 mm high letters
Size 2 12 x 70 mm 1 line 5 mm high letters
Size 3 12 x 70 mm 2 lines 3 mm high letters
Size 4 20 x 90 mm 1 line 8 mm high letters
Size 5 20 x 90 mm 2 lines 5 mm high letters
Size 6 25 x 100 mm 1 line 12 mm high letters
Size 7 25 x 100 mm 2 lines 6 mm high letters

.3 Wording on nameplates and labels to be approved by departmental representative prior to manufacture.

.4 Allow for average of twenty-five (25) letters per nameplate.

.5 Identification to be English.

.6 Nameplates for junction boxes to indicate system and/or voltage characteristics.

.7 Nameplates for pull boxes to indicate system and type of cable.

1.10 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, numbered plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding for 120/208 V wiring throughout.

.3 Identify Telecommunications cabling as indicated.

1.11 WIRING TERMINATIONS

.1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

1.12 LOCATION OF OUTLETS

.1 Locate outlets as indicated on drawings.

.2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.

.3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3 m, and information is given before installation.

1.13 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

.3 Install electrical equipment at following heights unless indicated otherwise.
.1 Local switches: 1 200 mm.
.2 Wall receptacles: 400 mm.
.3 Voice outlets: 1000 mm.

1.14 PROTECTION

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

.2 Shield and mark live parts "LIVE 120 VOLTS", or with appropriate voltage.

1.15 CONDUIT AND CABLE INSTALLATION

.1 Refer to drawings for type of conduit and cable to be used.

1.16 FIRESTOPPING

.1 Where cables or conduits pass through fire rated ceilings and fire rated walls, pack space full with a ULC approved firestopping system.

1.17 CLEANING

.1 Do final cleaning in accordance with Section 01 01 50 – General Instructions.

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

1.18 RECORD DRAWINGS

.1 Refer to Section 01 01 50 – General Instructions.

.2 Indicate conduit and cable runs, junction boxes and circuit numbers.

.3 Indicate communication voice/data outlet numbers.

.4 Additional record drawing requirements are included under various other Sections.

1.19 ENVIRONMENTAL PROTECTION AND WASTE MANAGEMENT

.1 Refer to Section 01 01 50 – General Instructions.

END OF SECTION

1 General

1.1 PRODUCT DATA

.1 Submit product data in accordance with Section 01 01 50 – General Instructions.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 01 50 – General Instructions.

2 Products

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger, minimum size 12 AWG.

.2 Copper conductors with 600 V insulation of chemically cross-linked thermosetting polyethylene material rated RW90.

2.2 ARMOURED CABLES

.1 Type AC90. Conductors: Insulated, copper, minimum size 12 AWG.

.2 Armour: interlocking type fabricated from aluminum strip.

3 Execution

3.1 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:
.1 In conduit systems in accordance with Section 26 05 34 – Conduits, Fastenings and Fittings.

.2 Provide a green insulated bond conductor in all conduits sized in accordance with CSA C22.1-2012, Canadian Electrical Code, Part 1.

3.2 INSTALLATION OF ARMOURED CABLES

.1 Use armoured cables for final connection to luminaires installed in T-Bar ceiling.

.2 Terminate cables using connectors approved for armoured cable.

END OF SECTION

1 General

1.1 RELATED WORK

.1 Section 26 05 00 - Common Work Results - Electrical

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 01 01 50 – General Instructions.

2 Products

2.1 JUNCTION AND PULL BOXES

.1 Welded steel construction with screw-on flat covers for surface mounting.

.2 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

.3 Minimum size: 104 mm square.

.4 Cast aluminum, one or two gang FS or FD boxes with factory threaded hubs and mounting feet for all boxes mounted on finished wall or ceiling surfaces.

3 Execution

3.1 JUNCTION AND PULL BOX INSTALLATION

.1 All junction and pull boxes are not indicated. Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.

.2 Ground pull boxes as indicated.

3.2 IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results – Electrical.

.2 Install size 2 identification lamicoids indicating system name on pull boxes and junction boxes.

END OF SECTION

1 General

1.1 REFERENCES

.1 CSA C22.1-2012 Canadian Electrical Code, Part 1.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 01 01 50 – General Instructions.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Refer to Section 01 01 50 – General Instructions.

1.4 ENVIRONMENTAL PROTECTION

.1 Refer to Section 01 01 50 – General Instructions.

2 Products

2.1 RECESSED OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 102 mm square or larger outlet boxes as required for special devices.

.3 102 mm square outlet boxes for lighting fixture outlets.

.4 102 mm square outlet boxes with extension and plaster rings for flush mounting devices in finished walls.

.5 Gang boxes where wiring devices are grouped.

.6 Blank cover plates for boxes without wiring devices.

2.2 SURFACE CONDUIT AND DEVICE BOXES

.1 Cast aluminum, one or two gang FS or FD boxes with factory threaded hubs and mounting feet for all boxes mounted on finished wall or ceiling surfaces.

2.3 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 35 mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

3 Execution

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

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

.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

.4 Provide correct size of openings in boxes for conduit and armoured cable connections. Reducing washers are not allowed.

END OF SECTION

1 General

1.1 LOCATION OF CONDUIT

.1 Drawings do not show all conduits. Those shown are in diagrammatic form only.

1.2 CONDUIT SIZES

.1 Note that conduit sizes referenced in the 2012, Canadian Electrical Code are used.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Refer to Section 01 01 50 - Waste Management.

1.4 ENVIRONMENTAL PROTECTION

.1 Refer to Section 01 01 50 – General Instructions.

2 Products

2.1 CONDUITS

.1 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

.2 Rigid steel conduit: to CSA C22.2 No. 45, galvanized steel.

2.2 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 53 mm and smaller. Two hole steel straps for conduits larger than 53 mm.

2.3 CONDUIT FITTINGS

.1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.

.2 EMT couplings and connectors shall be malleable steel, set screw type. Connectors shall have insulated throats. Cast fittings are not acceptable.

2.4 FISH CORD

.1 Polypropylene.

3 Execution

3.1 INSTALLATION

.1 All conduit is to be EMT except where indicated to use Rigid Steel Conduit.

.2 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.3 Conceal conduits above finished ceilings, except in mechanical and electrical rooms and in unfinished areas.

.4 Where conduits become blocked, remove and replace blocked section. Do not use liquids to clean out conduits.

.5 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.6 Mechanically bend steel conduit over 21 mm diameter.

.7 Dry conduits out before installing wire.

.8 Install fish cord in empty conduits.

3.2 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Group conduits wherever possible on surface channels.

.3 Do not pass conduits through structural members except as indicated.

.4 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum 25 mm at crossovers.

3.3 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

END OF SECTION

1 General

1.1 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 01 01 50 – General Instructions.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Refer to Section 01 01 50 - Waste Management.

1.3 ENVIRONMENTAL PROTECTION

.1 Refer to Section 01 01 50 – General Instructions.

2 Products

2.1 SWITCHES

.1 Single pole single throw switches.

.2 Specification Grade, 15 A, 120 V to: CSA-C22.2, No.55 and CSA – C22.2, No.111.

.3 Manually-operated general purpose ac switches with following features:
- .1 Terminal holes approved for No. 10 AWG wire.
- .2 Silver alloy contacts.
- .3 Urea molded housing.
- .4 Suitable for back and side wiring.
- .5 Color to match existing.

.4 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.

2.2 RECEPTACLES

.1 CSA type 5-15R, 125 V, 15 A, U ground, Specification Grade with the following features:
- .1 Urea molded housing.
- .2 Suitable for No. 10 AWG wiring.
- .3 Triple wipe line contacts.
- .4 Double wipe ground contacts.
- .5 Color to match existing.

2.3 COVER PLATES

.1 Stainless steel cover plates for wiring devices.

3 Execution

3.1 INSTALLATION

.1 Switches:
- .1 Install single throw switches with handle in "UP" position when switch closed.

.2 Cover Plates:
- .1 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
- .2 Install suitable common cover plates where wiring devices are grouped.
- .3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

END OF SECTION