Public Works and Government Services Canada

Requisition Number: EZ899-180220/A

MERX I.D. Number: _____

SPECIFICATIONS for:

Okanagan and Kootenay District Office Relocation

Project No: R.082890.001

Issued for Tender

APPROVED BY:

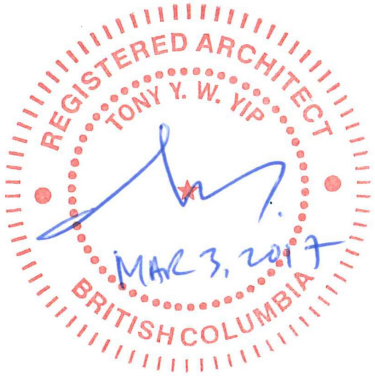
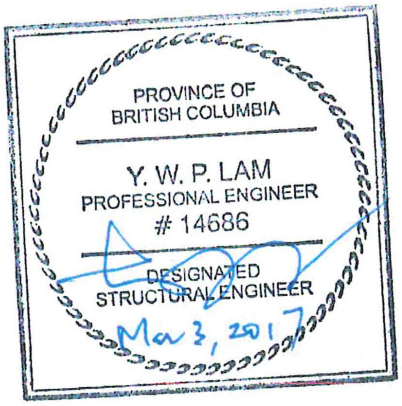
_____ May 10/2017.
Regional Manager, AES — Date

_____ 2017.05.09
Construction Safety Coordinator — Date

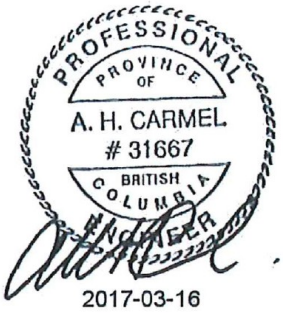
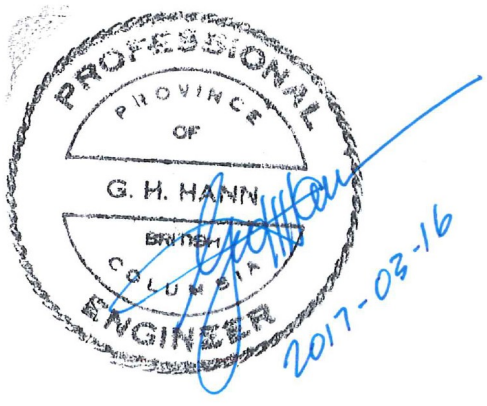
TENDER:

_____ 2017-05-09.
Project Manager — Date

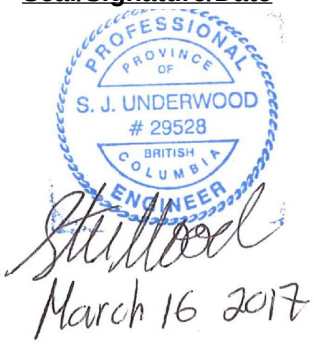
CONSULTANTS – SEAL & SIGNATURE

Discipline	**Seal/Signature/Date**
Architect Chernoff Thompson Architects	
Structural Consultant CWMM Consulting Engineers Ltd.	

CONSULTANTS – SEAL & SIGNATURE

Discipline	**Seal/Signature/Date**
Mechanical Consultant Smith +Andersen	
Electrical Consultant Smith +Andersen	

CONSULTANTS – SEAL & SIGNATURE

Discipline	**Seal/Signature/Date**
Civil Consultant TRUE Consulting Ltd.	

END OF SECTION 00 01 07

DRAWING LIST

ARCHITECTURAL

A-00a	COVER SHEET - GENERAL NOTES
A-00b	PHASING PLANS
A-00c	3D RENDERING (FOR REFERENCE ONLY)
A-01	EXISTING SITE PLAN
A-02	NEW SITE PLAN
A-03	MAIN FLOOR DEMOLITION PLAN
A-04	SECOND FLOOR DEMOLITION PLAN
A-05	MAIN FLOOR DEMOLITION CEILING PLAN
A-06	SECOND FLOOR DEMOLITION CEILING PLAN
A-07	MAIN FLOOR NEW FLOOR PLAN
A-08	SECOND FLOOR NEW FLOOR PLAN
A-09	MAIN FLOOR NEW CEILING PLAN
A-10a	SECOND FLOOR NEW CEILING PLAN - LOWER LEVEL
A-10b	SECOND FLOOR NEW CEILING PLAN - UPPER LEVEL
A-11	BUILDING SECTIONS
A-12	BUILDING ELEVATIONS
A-13	INTERIOR ELEVATIONS
A-14	INTERIOR ELEVATIONS & DOOR DETAILS
A-15	STAIR & WHEELCHAIR LIFT DETAILS
A-16	MAIN FLOOR INTERIOR FINISH PLAN
A-17	SECOND FLOOR INTERIOR FINISH PLAN
A-18	SECOND FLOOR PARTITION SETTING OUT PLAN
A-19	MILLWORK ELEVATIONS & DETAIL SECTIONS
A-20	DETAILS
A-21	SIGNAGE PLAN

STRUCTURAL

S101	GENERAL NOTES & TYPICAL DETAILS
S201	FIRST FLOOR NEW FLOOR PLAN
S202	SECOND FLOOR NEW FLOOR PLAN
S203	ROOF NEW ROOF PLAN
S301	SECTIONS & DETAILS SHEET 1
S302	SECTIONS & DETAILS SHEET 2

MECHANICAL

M0.1	MECHANICAL DRAWING LEGENDS AND BREAK OUT PRICE 1 KEYPLAN
M1.0	FOUNDATION PLAN NEW PLUMBING AND HVAC LAYOUT
M1.1	FIRST FLOOR PLAN NEW PLUMBING LAYOUT
M1.2	SECOND FLOOR PLAN PLUMBING LAYOUT
M2.0	FIRST FLOOR PLAN NEW HVAC LAYOUT
M2.1	SECOND FLOOR PLAN NEW HVAC
M3.0	FIRST FLOOR SPRINKLER PLAN

END OF SECTION 00 00 10

1.0 GENERAL

1.1 RELATED SECTIONS

.1 General Instructions Section 01 11 55

1.2 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this contract comprises the tenant fit out work and energy upgrade of the Osoyoos Port of Entry at 202 – 97th Street, Osoyoos, BC.

1.3 CONTRACT METHOD

.1 Construct work under lump sum contract.

1.4 WORK BY OTHERS

.1 Co-operate with other Contractors on site in carrying out their respective works and carry out instructions from the Departmental Representative.

.2 Coordinate work with that of other Contractors. If any part of the work under this Contract depends for its proper execution or result upon work of another Contractor, report promptly to Departmental Representative, in writing, any defects which may interfere with proper execution of work.

1.5 WORK SEQUENCE

.1 Construct work in stages to accommodate continued use of premises and access road in immediate surrounding areas.

.2 Do not close public usage of facilities such as roadways, walkways and building access until alternate usage has been provided.

.3 Closing of any Road is not permitted.

.4 Maintain fire truck access throughout the duration of the contract.

.5 Refer to drawing for construction phasing.

1.6 CONTRACTOR USE OF PREMISES

.1 Co-ordinate use of premises under direction of Departmental Representative.

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

1.7 OWNER OCCUPANCY

.1 During the entire construction period, the owner will occupy all adjacent buildings and parking lots around the project work site for execution of their normal operations.

.2 Co-operate with Departmental Representative in scheduling operations to minimize conflict and to facilitate Owner usage of all adjacent areas. In the event of a conflict the contractor will accommodate changes to their operations to minimize interference with owner operations.

1.8 DEPARTMENTAL REPRESENTATIVE AND CONTRACTOR RESPONSIBLITIES

.1 Departmental Representative Responsibilities:

.1 Arrange for delivery of up-to-date utility location information, safety requirements, and any site specific work policies that may have changed or were not available at the time of specification and drawing preparation.

.2 Contractor Responsibilities:

.1 Work in progress schedule.

.2 Review all submittals and contract requirements. As soon as it becomes apparent, submit to Departmental Representative written and verbal notification of observed discrepancies or problems anticipated due to non-conformance with Contract Documents.

.3 Provide any installation inspections required by public safety authorities and authority having jurisdiction.

.4 Receive and unload products and equipment at site.

.5 Review deliveries jointly with Departmental Representative, record shortages, and damaged or defective items.

.6 Handle product at site, including uncrating and storage.

.7 Protect product from damage.

.8 Repair or replace items damaged by Contractor or subcontractor on site.

1.9 EXISTING SERVICES

.1 Notify Departmental Representative of intended interruption of services and obtain required permission. Where work involves breaking into or connecting to existing services, contractor shall submit a request to the Departmental Representative a minimum of 48 hours prior to the event. The contractor will not proceed until approval has been granted. The Departmental Representative will make all reasonable efforts to accommodate the request; however the Departmental Representative will not accept delay charges should the request not be accepted.

.2 Minimize duration of interruptions, and where required, provide temporary services to maintain critical systems.

.3 Provide alternative routes for personnel and vehicular traffic when existing route is interrupted by construction work.

.4 Establish location and extent of service lines in area of work before starting work. Notify Departmental Representative of findings.

.5 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility including but not limited to mechanical, plumbing, power and communication services. Adhere to approved schedule and provide notice to affected parties.

.6 Provide temporary services, when directed by Departmental Representative to maintain critical systems.

.7 Provide adequate bridging over trenches which cross roads or walkways to permit normal traffic.

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

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

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

.11 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

END OF SECTION 01 11 00

1.0 GENERAL

1.1 CODES, BYLAWS, STANDARDS

.1 Perform work in accordance with the National Building Code of Canada (NBCC) 2015, and other indicated Codes, Construction Standards and/or any other Code or Bylaw of local application.

.2 Comply with applicable local bylaws, rules and regulations enforced at the location concerned.

.3 Meet or exceed requirements of Contract documents, specified standards, codes and referenced documents.

.4 In any case of conflict or discrepancy, the most stringent requirements shall apply.

1.2 DESCRIPTION OF WORK

.1 Work under this Contract is comprised of, but is not limited to, the provision of all labour, materials, services and equipment necessary for the Tenant Fit Out and energy upgrade work at the Osoyoos Port of Entry (POE) at 202 – 97th Street, Osoyoos, BC, including civil work in the exterior parking area as fully described in the Tender Documents.

1.3 CONTRACT DOCUMENTS

.1 The Contract documents, drawings and specifications are intended to complement each other.

.2 Drawings are, in general, diagrammatic and are intended to indicate the scope and general arrangement of the work.

1.4 TIME OF COMPLETION

.1 Commence work immediately upon official notification of acceptance of offer and complete the project within 28 weeks after contract award.

1.5 HOURS OF WORK

.1 All work which generates excessive noise, including cutting and coring, hammer drills and powder activated fastening shall be executed during the operating hours of low traffic volume prior to 10:00 am on any day.

.2 All work shall be executed during normal office hours between 7:00am and 7:00pm.

.3 Any work required to be performed outside of normal office hours must be arranged with CBSA.

.4 The Osoyoos POE operates 24 hours per day, 365 days of the year.

1.6 WORK SCHEDULE

.1 Carry out work as follows:

.1 Within 10 working days after Contract award, submit Bar (GANTT) chart as per specification sections 01 32 16.07 Construction Progress Schedule Bar (GANTT) chart. Indicate the following:

.1 Submission of shop drawings, product data, MSDS sheets and samples.

.2 Commencement and completion of work of each section of the specifications or trades for each phase as outlined.

.3 Final completion date within the time period required by the Contract documents.

.2 Do not change approved Schedule without notifying Departmental Representative.

.3 Interim reviews of work progress based on work schedule will be conducted monthly by Departmental Representative and schedule updated by Contractor in conjunction with and approval of Departmental Representative. A copy of the updated schedule will be provided with monthly progress payment.

1.7 DIVISION OF SPECIFICATIONS

.1 The specifications are subdivided in accordance with the current 6-digit National Master Specifications System.

.2 A division may consist of the work of more than 1 subcontractor. Responsibility for determining which subcontractor provides the labour, material, equipment and services required to complete the work rests solely with the Contractor.

.3 In the event of discrepancies or conflicts when interpreting the drawings and specifications, the specifications govern.

1.8 DOCUMENTS REQUIRED

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

1.9 REGULATORY REQUIREMENTS

.1 Building permit to be applied for by Contractor.
- .1 Contractor to pay for permit fee and obtain building permit from City of Osoyoos.
- .2 Other permit such as occupancy permit, certificates or licenses required by City of Osoyoos or Provincial Authority to complete work will also be the responsibility of the contractor.

.2 Furnish inspection certificates in evidence that the work installed conforms with the requirements of the authority having jurisdiction.

.3 Comply with conditions as stated in Standard Acquisition Clauses and Conditions (SACC) Manual.

1.10 CONTRACTOR'S USE OF SITE

.1 Use of site:

.1 Exclusive and complete for execution of work.

.2 Assume responsibility for assigned premises for performance of this work.

.3 Be responsible for coordination of all work activities on site, including the work of other contractors engaged by the Departmental Representative.

.4 Provide security of Contractor's work site and all Contractors and Subcontractor's equipment and material. Secure Contractor's work site at the end of each work day.

.5 Perform work in accordance with the Contract documents. Ensure work is carried out in accordance with indicated phasing.

.6 Do not unreasonably encumber site with material or equipment

.7 Any area of the Pacific Forestry Centre property to which access is restricted by sign is a secured or restricted area and shall not be entered.

.8 Do not obstruct access to other areas outside of the Contractor's work site. Maintain overhead clearances, keep roadways and walkways clear, and maintain routes for emergency response vehicles.

.2 Perform work in accordance with Contract documents. Ensure work is carried out in accordance with approved schedules.

.3 Do not unreasonably encumber site with material or equipment.

.4 Coordinate work in particular crossover of underground duct banks entering and under the building.

1.11 EXAMINATION

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

1.12 EXISTING SERVICES

.1 Where Work involves breaking into or connecting to existing services, carry out work as directed in Section 01 14 00 – Work Restrictions.

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

.3 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

.4 Contractor to provide Ground Penetrating Radar (GPR) as required prior to excavation work or breaking into existing floor slab to verify hidden services.

1.13 SETTING OUT OF WORK

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

.2 Provide devices needed to lay out and construct work.

.3 Supply such devices as templates required to facilitate Departmental Representative's inspection of work.

1.14 QUALITY OF WORK

.1 Ensure that quality workmanship is performed through use of skilled tradesmen, under supervision of qualified journeyman.

.2 The workmanship, erection methods and procedures to meet minimum standards set out in the National Building Code of Canada 2015 and Construction Standards as specified herein.

.3 In cases of dispute, decisions as to standard or quality of work rest solely with the Departmental Representative, whose decision is final.

1.15 WORKS COORDINATION

.1 Coordinate work of sub-trades:
- .1 Designate one person to be responsible for review of contract documents and shop drawings and managing coordination of Work.

.2 Convene meetings between subcontractors whose work interfaces and ensure awareness of areas and extent of interface required.
- .1 Provide each subcontractor with complete plans and specifications for Contract, to assist them in planning and carrying out their respective work.
- .2 Develop coordination drawings when required, illustrating potential interference between work of various trades and distribute to affected parties.
  - .1 Pay particularly close attention to overhead work above ceilings and within or near to building structural elements.
  - .2 Identify on coordination drawings, building elements, services lines, rough-in points and indicate location services entrance to site.
- .3 Facilitate meeting and review coordination drawings. Ensure subcontractors agree and sign off on drawings.
- .4 Publish minutes of each meeting.
- .5 Plan and coordinate work in such a way to minimize quantity of service line offsets.
- .6 Submit copy of coordination drawings and meeting minutes to Departmental Representative for information purposes.

.3 Submit shop drawings and order of prefabricated equipment or rebuilt components only after coordination meeting for such items has taken place.

.4 Work cooperation:
- .1 Ensure cooperation between trades in order to facilitate general progress of Work and avoid situations of spatial interference.
- .2 Ensure that each trade provides all other trades reasonable opportunity for completion of Work and in such a way as to prevent unnecessary delays, cutting, patching and removal or replacement of completed work.
- .3 Ensure disputes between subcontractors are resolved.
- .4 Departmental Representative is not responsible for, or accountable for extra costs incurred as a result of Contractor's failure to coordinate Work.

.5 Maintain efficient and continuous supervision.

1.16 APPROVAL OF SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

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

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

1.17 PROJECT MEETINGS

.1 Contractor shall arrange project meetings and assume responsibility for setting times and distributing minutes. Meeting frequency should be at a minimum of once every 2 weeks throughout the contract period.

.2 The contractor shall record the meeting minutes and distribute meeting agenda 5 days prior to the meeting to Departmental Representative and all other parties as directed by Departmental Representative for review.

.3 Meeting room will be provided by the contractor in a site trailer on site.

1.18 TESTING AND INSPECTION

.1 Particular requirements for inspection and testing to be carried out by testing service or laboratory approved by the Departmental Representative are specified in Sections 01 45 00.

.2 The Contractor will appoint and pay for all the services of testing agency or testing laboratory as specified, and where required for the following:
- .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
- .2 Inspection and testing performed exclusively for Contractor's convenience.
- .3 Testing, adjustment and balancing of mechanical and electrical equipment and systems.
  - .1 Mill tests and certificates of compliance.
  - .2 Sprinkler material and testing certificate.
  - .3 Domestic water pressure test and verification of water quality.
  - .4 Balancing Report.
  - .5 Commissioning Report.
  - .6 Duct leakage test.
  - .7 Seismic Engineer’s Report.
  - .8 Tests specified in the contract documents to be carried out by Contractor which may be under the Departmental Representative's supervision.

.3 Within 10 working days after Contract award provide a list of proposed testing services or testing laboratories for Departmental Representative’s approval.

.4 The Departmental Representative may require, and pay for, additional inspection and testing services to verify compliance of contractor’s work to the requirement of the Contract document.

.5 Where tests or inspections by designated testing laboratory reveal work is not in accordance with the Contract requirements, Contractor shall pay costs for additional tests or inspections as the Departmental Representative may require to verify acceptability of corrected work.

.6 Contractor shall furnish labour and facilities to carry out specified testing and notify Departmental Representative in advance of planned testing.

.7 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.

.8 Pay costs for uncovering and making good work that is covered before required inspection or testing is completed and approved by Departmental Representative.

.9 Provide Departmental Representative with digital copy of testing laboratory reports as soon as they are available.

1.19 SURVEYING

.1 All construction layout and final accurate construction records shall be the responsibility of the contractor and shall be set by a licensed land surveyor in the Province of British Columbia.

.2 Contractor to submit name of licensed land surveyor to Departmental Representative during first project meeting (startup meeting).

1.20 AS-BUILT DOCUMENTS

.1 The Departmental Representative will provide 5 sets of drawings and 5 sets of specifications, including 1 set of drawings and specification for “as-built” purposes.

.2 Keep one set of current prints of all contract drawings and all addenda, revisions, clarifications, change orders, and reviewed shop drawings in the site office; and have them available at all times for inspection by the Consultant.

.3 As the Work progresses, maintain accurate records to show all deviations from the Contract documents. Note on as-built specifications, drawings and shop drawings as changes occur.

.4 Provide accurate as-built drawings identifying the various elements shown on the drawings in the requested format.

.5 At completion of the Work, transfer all deviations, including those called up by addenda, revisions, clarifications, shop drawings and change order, to a set of Issued for Construction drawings. Submit the ‘red-marked’ as-built set to the Departmental Representative in hard copy with contractor’s review stamp and date confirming that the set submitted are a true record of “as-built” information.

.6 Refer to Section 01 78 00 – Close-out Submittals.

1.21 CLEANING

.1 Refer to Section 01 74 11 - Cleaning.

1.22 ENVIRONMENTAL PROTECTION

.1 Prevent extraneous materials from contaminating air beyond construction area, by providing temporary enclosures during work.

.2 Do not dispose of waste or volatile materials into water courses, storm or sanitary sewers.

3 Ensure proper disposal procedures in accordance with all applicable territorial regulations.

1.23 ADDITIONAL DRAWINGS

.1 The Departmental Representative may furnish additional drawings for clarification. These additional drawings have the same meaning and intent as if they were included with drawings referred to in the Contract Documents.

.2 Departmental Representative will furnish up to a maximum of five (5) sets of Contract Documents for use by the Contractor at no additional cost. Should more than five (5) sets of documents be required, the Departmental Representative can provide them at additional cost.

1.24 BUILDING SMOKING ENVIRONMENT

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

.2 A 'No Smoking' sign to be put up by Contactor at the project area.

.3 Smoking is only allowed in designated locations within the Port. "Designated Smoking Areas" are at the discretions of Osoyoos Port of Entry and Departmental Representative.

1.25 SYSTEM OF MEASUREMENT

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

1.26 FAMILIARIZATION WITH SITE

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

1.27 SUBMISSION OF TENDER

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

1.28 COST BREAKDOWN

.1 Before submitting the first progress claim, submit a breakdown of the Contract price in detail as directed by the Departmental Representative and aggregating Contract price. After approval, the cost breakdown will form the basis of progress payments.

.2 Within 10 days after award of contract, provide a monthly cash flow projection for the whole contract period in detail as directed by Departmental Representative. Contractor should provide a monthly update of the cash flow projection according to the actual work schedule and progress payment submitted.

3 General Contractor, Mechanical and Electrical Sub-Contractor should attend meetings with Departmental Representative as required to finalize the breakdown.

.4 Provide breakout price for Energy Upgrade Work. Mechanical upgrade will include equipment installation, control points and programming to:

.1 Ventilation setback for the Bus Passenger Processing Area.
.2 Ventilation setback for the Public Washroom.
.3 Ventilation setback for the PIL Booths.

.5 Ventilation Scheduling for the Admin Building.
.6 Thermostat replacement for a vestibule heater in the Admin Building.
.7 Thermostat replacement for the PWGSC container.

Upgrade items are identified through the Mechanical Drawings.

.5 Provide breakout price for Energy Upgrade work, Electrical upgrade is as follows: Electrical Energy Upgrade Work generally includes the upgrade or replacement of exterior lighting and lighting in the Devanning Warehouse as identified on Drawings E-6 and E-7, and the connections to the new boilers and associated circulation pumps, a new unit heater and a relocated unit heater as identified on Drawings E-4, E-5, and E-8.

.6 Provide breakout price for parking re-configuration as shown in drawings A01, A02, C-1 and C-2.

1.29 SUBSTANTIAL COMPLETION

.1 Substantial completion includes commissioning and functional use of the project in addition to the requirements under the terms and conditions of the Contract listed in the Standard Acquisition Conditions and Clauses.

1.30 SIGNAGE SCOPE OF WORK

.1 All signage as shown on drawing A21 must be provided by Public Works appointed signage contractor:

Pattison Sign

Hellen Garcia

Adjointe aux Ventes / Sales Assistant

Enseignes Pattison | Pattison Sign Group

2421 Holly Lane, Ottawa, ON, Canada, K1V 7P2

Direct Tel: 1-613-319-0870|Tel: 613-247-7762 ext. 1229 | Fax: 1-613-247-7763

Web: www.pattisonsign.com

Contractor to include Pattison Sign as their subcontractor and include all the cost of supply, installation and coordination of the full signage scope of work. Provide shop drawings for review according to Section 01 33 00 Submittal Procedures.

1.30 SECURITY SCOPE OF WORK

.1 All card access system work to be completed by Public Works appointed security contractor:

Rose Security Services Inc.
260-500 Sixth Avenue, New Westminster, BC
TODD VICKERS | Account Manager
www.rosesecurity.com
W 604.540.7673 | M 778.873.4557

Contractor to include Rose Security Services Inc as their subcontractor and include all the cost of supply, installation and coordination of the full card access system scope of work. Provide shop drawings for review according to Section 01 33 00 Submittal Procedures.

END OF SECTION 01 11 55

1.0 GENERAL

1.1 FACILITY OPERATIONS AND SECURITY PROCEDURES

.1 Cooperate with and coordinate construction/demolition activities with Canada Border Services Agency.

1.2 ACCESS AND EGRESS

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

1.3 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.

.2 Maintain existing services to building and provide for personnel and vehicle access.

.3 Portions of the existing complex will be occupied by the public and government staff during entire construction period.

.4 Coordinate with Departmental Representative in scheduling operations to minimize conflict and to facilitate use of space.

1.4 EXISTING SERVICES

.1 Notify, Departmental Representative and utility companies of intended interruption of services and obtain required permission.

.2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 7 working days of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum. Departmental Representative will not guarantee shut down can be granted on the requested date subject to operation.

.1 Optimize and plan shut-downs so that services are restored in time for normal facility operation hours. Coordinate all shut-downs with facility maintenance personnel.
.2 Contractor shall be held responsible for damages to facility equipment as the result of service shut-downs.
.3 Contractor shall be held responsible for any and all unscheduled shut-downs of building utilities and services.
.4 Submit a “Fire Alarm Bypass” request to Departmental Representative 72 hours in advance for approval.
.5 Obtain permission from Departmental Representative for access to restricted areas outside the construction zones 24 hours in advance.

.3 Provide for personnel and vehicular traffic.

.4 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.5 SPECIAL REQUIREMENTS

.1 Carry out noise generating Work, as per 1.8 Noise Control.
.1 Means and procedures of controlling and isolating other construction noise affecting occupied areas shall be responsibility of the Contractor and approved by the Departmental Representative.

.2 Ensure Contractor's personnel employed on site become familiar with and obey regulations including

safety, fire, traffic and security regulations.

.3 Keep within limits of work and avenues of ingress and egress.

1.6 SECURITY

.1 All access to secured areas such as all base building electrical and mechanical rooms, roof and roof penthouse, and other normally secured services rooms will need escort by Commissionaires during and after normal office hours.

.2 All construction personnel must wear Government issued picture identification at all times while working on CBSA property.

.3 A Contractor pass will be signed out by each construction crew member at the start of the project. This pass must be worn and be visible at all times while on CBSA Property. This pass shall be surrendered to the CBSA personnel at the end of the project. If a pass is lost during the course of the project, a $100.00 replacement fee shall be paid by the Contractor.

.4 While on CBSA Property, all construction personnel shall remain within the designated work areas. Movement within CBSA restricted areas must be approved and may require escort by the CBSA personnel overseeing the work.

.5 Due to the potential sensitive and personal nature of the interactions between the CBSA staff and the travelling public, construction personnel should make every reasonable effort not to interfere with the border process (including overhearing of conversations).

.6 Construction personnel must remain aware of their surroundings and be accountable for their tools/equipment at all times. At no point should tools be left unattended that are within reach of the travelling public.

.7 As construction personnel are within the CBSA areas, their actions and language content of conversation will be a direct reflection on the CBSA. Be mindful that the travelling public will be aware of your presence and act professionally at all times.

.8 Construction personnel shall not have any interactions with the travelling public.

.9 Construction personnel shall obey uniformed officers regarding operational directions (i.e. removal from the site during a dangerous situation) but shall refrain from taking direction from uniformed officers or PWGSC building maintenance regarding project construction. Should any contractor take direction from a party other than the Departmental Representative, he does so at his own risk.

.10 Construction noise levels that disrupt the processing of travelers shall be conducted during the low volume hours as determined by the CBSA.

.11 Any work which impacts the Operations onsite (traffic, commercial, support staff, etc.) must have one week's notice and must be approved by CBSA. CBSA withholds the right to have work completed at low volume periods (after hours such as 3am on a weekday morning).

.12 Any work which impacts the flow of traffic (bus, regular passengers, or trucks) must be approved by CBSA and must have two weeks' notice.

.13 All deliveries which require escort services against PIL traffic will require a minimum of 24 hrs notice to CBSA so that an escort may be arranged.

1.7 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions. Smoking is not permitted within the Port of Entry.

1.8 NOISE CONTROL

.1 Refer to section 01 11 00 clause 1.5 for hours of work when excessive noise and vibration generation is allowed.

.2 Means and procedures of controlling and isolating construction noise affecting occupied areas shall be responsibility of the contractor and approval of Departmental Representative.

.3 Level of work noise must be monitored by Contractor and maintained at a level no greater than 87 dBA, over an eight-hour period.

.4 If work noise level exceeds 87 dBA, reduce noise either by using engineering devices to reduce or by shortening the duration of exposure.

.1 Refer to Table of maximum duration of exposure to sound levels higher than 87dBA permitted by Canada Occupational Health and Safety Regulations:

Sound Level in dBA	Maximum Duration of Exposure in Hours per Employee per 24-Hour Period		Sound Level in dBA	Maximum Duration of Exposure in Hours per Employee per 24-Hour Period
87	8.0		104	0.16
88	6.4		105	0.13
89	5.0		106	0.10
90	4.0		107	0.080
91	3.2		108	0.064
92	2.5		109	0.050
93	2.0		110	0.040
94	1.6		111	0.032
95	1.3		112	0.025
96	1.0		113	0.020
97	0.80		114	0.016
98	0.64		115	0.013
99	0.50		116	0.010
100	0.40		117	0.008
101	0.32		118	0.006
102	0.25		119	0.005
103	0.20		120	0.004

.5 All Hoarding enclosing noise generating activities must be acoustically sealed to structure.
All temporary construction doors to be solid core wood door installed with door seal, door bottom and threshold.

1.9 COMMISSIONAIRE ESCORT

.1 All work within the facility will require full-attendance commissionaires irrespective of working hours. The Contractor shall make minimum 48 hours advance arrangements with PWGSC for access and security. All security costs will initially be paid for by PWGSC and reimbursed by the contractor.

.2 Security Service charge will apply for all Commissionaire's escort and attendance.

.1 Charge-out hourly rate for regular federal work by Commissionaires BC are as follows:

.1	Regular rate	$29
.2	Regular overtime rate	$40.29
.3	Double overtime rate	$51.58
.4	Stat Holiday rate	$40.28

.2 Overtime is charged after 8 hours, double overtime after 12 hours.

.3 Weekend is not considered as overtime.

.3 Contractor must include cost of escort by Commissionaires in their contract price.

.4 PWGSC will hire and pay for the Commissionaires directly but the Contractor will include for all Commissionaire costs in their contract price. When the final cost is known, PWGSC will then issue a credit change order for that cost.

1.10 CONSTRUCTION PHASING

.1 Maintain a minimum of 2 bays in the examination area on the main floor of the commercial warehouse as shown in drawing A-00b

.2 Coordinate with Departmental Representative on duration of phasing for sequential construction of 2nd floor slab and new staircase.

.3 Coordinate with Departmental Representative on turnover of project areas to Contractor for re-configuration of existing space on both main floor and 2nd floor.

END OF SECTION 01 14 00

1.0 GENERAL

1.1 ADMINISTRATIVE

.1 Schedule and administer site meetings throughout the progress of the work on a regular basis or at the call of Departmental Representative.

.2 Prepare and distribute agenda at least three (3) days prior to the meetings.

.3 Distribute written notice of each meeting seven (7) days in advance of meeting date to Departmental Representative.

.4 Meeting space can be held in the meeting room in the EGD administration building or operation trailer. Book meeting room in advance through Departmental Representative.

.5 Preside at meetings.

.6 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.

.7 Reproduce and distribute copies of minutes within five (5) days after meetings and transmit to meeting participants and affected parties not in attendance, Departmental Representative and Consultants.

.8 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.2 PRE – CONSTRUCTION MEETING

.1 Within 15 days after award of Contract: Departmental Representative will request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.

.2 Attendance will include, but is not limited to, the Departmental Representative, members of the EGD Project Management Office (PMO) and Contractor.

.3 Departmental Representative to establish time and location of preconstruction meeting, Contractor to notify parties concerned a minimum of 4 working days before meeting.

.4 Departmental Representative will chair the meeting, record minutes and issue minutes.

.5 Agenda to include:

- .1 Introduction of official representative of participants in the Work.
- .2 Start date on site.
- .3 Communication Protocol for submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 51 00 - Temporary Utilities.
- .5 EGD Security requirements.
- .6 Site safety in accordance with Section 01 56 00 - Temporary Barriers and Enclosures, Section 01 35 33 – Health and Safety Requirements.
- .7 Communication Protocol for proposed changes, change orders, procedures, approvals required.
- .8 Owner’s Work.
- .9 Record drawings in accordance with Section 01 78 00 - Closeout Submittals.
- .10 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.

.11 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.
.12 Monthly progress claims, administrative procedures, photographs, hold backs.
.13 Appointment of inspection and testing agencies or firms being submitted for Review of Surveyor.

1.3 PROGRESS MEETINGS

.1 During course of Work and two weeks prior to Project Completion, schedule progress meetings bi-weekly.

.2 Attendance to include but is not limited to Departmental Representatives, members of the EGD Project management Office (PMO) and Contractor.

.3 Contractor responsible to record minutes of meetings and circulate to attending parties and affected parties not in attendance within five (5) days after meeting.

.4 Record next meeting dates in the meeting minutes or notify parties minimum of seven (7) days in advance for other ad-hoc meetings.

.5 Agenda to include, at a minimum, the following:
.1 Review, approval of minutes of previous meeting.
.2 Review of Health and Safety including any incidents, near misses, and WorkSafe BC visits.
.3 Review of Work progress since previous meeting.
.4 Coordination discussions with EGD..
.5 Construction schedule review.
.6 Review of off-site fabrication delivery schedules.
.7 Corrective measures and procedures to regain projected schedule.
.8 Request for Information (RFI) log review.
.9 Engineering Disciplines Reviews.
.1 Architectural
.2 Structural
.3 Mechanical
.4 Electrical
.5 Civil
.10 Change order log review.
.11 Review submittal schedule.
.12 Review updated as built.
.13 Review and resolve site issues.
.14 New business.

END OF SECTION 01 31 19

1.0 GENERAL

1.1 DEFINITIONS

.1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.

.2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management system.

.3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.

.4 Construction Work Week: Monday to Friday, inclusive, will provide five day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.

.5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.

.6 Master Plan: summary-level schedule that identifies major activities and key milestones.

.7 Milestone: significant event in project, usually completion of major deliverable.

.8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.

.9 Project Planning, Monitoring and Control System: overall system operated by Departmental Representative to enable monitoring of project work in relation to established milestones.

1.2 REQUIREMENTS

.1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.

.2 Plan to complete Work in accordance with prescribed milestones and time frame.

.3 Limit activity durations to maximum of approximately 15 working days, to allow for progress reporting.

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

.5 Clearly show sequence and interdependence of construction activities and indicate:

- .1 Start and completion of all items of Work, their major components and interim milestones completion dates.
- .2 Activities for procurement, delivery, installation and completion of each major piece of equipment, materials and other supplies, including:
  - .1 Time for submittals, re-submittal and review.
  - .2 Time for fabrication and delivery of manufactured products for Work.
  - .3 Interdependence of procurement and construction activities.

.3 Include sufficient detail for project activities to assure adequate planning and execution of work. Activities should generally range in duration from 3 to 15 days each.

.4 Provide level of detail for project activities such that sequence and interdependency of Contract tasks are demonstrated to allow coordination and control of project activities. Show continuous flow from left to right.

.5 Ensure activities with no float are calculated and clearly indicated on logical CPM construction network system as being whenever possible, continuous series of activities throughout length of project to form critical path.

1.3 SUBMITTALS

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

.2 Submit to Departmental Representative within 28 working days after Award of Contract Project schedule in form of Bar (GANTT) Chart for planning, monitoring and reporting of project progress.

1.4 REVIEW OF THE SCHEDULE

.1 Allow 10 working days for Departmental Representative to review proposed schedule. Make necessary changes to proposed schedule within 5 days.

.2 Submit letter ensuring the schedule has been prepared in coordination with major subcontractors and suppliers.

.3 Promptly provide additional information to validate practicability of schedule as required by Departmental Representative.

.4 Submittal of Schedule indicates that it meets Contract Requirements and will be executed generally in sequence.

1.5 COMPLIANCE WITH SCHEDULE

.1 Comply with reviewed schedule.

.2 Proceed with significant changes and deviations from schedule sequence of activities which cause delay only after review by Departmental Representative.

.3 Identify activities that are behind schedule and causing delay. Provide recovery plan and schedule to regain slippage.

.1 Recovery plan and schedule must include:

.1 An increase of personnel on the site for effective activities or work packages.

.2 An increase in materials and equipment.

.3 Additional work shifts, longer hours.

.4 Resource loaded schedule indicating the items noted above.

1.6 PROJECT SCHEDULE

.1 Develop detailed Project Schedule derived from Master Plan.

.2 Ensure detailed Project Schedule that shows milestone and activity types and expand from the following items:

.1 Award.

.2 Shop Drawings, Samples and Approvals.

.3 Permits.

.4 Mobilization.

.5 Mock-ups and Approvals.

.6 Procurement.

.7 Construction.
.8 Installation.
.9 Site Works.
.10 Training.
.11 Shutdowns for systems indicated in Section 01 14 00 1.5 Existing Services Shut Downs.
.12 Commissioning.

1.7 PROJECT SCHEDULE REPORTING

.1 On an ongoing basis, schedule on job site must show “progress to date”. Arrange participation on and off site of subcontractor and suppliers, as and when necessary, for purpose of network planning, scheduling, updating and progress monitoring. Inspect Work with Departmental Representative at least once monthly to establish progress on each current activity shown on applicable networks.

.2 Maintain a daily log of progress of the work:
.1 Submit daily force report to Departmental Representative daily prior to noon the following day indicating:
.1 Total number of personnel on site.
.2 Major subcontractors on site listed by trade.
.3 Major equipment on site, i.e. excavators, cranes, drills.
.4 Concrete volumes.
.5 Visitors to site.
.6 Weather
.7 Documents required from Departmental Representative to Contractor to maintain.

.3 Perform schedule update monthly dated on last working day of the month. Update to reflect activities completed to date, activities in progress, logic and duration changes.

.4 Do not automatically update actual start and finish dates by using default mechanisms found in project management software.

.5 Requirements for monthly progress monitoring and reporting are basis for progress payment request.

.6 Submit monthly schedule updates with the progress payment request.

.7 Submit monthly written reports based on schedule, showing Work to Date performed, comparing work progress planned and presenting current forecasts. Report must summarize progress, defining problem areas and anticipated delays with respect to Work Schedule, and critical paths. Explain alternatives for possible schedule recovery to mitigate any potential delay. Include in report:
.1 Description of progress made.
.2 Pending items and status of: Permits, shop drawings, samples, mockups, deliveries, change orders, possible time extension.
.3 Status of Contract Completion Date and Milestones.
.4 Current and Anticipated problem areas, potential delays and corrective measures.

.8 Submit weekly 3 week look ahead schedule to Departmental Representative on each Friday of the Week indicating the planned tasks of the next three week period.

1.8 PROJECT MEETINGS

.1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and

provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.

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

END OF SECTION 01 32 16.07

1.0 GENERAL

1.1 ADMINISTRATIVE

.1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

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

.3 Present shop drawings, product data, samples and mock-ups in SI Metric units.

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

.5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.

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

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

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

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

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

.11 Do not proceed with work until relevant submissions are reviewed by Departmental Representative.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.

.2 When specified in the Contract document, submit drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia of Canada.

.3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.4 Allow 10 days for Departmental Representative's review of each submission, unless noted otherwise.

.5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

.6 Make changes in shop drawings as Departmental Representative may require consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.

.7 Accompany submissions with transmittal letter, in duplicate, containing:
- .1 Date.
- .2 Project title and number.
- .3 Contractor's name and address.
- .4 Identification and quantity of each shop drawing, product data and sample.
- .5 Other pertinent data.

.8 Submissions include:
- .1 Date and revision dates.
- .2 Project title and number.
- .3 Name and address of:
  - .1 Subcontractor.
  - .2 Supplier.
  - .3 Manufacturer.
- .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- .5 Details of appropriate portions of Work as applicable:
  - .1 Fabrication.
  - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
  - .3 Setting or erection details.
  - .4 Capacities.
  - .5 Performance characteristics.
  - .6 Standards.
  - .7 Operating weight.
  - .8 Wiring diagrams.
  - .9 Single line and schematic diagrams.
  - .10 Relationship to adjacent work.

.9 After Departmental Representative's review, distribute copies.

.10 Submit electronic copy of shop drawings for each requirement requested in specification sections and as Departmental Representative may reasonably request.

.11 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.

.12 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with

specified requirements.

.2 Testing must have been within 3 years of date of contract award for project.

.13 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.

.2 Certificates must be dated after award of project contract complete with project name.

.14 Submit electronic copies of manufacturers instructions for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

.15 Submit copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.

.16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

.17 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.

.18 Delete information not applicable to project.

.19 Supplement standard information to provide details applicable to project.

.20 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, electronic copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

.21 The review of shop drawings by Departmental Representative is for sole purpose of ascertaining conformance with general concept.

.1 This review shall not mean that Departmental Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of Construction and Contract Documents.

.2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

.22 Shop drawings format larger than 11” x17” (275mm x 430mm) must be submitted with hardcopies together with electronic format. Submit sufficient copies such that Departmental Representative will keep 5 copies plus contractor’s distribution and maintenance manual.

.23 Electronic submissions will only be reviewed and returned electronically. No hardcopies will be returned to contractor.

.24 All electronic submissions to be uploaded to Document Control System Collaborative site hosted by PWGSC. Contractor will be responsible for becoming familiar with and utilizing the system.

1.3 SAMPLES

.1 Submit for review samples in duplicate as required in respective specification Sections. Label samples with origin and intended use.

.2 Deliver samples prepaid to Departmental Representative's business address.

.3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.

.4 Where colour, pattern or texture is criterion, submit full range of samples.

.5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

.6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.

.7 Reviewed and accepted samples will be kept onsite and will become standard of workmanship and material against which installed Work will be verified.

1.4 MOCK-UPS

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

1.5 PHOTOGRAPHIC DOCUMENTATION

.1 Submit electronic copy of colour digital photography in jpg format, standard resolution monthly with progress statement and as directed by Departmental Representative.

.2 Project identification: name and number of project and date of exposure indicated.

.3 Viewpoints and their locations as reasonably determined by Departmental Representative.

.4 Provide photographic documentation of adjacent existing conditions prior to commencement of construction for determining and accidental damage as a result of contractor’s work.

.5 Frequency of photographic documentation: monthly as directed by Departmental Representative.

.1 Upon completion of: demolition, framing and services before concealment of Work, and as directed by Departmental Representative.

1.6 CERTIFICATES AND TRANSCRIPTS

.1 Submit electronic copies of test results and inspection reports required as noted in each section of specifications.

END OF SECTION 01 33 00

PSPC Update on Asbestos Use

Effective April 1, 2016, all Public Service and Procurement Canada (PSPC) contracts for new construction and major rehabilitation will prohibit the use of asbestos-containing materials. Further information can be found at http://www.tpsgc-pwgsc.gc.ca/comm/vedette-features/2016 04-19-00-eng.html

1.0 GENERAL

1.1 REFERENCES

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

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

.3 Canadian Standards Association (CSA) as amended:
- .1 CSA Z797-2009 Code of Practice for Access Scaffold
- .2 CSA S269.1-1975 (R2003) Falsework for Construction Purposes
- .3 CSA S350-M1980 (R2003) Code of Practice for Safety in Demolition of Structure
- .4 CSA Z1006-10 – Management of Work In Confined Space

.4 National Fire Code of Canada 2010 (as amended)
- .1 Part 5 – Hazardous Processes and Operations and Division B as applicable and required.

.5 American National Standards Institute (ANSI):
- .1 ANSI A10.3, Operations – Safety Requirements for Powder-Actuated Fastening Systems.

.6 Province of British Columbia:
- .1 Workers Compensation Act Part 3-Occupational Health and Safety.
- .2 Occupational Health and Safety Regulation

.7 NMS Section 00 10 10 Specification Index (Appendix A thru Appendix E)

1.2 RELATED SECTIONS

.1	Section 01 32 16.0	Construction Progress Schedule-Bar (GANTT) Chart:
.2	Section 01 33 00	Submittal Procedures:
.3	Section 01 51 00	Temporary utilities:
.4	Section 01 52 00	Construction facilities:
.5	Section 01 56 00	Temporary barriers and enclosures:
.6	Section 02 82 00.02	Asbestos abatement Intermediate Precautions
.7	Section 02 83 11	Lead Base Paint Abatement Intermediate Precautions:

1.3 WORKERS' COMPENSATION BOARD COVERAGE

.1 Comply fully with the Workers' Compensation Act, regulations and orders made pursuant thereto, and any amendments up to the completion of the work.

.2 Maintain Workers' Compensation Board coverage during the term of the Contract, until and including the date that the Certificate of Final Completion is issued.

1.4 COMPLIANCE WITH REGULATIONS

.1 PSPC may terminate the Contract without liability to PSPC where the Contractor, in the opinion of PSPC, refuses to comply with a requirement of the Workers' Compensation Act or the Occupational Health and Safety Regulations.

.2 It is the Contractor's responsibility to ensure that all workers are qualified, competent and certified to perform the work as required by the Workers' Compensation Act or the Occupational Health and Safety Regulations.

1.5 SUBMITTALS

.1 Submit to Departmental Representative submittals listed for review. In accordance with Section 01 33 00

.2 Work effected by submittal shall not proceed until review is complete.

.3 Submit the following:
- .1 Site Specific 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 Material Information System (WHMIS) requirements.
- .5 Copy of Contractors' Construction Safety Manual
- .6 Emergency Procedures

.4 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 (five) days after receipt of the plan. Revise the plan as appropriate and resubmit to Departmental Representative.

.5 Medical surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of work, and submit additional certifications for any new site personnel to Departmental Representative.

.6 Submission of the Site Specific Health and Safety Plan, and any revised version, to the Departmental Representative is for information and reference purposes only. It shall not:
- .1 Be construed to imply approval by the Departmental Representative.
- .2 Be interpreted as a warranty of being complete, accurate and legislatively compliant.
- .3 Relieve the Contractor of his legal obligations for the provision of health and safety on the project.

1.6 RESPONSIBILITY

.1 Assume responsibility as the Prime Contractor for work under this contract.

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

.3 Comply with and enforce compliance by employees with safety requirements of Contract documents, applicable Federal, Provincial, Territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.7 HEALTH AND SAFETY COORDINATOR

.1 The contractor shall appoint a Health and Safety Coordinator who shall:

.1 Be responsible for completing all health and safety training, and ensuring that personnel that do not successfully complete the required training are not permitted to enter the site to perform work.

.2 Be responsible for implementing, daily enforcing, and monitoring the site-specific Health and Safety Plan.

.3 Be on site during execution of work.

1.8 GENERAL CONDITIONS

.1 Provide safety barricades and lights around the Contractor's Work Site (as required) and the Contractor Off-Site Offload Facility (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 sites.

.1 Provide appropriate means by use of barricades, fences, warning signs, traffic control personnel, and temporary lighting as required.

.2 Secure site at night time as deemed necessary to protect site against entry.

1.9 Utility Clearances

.1 The Contractor is solely responsible for all utility detection and clearances prior to starting the work.

.2 The Contractor will not rely solely upon the Reference Drawings or other information provided for utility locations.

1.10 PROJECT/SITE CONDITIONS

.1 Not Applicable

1.11 REGULATORY REQUIREMENTS

.1 Comply with specified codes, acts, bylaws, standards and regulations to ensure safe operations at site.

.2 In event of conflict between any provision of the above authorities, the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, the Departmental Representative will advise on the course of action to be followed.

1.12 WORK PERMITS

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

1.13 FILING OF NOTICE

.1 The Prime Contractor is to complete and submit a Notice of Project as required by Provincial authorities.

.2 Provide copies of all notices to the Departmental Representative.

1.14 HEALTH AND SAFETY PLAN

.1 Conduct a site-specific hazard assessment for the Contractor's Work Site and the Contractors' Off-Site Offload Facility (as required), based on a review of Contract documents, required work, and both project work sites. Identify any known and potential health risks and safety hazards.

.2 Develop, implement, and enforce a Site Specific Project Health and Safety Plan based on hazard assessment, including, but not limited to, the following:

.1 Primary requirements:

.1 Contractor's safety policy.
.2 Identification of applicable compliance obligations.
.3 Definition of responsibilities for project safety/organization chart for project.
.4 General safety rules for project.
.5 Job-specific safe work, procedures.
.6 Inspection policy and procedures.
.7 Incident reporting and investigation policy and procedures.
.8 Occupational Health and Safety Committee/Representative procedures.
.9 Occupational Health and Safety meetings.
.10 Occupational Health and Safety communications and record keeping procedures.

.2 Summary of health risks and safety hazards resulting from analysis of hazard 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 Site Specific project health and Safety 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 Site Specific Project Health and Safety Plan as required, and re-submit to the Departmental Representative.

.5 Departmental Representative's review: the review of the contractors' Site Specific Safety Project Health and Safety Plan by Public Services and Procurement Canada (PSPC) shall not relieve the Contractor of responsibility for errors or omissions in final Site Specific Project Health and Safety Plan or of responsibility for meeting all requirements of construction and Contract documents.

1.15 EMERGENCY PROCEDURES

.1 List standard operating procedures and measures to be taken in emergency situations. Include an evacuation plan and emergency contacts (i.e. names/telephone numbers) of:

.1 Designated personnel from own company.
.2 Regulatory agencies applicable to work and as per legislated regulations.
.3 Local emergency resources.
.4 Departmental Representative and other PSPC staff as required.

.2 Include the following provisions in the emergency procedures:

.1 Notify workers and the first-aid attendant, of the nature and location of the emergency.
.2 Evacuate all workers safely.
.3 Check and confirm the safe evacuation of all workers.

.4 Notify the fire department or other emergency responders.
.5 Notify adjacent workplaces or residences which may be affected if the risk extends beyond the workplace.
.6 Notify Departmental Representative and PSPC site staff.

.3 Provide written rescue/evacuation procedures as required for, but not limited to:
.1 Work at high angles
.2 Work in confined spaces or where there is a risk of entrapment.
.3 Work with hazardous substances.
.4 Underground work.
.5 Work on, over, under and adjacent to water
.6 Workplaces where there are persons who require physical assistance to be moved.

.4 Design and mark emergency exit routes to provide quick and unimpeded exit.

.5 At least once each year, emergency drills must be held to ensure awareness and effectiveness of emergency exit routes and procedures, and a record of the drills must be kept

.6 Revise and update emergency procedures as required, and re-submit to the Departmental Representative

1.16 HAZARDOUS PRODUCTS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of hazardous materials, and regarding labeling and provision of Material Safety Data Sheets (MSDS) acceptable to the Departmental Representative and in accordance with the Canada Labour Code.

.2 Where use of hazardous and toxic products cannot be avoided:
.1 Advise Departmental Representative beforehand of the product(s) intended for use. Submit applicable MSDS and WHMIS documents as per [Section 013300].
.2 In conjunction with Departmental Representative, schedule to carry out work during "off hours" when tenants have left the building.
.3 Provide adequate means of ventilation in accordance with NMS Sections as indicated in Section 000110 Specification Index.

1.17 OFFSITE CONTINGENCY AND EMERGENCY RESPONSE PLAN

.1 Prior to commencing Work involving handling of hazardous materials, develop off site Contingency and Emergency Response Plan.

.2 Plan must provide immediate response to serious site occurrence such as explosion, fire, or migration of significant quantities of toxic or hazardous material from Site.

.3 Notification of fire departments [4.17 – Worksafe BC Regulations Part 4 Buildings, Structures, Equipment, and Site Conditions]
(1) An employer having at a workplace hazardous products covered by WHMIS, explosives, pesticides, radioactive material, consumer products or hazardous wastes in quantities which may endanger firefighters, must ensure the local fire department is notified of the nature and location of the hazardous materials or substances and methods to be used in their safe handling.
(2) Subsection (1) does not apply to a workplace
(a) where materials are kept on site for less than 15 days if the employer ensures an alternative effective means for notification of fire departments is in place in the event of fire or other emergency, or

(b) which is not within the service area of a fire department.
[Amended by B.C. Reg. 30/2015, effective August 4, 2015.]

1.18 PERSONNEL HEALTH, SAFETY, AND HYGIENE

.1 Training: ensure personnel entering Site are trained in accordance with specified personnel training requirements. Training session must be completed by Health and Safety Officer.

.2 Levels of Protection: establish levels of protection for each Work area based on planned activity and location of activity.

.3 Personal Protective Equipment

.4 Furnish site personnel with appropriate PPE as specified above. Ensure that safety equipment and protective clothing is kept clean and maintained

.5 Develop protective equipment usage procedures and ensure that procedures are strictly followed by site personnel; include following procedures as minimum:

.6 Ensure prescription eyeglasses worn are safety glasses and do not permit contact lenses on site within work zones.

.7 Ensure footwear is steel-toed safety shoes or boots and is covered by rubber overshoes when entering or working in potentially contaminated work areas.

.8 Dispose of or decontaminate PPE worn on site at end of each workday.

.9 Decontaminate reusable PPE before reissuing.

.10 Ensure site personnel have passed respirator fit test prior to entering potentially contaminated work areas.

.11 Ensure facial hair does not interfere with proper respirator fit.

Respiratory Protection:

1. Provide site personnel with extensive training in usage and limitations of, and qualitative fit testing for, air purifying and supplied-air respirators in accordance with specified regulations.
2. Develop, implement, and maintain respirator program.
3. Monitor, evaluate, and provide respiratory protection for site personnel.
4. Ensure levels of protection as listed have been chosen consistent with site-specific potential airborne hazards associated with major contaminants identified on site.
5. In absence of additional air monitoring information or substance identification, retain an industrial hygiene specialist to determine minimum levels of respiratory protection required.
6. Immediately notify Departmental Representative when level of respiratory protection required increases.
7. Ensure appropriate respiratory protection during Work activities. As minimum requirement, ensure that persons entering potentially contaminated work areas are supplied with and use appropriate respiratory protection.

Heat Stress/Cold Stress:
Implement heat stress or cold stress monitoring program as applicable and include in site-specific Health and Safety Plan.

Personnel Hygiene and Personnel Decontamination Procedures.
Provide minimum as follows:

1. Suitable containers for storage and disposal of used disposable PPE.
2. Potable water and suitable sanitation facility.

Emergency and First-Aid Equipment:

1. Locate and maintain emergency and first-aid equipment in appropriate location on site including first-aid kit to accommodate number of site personnel; portable emergency eye wash; 9 kg ABC type dry chemical fire extinguishers as required.

1.19 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.

.3 Develop, implement and enforce a communication plan with Departmental representative and EGD maintenance staff for all electrical work and lockout procedures.

1.20 ELECTRICAL LOCKOUT

.1 Develop, implement and enforce use of established procedures to provide electrical lockout and to ensure the health and safety of workers for every event where work must be done on any electrical circuit or facility.

.2 Prepare the lockout procedures in writing, listing step-by-step processes to be followed by workers, including how to prepare and issue the request/authorization form. Have procedures available for review upon request by the Departmental Representative.

.3 Keep the documents and lockout tags at the site and list in a log book for the full duration of the Contract. Upon request, make such data available for viewing by Departmental Representative or by any authorized safety representative.

1.21 OVERLOADING

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

1.22 FALSEWORK

.1 Design and construct falsework in accordance with CSA S269.1- 1975 (R2003).

1.23 SCAFFOLDING

.1 Design, construct and maintain scaffolding in a rigid, secure and safe manner, in accordance with CSA Z797-2009 and B.C. Occupational Health and Safety Regulations.

1.24 CONFINED SPACES

.1 Carry out work in confined spaces in compliance with Worksafe B.C. Part 9 Confined Spaces and CSA Z1006-10 Management of Work in Confined Space.

1.25 RESTRICTED ACCESS

.1 Contractor shall perform a hazard assessment and develop an appropriate restricted access entry plan in accordance with Worksafe B.C. regulations.

1.26 CONFINED SPACE AND RESTRICTED SPACE OUTSIDE OF DEFINED WORK SITE

.1 Carry out work in confined spaces in compliance with Worksafe B.C. Part 9 Confined Spaces and CSA Z1006-10 Management of Work in Confined Space. Coordinate all confined space entry work with PSPC Departmental Representative through the contractor's confined space entry permit system.

.2 Contractor shall perform a hazard assessment and develop an appropriate restricted access entry plan in accordance with Worksafe B.C. regulations. Coordinate all restricted access space entry work with the PSPC Departmental Representative prior to entry.

.3 The Contractor is required to provide a reasonable amount of time to the Departmental Representative for making arrangements for entry and/or access to Confined Space or Restricted Access spaces located outside the designated work site.

1.27 POWDER-ACTUATED DEVICES

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

1.28 FIRE SAFETY AND HOT WORK

.1 Coordinate all hot work with PSPC Departmental Representative through the contractors' hot work permit system

.2 Obtain Departmental Representative's authorization before any welding, cutting or any other hot work operations can be carried out on site.

.3 Hot work includes cutting/melting with use of torch, flame heating roofing kettles, or other open flame devices and grinding with equipment which produces sparks.

1.29 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.

1.30 FIRE PROTECTION AND ALARM SYSTEM

.1 Fire protection and alarm systems shall not be:
- .1 Obstructed.
- .2 Shut off.
- .3 Left inactive at the end of a working day or shift.

.2 Do not use fire hydrants, standpipes and hose systems for purposes other than firefighting.

.3 Be responsible/liable for costs incurred from the fire department, the building owner and the tenants, resulting from false alarms.

1.31 UNFORESEEN HAZARDS

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

1.32 POSTED DOCUMENTS

.1 Post legible versions of the following documents on site:

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

1.33 MEETINGS

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

.2 All personnel employed by the contractor and its subcontractors shall attend the mandatory EGD Safety Orientation presentation prior to performing Work at the EGD Work Site.

1.34 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 01 35 33

1.0 GENERAL

1.1 INSPECTION

.1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.

.2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work.

.3 If Contractor covers or permits to be covered, Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.

.4 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.

1.2 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies will be engaged by Contractor for purpose of inspecting and/or testing portions of Work.

.2 Provide equipment required for executing inspection and testing by appointed agencies.

.3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.

.4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and re-inspection.

1.3 ACCESS TO WORK

.1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.

.2 Co-operate to provide reasonable facilities for such access.

1.4 PROCEDURES

.1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.

.2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.

.3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.5 REJECTED WORK

.1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by 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 If in opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Departmental Representative.

1.6 REPORTS

.1 Submit electronic copy of inspection and test reports to Departmental Representative.

.2 Provide copies to subcontractor of work being, inspected or tested or manufacturer or fabricator of material being inspected or tested.

1.7 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as requested.

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

1.8 MOCK-UPS

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

.2 Construct in locations acceptable to Departmental Representative as specified in specific Section.

.3 Prepare mock-ups for Departmental Representative review with reasonable promptness and in orderly sequence, to not cause delays in Work.

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

.5 If requested, Departmental Representative will assist in preparing schedule fixing dates for preparation.

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

1.9 MILL TESTS

.1 Submit mill test certificates as requested.

1.10 EQUIPMENT AND SYSTEMS

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

.2 Refer to Divisions 21, 22, 23, 26, 27 and 28 for definitive requirements.

END OF SECTION 01 45 00

floors only when directed by Departmental Representative, where dust and fumes will be generated.

.2 Change filters in existing HVAC system frequently.

1.8 SCAFFOLDING

.1 Construct and maintain scaffolding in rigid, secure and safe manner.

.2 Erect scaffolding independent of walls. Remove promptly when no longer required.

1.9 HOISTING

.1 Provide, operate and maintain hoists required for moving of workers, materials and equipment. Make financial arrangements with Sub-contractors for their use of hoists.

.2 Hoists shall be operated by qualified operator.

1.10 ELEVATORS

.1 The elevator may be used for moving materials only when arrangements have been made with the Departmental Representative. Protect elevator cab and entrances from damage and dirt at all times. At completion of Project, remove any new temporary protection panels, make good to all damage and leave in “as before” condition.

1.11 HOARDING

.1 Prior to all demolition and construction, install module lock hoarding with dust screen to all construction zone. Maintain in safe and clean condition throughout duration of project. Submit hoarding plan to Departmental Representative for approval.

.2 Erect and maintain safety barricades around all openings and other danger areas as required by Building Code and Worksafe BC

.3 Installation of hoarding must not create permanent damage to existing wall cladding or flooring finish.

1.12 SITE OFFICE

.1 Contractor to provide a temporary site office. Contractor is responsible to set up phone line, fax line or data line required.

1.13 SIGNS AND NOTICES

.1 Signs and notices for safety and instruction shall be in both official languages or graphic symbols conforming to CAN/CSA-Z321.

.2 Maintain approved signs and notices in good condition for duration of Project, and dispose of offsite on completion of Project when directed by Departmental Representative.

1.14 CLEAN-UP

.1 Remove construction debris, waste materials, packaging material from work site daily.

.2 Clean dirt of mud tracked onto paved or surfaced roadways.

.3 Store materials resulting from demolition activities that are salvageable.

.4 Stack stored new or salvaged material not in construction facilities.

.5 At completion of Project: Remove and dispose of all debris, thoroughly clean and restore site to condition found at commencement of Work. Repair and make good to all damage caused by construction activities.

END OF SECTION 01 51 00

1.0 GENERAL

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB)
- .1 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
- .2 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.

.2 Canadian Standards Association (CSA International)
- .1 CSA-O121-M1978 (R2003, Douglas Fir Plywood.

.3 Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses and Conditions (SACC)-ID: R0202D, Title: General Conditions 'C', In Effect as Of: May 14, 2004.

1.3 INSTALLATION AND REMOVAL

.1 Provide temporary controls in order to execute Work expeditiously.

.2 Remove from site all such work after use.

1.4 HOARDING

.1 Refer to Section 01 51 00 Temporary Facilities Clause 1.11.

1.5 GUARD RAILS AND BARRICADES

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

.2 Provide as required by governing authorities.

1.6 WEATHER ENCLOSURES

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

.2 Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.

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

1.7 ACCESS TO SITE

.1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.

1.8 PUBLIC TRAFFIC FLOW

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

1.9 FIRE ROUTES

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

.2 Maintain clearance for all egress routes.

1.10 PROTECTION OFF-SITE AND PUBLIC PROPERTY

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

.2 Be responsible for damage incurred.

1.11 PROTECTION OF BUILDING FINISHES

.1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.

.2 Provide necessary screens, covers, and hoardings.

.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.

1.12 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management And Disposal.

END OF SECTION 01 56 00

1.0 GENERAL

1.1 PRODUCTS/MATERIAL AND EQUIPMENT

.1 Use NEW products/material and equipment unless otherwise specified. The term "products" is referred to throughout the specifications.

.2 Use products of 1 manufacturer for material and equipment of the same type or classification unless otherwise specified.

.3 Unless otherwise specified, comply with manufacturer's latest printed instructions for materials and installation methods.

.4 Notify Departmental Representative in writing of any conflict between these specifications and manufacturer's instructions. Departmental Representative will designate which document is to be followed.

.5 Provide metal fastenings and accessories in the same texture, colour and finish as base metal in which they occur.

- .1 Prevent electrolytic action between dissimilar metals.
- .2 Use non-corrosive fasteners, anchors and spacers for securing exterior work.
- .3 Fastenings which cause spalling or cracking are not acceptable.
- .4 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .5 Use heavy hexagon heads, semi-finished unless otherwise specified.
- .6 Bolts may not project more than 1 diameter beyond nuts.
- .7 Types of washers as follows:
  - .1 Plain type washers: use on equipment and sheet metal.
  - .2 Soft gasket lock type washers: use where vibrations occur.
  - .3 Resilient washers: use with stainless steel.
- .8 Deliver, store and maintain packaged material and equipment with manufacturer's seals and labels intact.
- .9 Prevent damage, adulteration and soiling of products during delivery, handling and storage. Immediately remove rejected products from site.
- .10 Store products in accordance with suppliers' instructions.
- .11 Touch up damaged factory finished surfaces to Departmental Representative's satisfaction.
  - .1 Use primer or enamel to match original.
  - .2 Do not paint over nameplates.

1.2 QUALITY OF PRODUCTS

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

.2 Defective products will be rejected regardless of previous inspections.

- .1 Inspection does not relieve responsibility, but is precaution against oversight or error.
- .2 Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .3 Retain purchase orders, invoices and other documents to prove that all products utilized in this Contract meet the requirements of the specifications. Produce documents when

requested by the Departmental Representative.

.4 Should any dispute arise as to quality or fitness of products, the decision rests strictly with the Departmental Representative based upon the requirements of the Contract documents.

.5 Unless otherwise indicated in the specifications, maintain uniformity of manufacture for any particular or like item throughout the building.

.6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.3 AVAILABILITY OF PRODUCTS

.1 Immediately upon signing the Contract, review product delivery requirements and anticipate foreseeable supply delays for any items.

.2 If delays in supply of products are foreseeable, notify Departmental Representative of such in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of the work.

.3 In event of failure to notify Departmental Representative at the start of work and should it subsequently appear that the work may be delayed for such reason, the Departmental Representative reserves the right to substitute more readily available products of similar character, at no increase in either the Contract price or the Contract time.

1.4 MANUFACTURER'S INSTRUCTIONS

.1 Unless otherwise indicated in the specifications, install or erect products in accordance with the manufacturer's instructions.

.1 Do not rely on labels or enclosures provided with products.

.2 Obtain written instructions directly from the manufacturer.

.2 Notify Departmental Representative in writing of conflicts between the specifications and the manufacturer's instructions so that the Departmental Representative may establish the course of action.

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes the Departmental Representative to require removal and reinstallation at no increase in either the Contract price or the Contract time.

1.5 CONTRACTOR'S OPTIONS FOR SELECTION OF PRODUCTS FOR TENDERING

.1 Products are specified by "Prescriptive" specifications: select any product meeting or exceeding specifications.

.2 Products specified under "Acceptable Products": select any one of the indicated manufacturers, or any other manufacturer meeting or exceeding the Prescriptive specifications and indicated Products.

.3 Products specified by performance and referenced standard: select any product meeting or exceeding the referenced standard.

.4 Products specified to meet particular design requirements or to match existing materials: use only material specified Approved Product. Alternative products may be considered provided full technical data is received in writing by Departmental Representative in

accordance with "Special Instructions to Tenderers".

.5 When products are specified by a referenced standard or by or Performance specifications, upon request of Departmental Representative obtain from manufacturer an independent laboratory report showing that the product meets or exceeds the specified requirements.

1.6 SUBSTITUTION AFTER CONTRACT AWARD

.1 No substitutions are permitted without prior written approval of the Departmental Representative.

.2 Proposals for substitution may only be submitted after Contract award. Such request must include statements of respective costs of items originally specified and the proposed substitution.

.3 Proposals will be considered by the Departmental Representative if:

.1 Products selected by tenderer from those specified are not available;

.2 Delivery date of products selected from those specified would unduly delay completion of Contract, or

.3 Alternative product to that specified, which is brought to the attention of and considered by Departmental Representative as equivalent to the product specified, and will result in a credit to the Contract amount.

.4 Should the proposed substitution be accepted either in part or in whole, assume full responsibility and costs when substitution affects other work on the project. Pay for design or drawing changes required as result of substitution.

.5 Amounts of all credits arising from approval of the substitutions will be determined by the Departmental Representative and the Contract price will be reduced accordingly.

END OF SECTION 01 61 00

1.0 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 11 00 - General Instructions

1.2 COORDINATION

.1 Contractor shall coordinate Departmental Representative supplied products and services with the Construction Schedule for delivery dates.

.2 Contractor shall coordinate with the Departmental Representative for installation of Departmental Representative installed items, blocking and servicing requirements and confirm dimensional requirements for items being built-in or attached to Contractor work.

.3 Contractor shall coordinate Departmental Representative supplied products, installed by Contractor for installation requirements, blocking and servicing requirements and confirm dimensional requirements for items being built-in or attached to Contractor's work.

2.0 PRODUCTS

2.1 DEPARTMENTAL REPRESENTATIVE'S WORK

.1 The Departmental Representative has established the items of work as indicated in Appendix A to be Departmental Representative's supplied and installed, or Departmental Representative's supplied and Contractor to install. All Departmental Representative's work to be coordinated by Contractor.

3.0 EXECUTION

3.1 PREPARATION

.1 Contractor shall provide all necessary framing, support and blocking to receive Departmental Representative's Work, all services roughing-in, in accordance with shop drawings, which will be, supplied by the Departmental Representative if available or products delivered on site, at no additional cost to the Contract.

END OF SECTION 01 64 00

1.0 GENERAL

1.1 REFERENCES

.1 A set of construction drawings of existing buildings in pdf format are available for viewing and reference only upon request. The set of drawings may not be full completed set and do not necessarily represent as-built conditions. All existing conditions measurements need to be verified on site.

1.2 QUALIFICATIONS OF SURVEYOR

.1 Qualified registered land surveyor, licensed to practice in the province of British Columbia, acceptable to Departmental Representative.

1.3 EXISTING SERVICES

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

1.4 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.

1.5 RECORDS

.1 Maintain a complete, accurate log of control and survey work as it progresses.

.2 On completion of foundations and major site improvements, prepare a certified survey showing dimensions, locations, angles and elevations of Work.

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

1.6 SUBMITTALS

.1 Submit name and address of Surveyor to Departmental Representative.

.2 On request of Departmental Representative, submit documentation to verify accuracy of field engineering work.

.3 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform and do not conform with Contract Documents.

1.7 SUBSURFACE CONDITIONS

.1 Promptly notify Consultant in writing if subsurface conditions at Place of Work differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.

.2 After prompt investigation, should Consultant determine that conditions do differ materially, instructions will be issued for changes in Work as provided in Changes and Change Orders.

END OF SECTION 01 71 00

1.0 GENERAL

1.1 SUBMITTALS

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

.2 Submit written request in advance of cutting or alteration which affects:
- .1 Structural integrity of elements of project.
- .2 Integrity of weather-exposed or moisture-resistant elements.
- .3 Efficiency, maintenance, or safety of operational elements.
- .4 Visual qualities of sight-exposed elements.
- .5 Work of Owner or separate contractor.

.3 Include in request:
- .1 Identification of project.
- .2 Location and description of affected Work.
- .3 Statement on necessity for cutting or alteration.
- .4 Description of proposed Work, and products to be used.
- .5 Alternatives to cutting and patching.
- .6 Effect on Work of Owner or separate contractor.
- .7 Written permission of affected separate contractor.
- .8 Date and time work will be executed.

1.2 MATERIALS

.1 Required for original installation.

.2 Change in Materials: Submit request for substitution in accordance with Section 01 33 00 - Submittal Procedures.

1.3 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 are to be exposed by uncovering work; maintain excavations free of water.

1.4 EXECUTION

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

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

.3 Uncover Work to install ill-timed Work.

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

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

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

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

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

.9 Restore work with new products in accordance with requirements of Contract Documents.

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

.11 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material in accordance with Section 07 84 00 - Firestopping, full thickness of the construction element.

.12 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.

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

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management And Disposal.

END OF SECTION 01 73 00

1.0 GENERAL

1.1 REFERENCES

.1 Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses and Conditions (SACC)-ID: R0202D, Title: General Conditions "C", In Effect as Of: May 14, 2004.

1.2 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Owner or other Contractors.

.2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site, unless approved by Departmental Representative.

.3 Clear snow and ice from access to building, bank/pile snow in designated areas only.

.4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.5 Provide on-site containers for collection of waste materials and debris.

.6 Provide and use marked separate bins for recycling. Refer to Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.7 Dispose of waste materials and debris off site.

.8 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.

.9 Store volatile waste in covered metal containers, and remove from premises at end of each working day.

.10 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

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

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

1.3 FINAL CLEANING

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

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

.3 Prior to final review remove surplus products, tools, construction machinery and equipment.

.4 Remove waste products and debris including that caused by Owner or other Contractors.

.5 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.

.6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.7 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

.8 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, millwork floors and ceilings.

.9 Clean lighting reflectors, lenses, and other lighting surfaces.

.10 Vacuum clean and dust building interiors, behind grilles, louvres and screens.

.11 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.

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

.13 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.

.14 Remove dirt and other disfiguration from exterior surfaces.

.15 Clean and sweep gutters.

.16 Sweep and wash clean paved areas.

.17 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.

.18 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

.19 Remove snow and ice from access to buildings.

1.4 LEVEL OF CLEANINESS WITHIN WAREHOUSE SPACE

.1 Work area within the ground floor warehouse area to be same as existing operational area condition. All walls, ceiling fixtures, equipment and floor must be free of duct and stain.

.2 Work in these areas must be carried out by cleaning company whose usual business is maintenance and cleaning of Commercial or office premises with 5 years or more expertise.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management And Disposal.

END OF SECTION 01 74 11

1.0 GENERAL

1.1 WASTE MANAGEMENT GOALS

.1 Prior to start of Work conduct meeting with Departmental Representative to review and discuss PWGSC's Waste Management Plan and Goals.

.2 Accomplish maximum control of solid construction waste.

.3 Preserve environment and prevent pollution and environment damage.

1.2 DEFINITIONS

.1 Class III: non-hazardous waste - construction renovation and demolition waste.

.2 Cost/Revenue Analysis Workplan (CRAW): based on information from WRW, and intended as financial tracking tool for determining economic status of waste management practices.

.3 Demolition Waste Audit (DWA): relates to actual waste generated from project.

.4 Inert Fill: inert waste - exclusively asphalt and concrete.

.5 Materials Source Separation Program (MSSP): consists of series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.

.6 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.

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

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

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

- .1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
- .2 Returning reusable items including pallets or unused products to vendors.

.10 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.

.11 Separate Condition: refers to waste sorted into individual types.

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

.13 Waste Audit (WA): detailed inventory of materials in building. Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project. Indicates quantities of reuse, recycling and landfill. Refer to Schedule A.

.14 Waste Management Co-ordinator (WMC): contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.

.15 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. Refer to Schedule B. WRW is based on information acquired from WA (Schedule A).

1.3 DOCUMENTS

.1 Maintain at job site, one copy of following documents:
- .1 Waste Audit.
- .2 Waste Reduction Workplan.
- .3 Material Source Separation Plan.
- .4 Schedules A, B, C, D, E completed for project.

1.4 SUBMITTALS

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

.2 Prepare and submit following prior to project start-up:
- .1 Submit 2 copies of completed Waste Reduction Workplan (WRW): Schedule B.
- .2 Submit 2 copies of completed Demolition Waste Audit (DWA): Schedule C.
- .3 Submit 2 copies of Materials Source Separation Program (MSSP) description.

.3 Submit before final payment summary of waste materials salvaged for reuse, recycling or disposal by project using deconstruction/disassembly material audit form.
- .1 Failure to submit could result in hold back of final payment.
- .2 Provide receipts, scale tickets, waybills, and show quantities and types of materials reused, recycled, co-mingled and separated off-site or disposed of.
- .3 For each material reused, sold or recycled from project, include amount quantities by number, type and size of items and the destination.
- .4 For each material land filled or incinerated from project, include amount in tonnes of material and identity of landfill, incinerator or transfer station.

1.5 WASTE AUDIT (WA)

.1 Conduct WA prior to project start-up.

.2 Prepare WA: Schedule A.

.3 Record, on WA - Schedule A, extent to which materials or products used consist of recycled or reused materials or products.

1.6 WASTE REDUCTION WORKPLAN (WRW)

.1 Prepare WRW prior to project start-up.

.2 WRW should include but not limited to:
- .1 Destination of materials listed.
- .2 Deconstruction/disassembly techniques and sequencing.
- .3 Schedule for deconstruction/disassembly.
- .4 Location.
- .5 Security.
- .6 Protection.
- .7 Clear labelling of storage areas.

.8 Details on materials handling and removal procedures.
.9 Quantities for materials to be salvaged for reuse or recycled and materials sent to landfill.

.3 Structure WRW to prioritize actions and follow 3R's hierarchy, with Reduction as first priority, followed by Reuse, then Recycle.

.4 Describe management of waste.

.5 Identify opportunities for reduction, reuse, and recycling of materials. Based on information acquired from WA.

.6 Post WRW or summary where workers at site are able to review content.

.7 Set realistic goals for waste reduction, recognize existing barriers and develop strategies to overcome these barriers.

.8 Monitor and report on waste reduction by documenting total volume and cost of actual waste removed from project.

1.7 DEMOLITION WASTE AUDIT (DWA)

.1 Prepare DWA prior to project start-up.

.2 Complete DWA: Schedule C.

.3 Provide inventory of quantities of materials to be salvaged for reuse, recycling, or disposal.

1.8 MATERIALS SOURCE SEPARATION PROGRAM (MSSP)

.1 Prepare MSSP and have ready for use prior to project start-up.

.2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by Departmental Representative.

.3 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.

.4 Provide containers to deposit reusable and recyclable materials.

.5 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.

.6 Locate separated materials in areas which minimize material damage.

.7 Collect, handle, store on-site, and transport off-site, salvaged materials in separate condition.
.1 Transport to approved and authorized recycling facility.

1.9 STORAGE, HANDLING AND PROTECTION

.1 Store, materials to be reused, recycled and salvaged in locations as directed by Departmental Representative.

.2 Unless specified otherwise, materials for removal become Contractor's property.

.3 Protect surface drainage, mechanical and electrical from damage and blockage.

.4 Separate and store materials produced during dismantling of structures in designated areas.

.5 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.
.1 On-site source separation is recommended.
.2 Remove co-mingled materials to off-site processing facility for separation.
.3 Provide waybills for separated materials.

1.10 DISPOSAL OF WASTES
.1 Do not bury rubbish or waste materials.

.2 Do not dispose of waste, volatile materials, mineral spirits, oil, paint thinner, into waterways, storm, or sanitary sewers.

.3 Keep records of construction waste including:
.1 Number and size of bins.
.2 Waste type of each bin.
.3 Total tonnage generated.
.4 Tonnage reused or recycled.
.5 Reused or recycled waste destination.

.4 Remove materials from deconstruction as deconstruction/disassembly Work progresses.

.5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.

1.11 USE OF SITE AND FACILITIES
.1 Execute work with least possible interference or disturbance to normal use of premises.

.2 Provide temporary security measures approved by Departmental Representative.

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

2.0 PRODUCTS

2.1 NOT USED
.1 Not Used.

3.0 EXECUTION

3.1 APPLICATION
.1 Do Work in compliance with WRW.

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

3.2 CLEANING
.1 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.

.2 Clean-up work area as work progresses.

.3 Source separate materials to be reused/recycled into specified sort areas.

3.3 DIVERSION OF MATERIALS

.1 From following list, separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by Departmental Representative, and consistent with applicable fire regulations.
- .1 Mark containers or stockpile areas.
- .2 Provide instruction on disposal practices.

.2 On-site sale of salvaged recovered reusable and/or recyclable materials is not permitted.

.3 Demolition Waste:

Material Type	Recommended Diversion %	Actual Diversion %
Acoustical Insulation	100	
Doors and Frames	100	
Electrical Equipment	80	
Mechanical Equipment	100	
Metals	100	
Rubble	100	
Wood (uncontaminated)	100	
Other		

.4 Construction Waste:

Material Type	Recommended Diversion %	Actual Diversion %
Cardboard	100	
Plastic Packaging	100	
Rubble	100	
Steel	100	
Wood (uncontaminated)	100	
Other		

3.4 WASTE AUDIT (WA)

The following pertains to Schedule A - Waste Audit (WA). Column-1 refers to the category of waste, and a physical description of the material (e.g. off-cuts, clean drywall, etc.). Column-2 refers to the total quantity of materials received by the Contractor. Measurement units must be specified. Column-3 refers to the estimated percentage of material that is waste. Column-4 refers to the total quantity of waste (column-2 x column-3). Column-5 refers to the areas(s) in which the waste was generated. Column-6 refers to the total percentage of recycled material from the specified total quantity of waste (column-4). Column-7 refers to the total percentage of reused material from the specified total quantity of waste (column-4).

.1 Schedule A - Waste Audit (WA):

(1) Material Category	(2) Material Quantity Unit %	(3) Estimated Waste	(4) Total Quantity of Waste (unit)	(5) Generation Point	(6) % Recycled	(7) % Reused
Wood & Plastics						
Material Description						
Off-Cuts						
Warped						
Plastic						
Cardboard						
Other						
Doors & Windows						
Material Description						
Frames						
Glass						
Wood						
Metal						

3.5 WASTE REDUCTION WORKPLAN (WRW)

The following pertains to Schedule B - Waste Reduction Workplan (WRW). Column-1 refers to the category and type of waste materials. Column-2 refers to the persons responsible for completing the WRW. Column-3 refers to Column-4 of Schedule A. Column-4 refers to the amount of reused waste predicted and realized. Column-5 refers to the amount of recycled waste predicted and realized. Column-6 refers to the approved recycling facility.

.1 Schedule B:

(1) Material Quantity Category	(2) Person Amount Responsible Waste	(3) Total of Project (unit)	(4) Reused Actual (units)	(5) Recycle Actual (s) Amount	(6) Material Destination (s)
Wood & Plastics					
Material Description					
Chutes					
Warped					
Plastic					
Cardboard Packaging					
Other					
Doors & Windows					
Material Description					
Painted					
Frames					
Glass					
Wood					
Metal					
Other					

3.6 DEMOLITION WASTE AUDIT (DWA)

The following pertains to Schedule C - Demolition Waste Audit (DWA). Column-1 refers to the type of material salvaged. Column-2 refers to the material quantity shown in column-1. Several columns may be required to identify specific demolition areas. Column-3 refers to the unit of measurement used to describe Column-2. Column-4 refers to the total quantity of salvaged material. Column-5 refers to the cumulative volume of salvaged material. Column-6 refers to the total weight in kilograms. Column-7 refers to remarks and assumptions made about the specified material.

.1 Schedule C - Demolition Waste Audit (DWA):

(1) Material Description Assumptions	(2) Quantity	(3) Unity	(4) Total	(5) Volume (cum)	(6) Weight (cum)	(7) Remarks & Assumptions
Wood						
Wood						
Stud						
Plywood						
Baseboard -wood						
Door						
Trim-Wood						
Cabinet						
Doors & Windows						
Panel						
Regular						
Slab Regular						
Wood						
Laminate						
Byfold-Closet						
Glazing						

3.7 CANADIAN GOVERMENTAL DEPARTMENTS CHIEF REPSONSIBLITY FOR THE ENVIROMENT

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

.1 Ministry of Environment Lands and Parks
810 Blanshard Street, 4th Floor
Victoria, BC V8V 1X4
604-387-1161 / 604-356-6464

.2 Waste Reduction Commission Soils and Hazardous Waste
770 South Pacific Blvd, Suite 303
Vancouver BC, V6B 5E7
604-660-9550 / 604-660-9596

END OF SECTION 01 74 19

1.0 GENERAL

1.1 SECTION INCLUDES

.1 Administrative procedures preceding preliminary and final inspections of Work.

1.2 RELATED SECTIONS

.1 Section 01 78 00 - Closeout Submittals.

1.3 INSPECTION AND DECLARATION

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

- .1 Notify Departmental Representative in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
- .2 Request Departmental Representative's Inspection.
- .3 Departmental Representative's Inspection: Departmental Representative and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.
- .4 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.
  - .4 Certificates required by authorities having jurisdiction.
  - .5 Commissioning of all systems: Final commissioning reports have been submitted to the Departmental Representative.
  - .6 Operation of systems have been demonstrated to Owner's personnel.
  - .7 Work is complete and ready for Final Inspection.

END OF SECTION 01 77 00

1.0 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 45 00 - Quality Control.

.2 Section 01 71 00 – Examination & Preparation.

.3 Section 01 77 00 – Closeout Procedures.

.4 Section 01 79 00 – Demonstration and Training.

.5 Section 01 91 13 – General Commissioning Requirement

1.2 SUBMISSION

.1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.

.2 Copy will be returned after final inspection, with Departmental Representative's comments.

.3 Revise content of documents as required prior to final submittal.

.4 Two weeks prior to Interim Completion of the Work, submit to the Departmental Representative, four final copies of operating and maintenance manuals in English.

.5 An electronic copy Interactive Operating and Maintenance Manual System is required as specified under clause 1.3. Provide 4 sets of the Electronic Interactive Operating and Maintenance Manual System to the Departmental Representative.

.6 Hard copies of the Operating and Maintenance Manual System is required as specified under clause 1.4. Provide 4 sets of the Hard Copy Interactive Operating and Maintenance Manual System to the Departmental Representative.

.7 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.

.8 If requested, furnish evidence as to type, source and quality of products provided.

.9 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.

.10 Pay costs of transportation.

1.3 INTERACTIVE OPERATING AND MAINTENANCE MANUAL SYSTEM

.1 In addition to the printed copies, submit provide an Interactive Operating and Maintenance Manual System as specified herein.

.2 System Description and Requirements

.1 All as constructed drawings and operation and maintenance (O&M) manuals listed under the Scope of Work shall be converted, where necessary, into Portable Data File (PDF) format for viewing using the Adobe Acrobat Reader.

.2 Documentation storage and retrieval system shall be structured based on a database framework with direct links to the appropriate PDF files. Documents retrieval and viewing shall be executed through a menu driven approach.

.3 Program shall be capable of storing separately and independently data of multiple buildings and shall be expandable for addition of new buildings and systems.

.4 Data of each building shall be accessible by the input of either the building name or building number as defined by the Departmental Representative.

.5 O&M data and as constructed drawings shall be classified by their corresponding disciplines, including:

.1 Architectural
.2 Mechanical
.3 Electrical
.4 Data & Communication
.5 BSCS
.6 Under each discipline, data shall be grouped into the following four major categories:

.1 Basic Documents

.1 'Basic Documents' shall, according to the type of services or disciplines, include the full contents of each hard copy of the O&M manuals with the addition of Miscellaneous Maintenance Reports and Records, or as defined by the user. In general the following shall be included unless specifically excluded by the Departmental Representative:

.1 Introduction
.2 Consultant/Contractor/Suppliers List
.3 System Description
.4 Maintenance and Lubrication Schedules
.5 Testing and Commissioning (T&C) Reports
.6 Misc. Reports
.7 Specifications
.8 Equipment and/or point schedules as identified in the hard copy documents
.9 Others as stipulated by the Departmental Representative

.2 All Basic Documents PDF files shall be enhanced with appropriate bookmarks to facilitate searching of information within the document or linking to other relevant documents for references.

.2 'As-Constructed' Drawings

.1 'As-Constructed' drawings shall be converted from the original electronic files, such as CAD, into PDF format. If only the hard copies of the 'as constructed' drawings are available, they shall be scanned and saved in PDF format. PDF files of the 'As-Constructed' drawings shall be enhanced with the following bookmarks to zoom into legible views on the computer screen as a minimum:

.1 Drawing Number and Title
.2 Drawing Notes
.3 Major Equipment Locations
.4 Cross-links to other related drawings
.5 Revisions

.3 System Data

.1 Building systems shall be identified by their services, disciplines, function, nature and specific scope. System data shall be classified into the following categories:

.1 System Description
.2 Schematic (where applicable)
.3 Equipment List

.2 Provide hot key buttons, where applicable, for direct access to drawings/data referenced on the schematics. The same shall be applied to listed equipment for direct links to the corresponding equipment data.

.4 Equipment Data

.1 Equipment data shall be classified into the following categories:

.1 Equipment submittals
.2 T&C Report
.3 Maintenance Data
.4 Maintenance Records
.5 Photo

.2 Provide a summary screen to list all equipment classified under a specific system. On the summary screen, provide direct links to the corresponding equipment data under each category with addition links to the relevant 'As Constructed' drawings.

.6 The system shall be executed by Professional Engineers with a minimum of 10 years post qualification experience in the field of Building Services Engineering.

.7 The Contractor shall provide a minimum of 3 past job references as proven record of similar undertakings.

.8 The Contractor shall provide a demonstration of the system to the Departmental Representative to provide verification that the requirements if the specification are fulfilled.

1.4 FORMAT HARD COPY MANUALS

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

.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.

.3 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.

.4 Cover: Identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.

.5 Arrange content by Section numbers and sequence of Table of Contents.

.6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

.7 Text: Manufacturer's printed data, or typewritten data.

.8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

.9 Provide 1:1 scaled CAD files in .dwg format on CD.

1.5 CONTENTS - EACH VOLUME

.1 Table of Contents: provide title of project;

.1 date of submission;
.2 names, addresses, and telephone and fax numbers of Contractor, Subcontractors, Suppliers with name of responsible parties;
.3 schedule of products and systems, indexed to content of volume.

.4 copy of hardware schedule and paint schedules, complete with the actual manufacturer, supplier and identification names and numbers.
.5 all extended guarantees, warranties, maintenance bonds, certificates, letters of guarantees, registration cards, as called for in the various sections of the specification.
.6 complete set of all final reviewed shop drawings.
.7 certificates of inspection by authorities having jurisdiction.
.8 test reports and certificates as applicable.
.9 complete set of as constructed drawings.

.2 For each product or system:
.1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

.3 Product Data: mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.

.4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

.5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

.6 Training: Refer to Section 01 91 41 - Demonstration and Training.

1.6 'AS CONSTRUCTED' DRAWINGS AND SAMPLES

.1 In addition to requirements in General Conditions, maintain at the site one record copy of:
.1 Contract Drawings.
.2 Specifications.
.3 Addenda.
.4 Change Orders and other modifications to the Contract.
.5 Reviewed shop drawings, product data, and samples.
.6 Field test records.
.7 Inspection certificates.
.8 Manufacturer's certificates.

.2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.

.3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.

.5 Keep record documents and samples available for inspection by Departmental Representative.

.6 Provide an electronic copy of as constructed drawings.

1.7 RECORDING ACTUAL SITE CONDITIONS

.1 Record information on set of black line opaque drawings, provided by Departmental Representative.

.2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.

.3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.

.

.4 Contract Drawings and shop drawings: legibly mark each item to record actual construction, including:

- .1 Measured depths of elements of foundation in relation to finish first floor datum.
- .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
- .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
- .4 Field changes of dimension and detail.
- .5 Changes made by change orders.
- .6 Details not on original Contract Drawings.
- .7 References to related shop drawings and modifications.

.5 Specifications: legibly mark each item to record actual construction, including:

- .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
- .2 Changes made by Addenda and change orders.

.6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

1.8 EQUIPMENT AND SYSTEMS

.1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

.2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.

.3 Include installed colour coded wiring diagrams.

.4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

.5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

.6 Provide servicing and lubrication schedule, and list of lubricants required.

.7 Include manufacturer's printed operation and maintenance instructions.

.8 Include sequence of operation by controls manufacturer.

.9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

.10 Provide installed control diagrams by controls manufacturer.

.11 Provide Contractor's coordination drawings, with installed colour coded piping diagrams.

.12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

.13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

.14 Include test and balancing reports as specified in Section 01 45 00 - Quality Control and 01 91 13 - Commissioning.

.15 Additional requirements: As specified in individual specification sections.

1.9 MATERIALS AND FINISHES

.1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.

.2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.3 Moisture-protection and Weather-exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.4 Additional Requirements: as specified in individual specifications sections.

1.10 SPARE PARTS

.1 Provide spare parts, in quantities specified in individual specification sections.

.2 Provide items of same manufacture and quality as items in Work.

.3 Deliver to location as directed; place and store.

.4 Receive and catalogue all items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.

.5 Obtain receipt for delivered products and submit prior to final payment.

1.11 MAINTENANCE MATERIALS

.1 Provide maintenance and extra materials, in quantities specified in individual specification sections.

.2 Provide items of same manufacture and quality as items in Work.

.3 Deliver to location as directed; place and store.

.4 Receive and catalogue all items. Submit inventory listing to Departmental Representative. Include approved listings in the Operating and Maintenance Manuals.

.5 Obtain receipt for delivered products and submit prior to final payment.

1.12 SPECIAL TOOLS

.1 Provide special tools, in quantities specified in individual specification section.

.2 Provide items with tags identifying their associated function and equipment.

.3 Deliver to location as directed; place and store.

.4 Receive and catalogue all items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.

1.13 STORAGE, HANDLING AND PROTECTION

.1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.

.2 Store in original and undamaged condition with manufacturer's seal and labels intact.

.3 Store components subject to damage from weather in weatherproof enclosures.

.4 Store paints and freezable materials in a heated and ventilated room.

.5 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

1.14 WARRANTIES AND BONDS

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

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

.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 Owner's permission, leave date of beginning of time of warranty until the Date of Substantial Performance is determined.

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

.6 Co-execute submittals when required.

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

END OF SECTION 01 78 00

1.0 GENERAL

1.1 ADMINISTRATIVE REQUIREMENTS

.1 Demonstrate scheduled operation and maintenance of equipment and systems to Owner's personnel two weeks prior to date of substantial performance.

.2 Owner: provide list of personnel to receive instructions, and co-ordinate their attendance at agreed-upon times.

.3 Preparation:
- .1 Verify conditions for demonstration and instructions comply with requirements.
- .2 Verify designated personnel are present.
- .3 Ensure equipment has been inspected and put into operation in accordance with Division.
- .4 Ensure testing, adjusting, and balancing has been performed in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements and equipment and systems are fully operational.

.4 Demonstration and Instructions:
- .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at agreed upon times, at the equipment location.
- .2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
- .3 Review contents of manual in detail to explain aspects of operation and maintenance.
- .4 Prepare and insert additional data in operations and maintenance manuals when needed during instructions.

.5 Time Allocated for Instructions: ensure adequate amount of time required for instruction of each item of equipment or system as follows:
- .1 Heating, Cooling, Exhaust, and Ventilation Systems
- .2 Plumbing System
- .3 Electrical System
- .4 Mechanical Control System
- .5 Lighting Control System
- .6 Communication System
- .7 Security System

1.2 SUBMITTALS

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

.2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Departmental Representative's approval.

.3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.

.4 Give time and date of each demonstration, with list of persons present.

.5 Provide electronic & hard copies (Refer to Section 01 78 00 Closeout Submittals) of completed operation and maintenance manuals for use in demonstrations and instructions.

1.3 QUALITY ASSURANCE

.1 When specified in individual Sections requiring manufacturer to provide authorized representative to demonstrate operation of equipment and systems:

.1 Instruct Owner's personnel.

.2 Provide written report that demonstration and instructions have been completed.

END OF SECTION 01 79 00

1.0 GENERAL

1.1 SUMMARY

.1 Section Includes:
General requirements relating to commissioning of project's components and systems, specifying general requirements to PV of components, equipment, sub-systems, systems, and integrated systems.

.2 Related Sections:

Commissioning Forms	Section 01 91 33
Commissioning Training	Section 01 91 41
Commissioning of HVAC	Section 23 08 00
Electrical	Section 26 08 00

.3 Acronyms:
- .1 AFD - Alternate Forms of Delivery, service provider.
- .2 BMM - Building Management Manual.
- .3 Cx - Commissioning.
- .4 EMCS - Energy Monitoring and Control Systems.
- .5 O&M - Operation and Maintenance.
- .6 PI - Product Information.
- .7 PV - Performance Verification.
- .8 TAB - Testing, Adjusting and Balancing.

1.2 GENERAL

.1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:
- .1 Verify installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and intent.
- .2 Ensure appropriate documentation is compiled into the BMM.
- .3 Effectively train O&M staff.

2 This section is included for reference. Inland Technical Services has been retained as Commissioning Authority, to oversee the commissioning process, and to perform the commissioning tasks of the mechanical systems. Commissioning of the electrical systems are to be undertaken by the electrical contractor, their suppliers and appropriate sub-trades. The Contractors are required to participate and provide all required manpower and specialized services to ensure the equipment supplied by the contractor meets the contract requirements. Duties of the Commissioning Authority do not relieve the contractor from providing equipment and systems that meet the design intent and specifications. It is not intended that this work shall, in any way, replace normal factory start-up service for equipment or relieve the contractor or his sub-trades of their responsibility for providing systems and equipment in satisfactory working order.

.3 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.
- .1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be interactively

with each other as intended in accordance with Contract Documents and design criteria.

.2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.

.4 Design Criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements.

1.3 COMMISSIONING OVERVIEW

.1 Section 01 91 31 - Commissioning (Cx) Plan.

.2 For Cx responsibilities refer to Commissioning (Cx) Plan.

.3 Cx to be a line item of Contractor's cost breakdown.

.4 Cx activities supplement field quality and testing procedures described in relevant technical sections.

.5 Cx is conducted in concert with activities performed during stage of project delivery. Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the built facility is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities includes transfer of critical knowledge to facility operational personnel.

.6 Departmental Representative will issue Interim Acceptance Certificate when:

.1 Completed Cx documentation has been received, reviewed for suitability and approved by Departmental Representative.

.2 Equipment, components and systems have been commissioned.

.3 O&M training has been completed.

1.4 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

.1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, correct deficiencies, re-verify equipment and components within the unfunctional system, including related systems as deemed required by Commissioning Authority, Departmental Representative to ensure effective performance.

.2 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor. Above costs to be in form of progress payment reductions or hold-back assessments.

1.5 PRE-CX REVIEW

.1 Before Construction:

.1 Review contract documents, confirm by writing to Commissioning Authority.

.1 Adequacy of provisions for Cx.

.2 Aspects of design and installation pertinent to success of Cx.

.2 During Construction:

.1 Co-ordinate provision, location and installation of provisions for Cx.

.3 Before start of Cx:

.1 Have completed Cx Plan up-to-date.

.2 Ensure installation of related components, equipment, sub-systems, systems is complete.

.3 Fully understand Cx requirements and procedures.
.4 Have Cx documentation shelf-ready.
.5 Understand completely design criteria and intent and special features.
.6 Submit complete start-up documentation to Commissioning Authority.
.7 Have Cx schedules up-to-date.
.8 Ensure systems have been cleaned thoroughly.
.9 Complete TAB procedures on systems, submit TAB reports to and Commissioning Authority for review and approval.
.10 Ensure "As-Built" system schematics are available.

.4 Inform Commissioning Authority in writing of discrepancies and deficiencies on finished works.

1.6 CONFLICTS

.1 Report conflicts between requirements of this section and other sections to Commissioning Authority before start-up and obtain clarification.

.2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

1.7 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
.1 Submit no later than 4 weeks after award of Contract:
.1 Name of Contractor's Cx agent.
.2 Draft Cx documentation.
.3 Preliminary Cx schedule.

.2 Request in writing to Commissioning Authority for changes to submittals and obtain written approval at least 8 weeks prior to start of Cx.

.3 Submit proposed Cx procedures to Commissioning Authority where not specified and obtain written approval at least 8 weeks prior to start of Cx.

.4 Provide additional documentation relating to Cx process required by Departmental Representative and Commissioning Authority. Specifically;
.1 Cx Plan and Schedule
.2 Accepted Shop drawings
.3 Completed PI forms
.4 Approved TAB report
.5 Approved PV forms
.6 Approved O&M manuals
.7 Approved System and Integrated System Test Report
.8 Approved Training and Attendance forms
.9 Accepted “As-built” Plans and Specifications

1.8 COMMISSIONING DOCUMENTATION

.1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms for requirements and instructions for use.
.2 Departmental Representative and Commissioning Authority to review and approve Cx documentation.

.3 Provide completed and approved Cx documentation to Commissioning Authority.

1.9 COMMISSIONING SCHEDULE

.1 Provide detailed Cx schedule as part of construction schedule in accordance with Section 01 11 55 General Instructions.

.2 Provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:
- .1 Approval of Cx reports.
- .2 Verification of reported results.
- .3 Repairs, retesting, re-commissioning, re-verification.
- .4 Training.

1.10 COMMISSIONING MEETINGS

.1 Convene Cx meetings following project meetings: Section 01 11 55 General Instructions.

.2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.

.3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.

.4 At 60% construction completion stage. Section 01 11 55 General Instructions. Commissioning Authority to call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Issues at meeting to include:
- .1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.
- .2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.

.5 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.

.6 Meeting will be chaired by Commissioning Authority, who will record and distribute minutes.

.7 Ensure subcontractors and relevant manufacturer representatives are present at 60% and subsequent Cx meetings and as required.

1.11 STARTING AND TESTING

.1 Contractor assumes liabilities and costs for inspections. Including disassembly and re-assembly after approval, starting, testing and adjusting, including supply of testing equipment.

1.12 WITNESSING OF STARTING AND TESTING

.1 Provide 14 days' notice prior to commencement.
.2 Commissioning Authority to witness of start-up and testing.
.3 Contractor's Cx Agent to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

1.13 MANUFACTURER'S INVOLVEMENT

.1 Factory testing: manufacturer to:
- .1 Coordinate time and location of testing.
- .2 Provide testing documentation for approval by Commissioning Authority.
- .3 Arrange for Commissioning Authority to witness tests.

.4 Obtain written approval of test results and documentation from Commissioning Authority before delivery to site.

.2 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Commissioning Authority
- .1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.
- .2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.

.3 Integrity of warranties:
- .1 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.
- .2 Verify with manufacturer that testing as specified will not void warranties.

.4 Qualifications of manufacturer's personnel:
- .1 Experienced in design, installation and operation of equipment and systems.
- .2 Ability to interpret test results accurately.
- .3 To report results in clear, concise, logical manner.

1.14 PROCEDURES

.1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.

.2 Conduct start-up and testing in following distinct phases:
- .1 Included in delivery and installation:
  - .1 Verification of conformity to specification, approved shop drawings and completion of PI report forms.
  - .2 Visual inspection of quality of installation.
- .2 Start-up: follow accepted start-up procedures.
- .3 Operational testing: document equipment performance.
- .4 System PV: include repetition of tests after correcting deficiencies.
- .5 Post-substantial performance verification: to include fine-tuning.

.3 Correct deficiencies and obtain approval from Departmental Representative and Commissioning Authority after distinct phases have been completed and before commencing next phase.

.4 Document require tests on approved PV forms.

.5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Commissioning Authority. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:
- .1 Minor equipment/systems: implement corrective measures approved by Commissioning Authority.
- .2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Commissioning Authority.

- .3 If evaluation report concludes that major damage has occurred, Departmental Representative and Commissioning Authority shall reject equipment.
  - .1 Rejected equipment to be remove from site and replace with new.
  - .2 Subject new equipment/systems to specified start-up procedures.

1.15 START-UP DOCUMENTATION

.1 Assemble start-up documentation and submit to Commissioning Authority for approval before commencement of commissioning.

.2 Start-up documentation to include:
- .1 Factory and on-site test certificates for specified equipment.
- .2 Pre-start-up inspection reports.
- .3 Signed installation/start-up check lists.
- .4 Start-up reports,
- .5 Step-by-step description of complete start-up procedures, to permit Departmental Representative or Commissioning Authority to repeat start-up at any time.

1.16 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

.1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.

.2 With assistance of manufacturer develop written maintenance program and submit to Commissioning Authority for approval by Departmental Representative before implementation.

3 Operate and maintain systems for length of time required for commissioning to be completed.

.4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

1.17 TEST RESULTS

.1 If start-up, testing and/or PV produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.

.2 Provide manpower and materials, assume costs for re-commissioning.

1.18 START OF COMMISSIONING

.1 Notify Commissioning Authority at least 21 days prior to start of Cx.

.2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

1.19 INSTRUMENTS / EQUIPMENT

.1 Submit to Commissioning Authority for review and approval:
- .1 Complete list of instruments proposed to be used.
- .2 Listed data including, serial number, current calibration certificate, calibration date, calibration expiry date and calibration accuracy.

.2 Provide the following equipment as required:
- .1 2-way radios.
- .2 Ladders.
- .3 Equipment as required to complete work.

1.20 COMMISSIONING PERFORMANCE VERIFICATION

.1 Carry out Cx:
- .1 Under accepted simulated operating conditions, over entire operating range, in all modes.
- .2 On independent systems and interacting systems.

.2 Cx procedures to be repeatable and reported results are to be verifiable.

.3 Follow equipment manufacturer's operating instructions.

.4 EMCS trending to be available as supporting documentation for performance verification.

1.21 WITNESSING COMMISSIONING

.1 Commissioning Authority to witness activities and verify results. Departmental Representative may also witness activities at their discretion.

1.22 AUTHORITIES HAVING JURISDICTION

.1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority to witness procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.

.2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.

.3 Provide copies to Commissioning Authority within 5 days of test and with Cx report.

1.23 COMMISSIONING CONSTRAINTS

.1 Since access into secure or sensitive areas will be very difficult after occupancy it is necessary to complete Cx of occupancy, weather, and seasonal sensitive equipment and systems in these areas before issuance of the Interim Certificate, using, if necessary, simulated thermal loads.

1.24 EXTENT OF VERIFICATION

Building:

.1 Provide manpower and instrumentation to verify up to 30% of reported results, unless specified otherwise in other sections.

.2 Number and location to be at discretion of Departmental Representative and Commissioning Authority.

.3 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.

.4 Review and repeat commissioning of systems if inconsistencies found in more than 20% of reported results.

.5 Perform additional commissioning until results are acceptable to Departmental Representative and Commissioning Authority.

1.26 REPEAT VERIFICATIONS

.1 Assume costs incurred by Departmental Representative and Commissioning Authority for third and subsequent verifications where:

- .1 Verification of reported results fail to receive Departmental Representative's or Commissioning Authority’s approval.
- .2 Repetition of second verification again fails to receive approval.
- .3 Departmental Representative or Commissioning Authority deems Contractor's request for second verification was premature.

1.27 SUNDRY CHECKS AND ADJUSTMENTS

.1 Make adjustments and changes which become apparent as Cx proceeds.

.2 Perform static and operational checks as applicable and as required.

1.28 DEFICIENCIES, FAULTS, DEFECTS

.1 Correct deficiencies found during start-up and Cx to satisfaction of Departmental Representative and Commissioning Authority.

.2 Report problems, faults or defects affecting Cx to Departmental Representative and Commissioning Authority in writing. Stop Cx until problems are rectified. Proceed with written approval from Departmental Representative or Commissioning Authority.

1.29 COMPLETION OF COMMISSIONING

.1 Upon completion of Cx leave systems in normal operating mode.

.2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx prior to issuance of Interim Certificate of Completion.

.3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Departmental Representative.

1.30 ACTIVITIES UPON COMPLETION OF COMMISSIONING

.1 When changes are made to baseline components or system settings established during Cx process, provide updated Cx form for affected item.

1.31 TRAINING

.1 In accordance with Section 01 91 41 - Commissioning (Cx) - Training.

1.32 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS

.1 Supply, deliver, and document maintenance materials, spare parts, and special tools as specified in contract.

1.33 OCCUPANCY

.1 Cooperate fully with Departmental Representative and Commissioning Authority during stages of acceptance and occupancy of facility.

1.34 INSTALLED INSTRUMENTATION

.1 Use instruments installed under Contract for TAB and PV if:
  .1 Accuracy complies with these specifications.
  .2 Calibration certificates have been deposited with Departmental Representative.

.2 Calibrated EMCS sensors may be used to obtain performance data provided that sensor calibration has been completed and accepted.

1.35 PERFORMANCE VERIFICATION TOLERANCES

.1 Application tolerances:
  .1 Specified range of acceptable deviations of measured values from specified values or specified design criteria. Except for special areas, to be within +/- 10% of specified values.

.2 Instrument accuracy tolerances:
  .1 To be of higher order of magnitude than equipment or system being tested.

.3 Measurement tolerances during verification:
  .1 Unless otherwise specified actual values to be within +/- 2% of recorded values.

1.36 OWNER'S PERFORMANCE TESTING

.1 Performance testing of equipment or system by Departmental Representative or Commissioning Authority will not relieve Contractor from compliance with specified start-up and testing procedures.

END OF SECTION 01 91 13

1.0 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Description of overall structure of Cx Plan and roles and responsibilities of Cx team.

1.2 REFERENCES

.1 American Water Works Association (AWWA)

.2 Public Works and Government Services Canada (PWGSC)

.1 PWGSC - Commissioning Guidelines CP.3 -3rd edition-03.

.3 Underwriters' Laboratories of Canada (ULC)

.4 ANSI/NETA Standard for Maintenance Testing Specifications for Electrical Power Distribution Equipment and Systems.

.5 CSA Z320-11

1.3 GENERAL

.1 Provide fully functional facilities:

.1 Systems, equipment and components meet user's functional requirements before date of acceptance, and operate consistently at peak efficiencies and within specified energy budgets under normal loads.

.2 Facility user and O&M personnel have been fully trained in aspects of installed systems.

.3 Optimized life cycle costs.

.4 Complete documentation relating to installed equipment and systems.

.2 Term "Cx" in this section means "Commissioning".

.3 Use this Cx Plan as master planning document for Cx:

.1 Outlines organization, scheduling, allocation of resources, documentation, pertaining to implementation of Cx.

.2 Communicates responsibilities of team members involved in Cx Scheduling, documentation requirements, and verification procedures.

.3 Sets out deliverables relating to O&M, process and administration of Cx.

.4 Describes process of verification of how built works meet design requirements.

.5 Produces a complete functional system prior to issuance of Certificate of Substantial Performance.

.6 Management tool that sets out scope, standards, roles and responsibilities, expectations, deliverables, and provides:

.1 Overview of Cx.

.2 General description of elements that make up Cx Plan.

.3 Process and methodology for successful Cx.

.4 Acronyms:

.1 Cx - Commissioning.

.2 BMM - Building Management Manual.

.3 EMCS - Energy Monitoring and Control Systems.

.4 MSDS - Material Safety Data Sheets.

.5 PI - Product Information.

.6 PV - Performance Verification.

.7 TAB - Testing, Adjusting and Balancing.
.8 WHMIS - Workplace Hazardous Materials Information System.

.5 Commissioning terms used in this Section:
.1 Bumping: short term start-up to prove ability to start and prove correct rotation.

.2 Deferred Cx - Cx activities delayed for reasons beyond Contractor's control due to lack of occupancy, weather conditions, need for heating/cooling loads.

1.4 DEVELOPMENT OF 100% CX PLAN

.1 Cx Plan to be 100% completed within 12 weeks of award of contract to take into account:
.1 Approved shop drawings and product data.
.2 Approved changes to contract.
.3 Contractor's project schedule.
.4 Cx schedule.
.5 Contractor's, sub-contractor's, suppliers' requirements.
.6 Project construction team's and Cx team's requirements.

.2 Submit completed Cx Plan to Departmental Representative and obtain written approval.

1.5 REFINEMENT OF CX PLAN

.1 During construction phase, revise, refine and update Cx Plan to include:
.1 Changes resulting from Client program modifications.
.2 Approved design and construction changes.

.2 Revise, refine and update every 3 months during construction phase. At each revision, indicate revision number and date.

.3 Submit each revised Cx Plan to Departmental Representative for review and obtain written approval.

.4 Include testing parameters at full range of operating conditions and check responses of equipment and systems.

1.6 COMPOSITION, ROLES AND RESPONSIBLITIES OF CX TEAM

.1 General Contractor to maintain overall responsibility for project and is sole point of contact between members of commissioning team.
.2 General Contractor will select independent Commissioning Agent to ensure Cx activities are carried out to ensure delivery of a fully operational project including:
.1 Organizing Cx.
.2 Monitoring operations Cx activities.
.3 Review of Cx documentation from operational perspective.
.4 Review for performance, reliability, durability of operation, accessibility, maintainability, operational efficiency under conditions of operation.
.5 Protection of health, safety and comfort of occupants and O&M personnel.
.6 Monitoring of Cx activities, training, development of Cx documentation.
.7 Work closely with members of Cx Team.
.8 Certifying accuracy of reported results
.9 Certifying tabs and other results
.10 Developing BMM.
.11 Ensuring implementation of final Cx Plan.
.12 Implementation of Training Plan

.3 Commissioning Authority is responsible for:
.1 Witnessing reported results.

.2 Witnessing TAB and other tests.
.3 Provides basis of design data not included in the Contract Documents.
.4 Reviews commissioning checklists and test forms to ensure applicability to the project and provide comments to the Commissioning Agent.
.5 Attends commissioning activities as required to certify the site adaptation and related work meet the design intent and the project requirements.

.4 Construction Team: contractor, sub-contractors, suppliers and support disciplines, is responsible for construction/installation in accordance with contract documents, including:
.1 Testing.
.2 TAB.
.3 Performance of Cx activities.
.4 Delivery of training and Cx documentation.
.5 Assigning one person as point of contact Departmental Representative for administrative and coordination purposes.

.5 General Contractor's Cx agent implements specified Cx activities including:
.1 Demonstrations.
.2 Training.
.3 Testing.
.4 Preparation, submission of test reports.
.5 Performing verification of performance of installed systems and equipment.

.6 EGD Facility Manager: represents lead role in Operation Phase and onwards and is responsible for:
.1 Receiving facility.
.2 Day-To-Day operation and maintenance of facility.

1.7 EXTENT OF CX

.1 The General Contractor shall provide commissioning services for the following items .
.1 List of Mechanical Equipment and Acceptance Tests:
.1 Domestic water system (including water heaters)
.2 Plumbing fixtures
.4 Compressed air system
.5 Air handling units
.6 Exhaust fans (washroom, general)
.7 Room air conditioner systems
.8 Sanitary and storm water sump pit and pumps
.9 BMS (controls) Operator Workstation (software)

.2 List of Electrical Equipment and Acceptance Tests:
.1 Preventable Inspections - Box, Conduit & Cable Installations
.2 Underground Services/Manholes
.3 Ground system inspection/report
.4 Digital Metering & Power System SCADA
.5 Protective Relay System
.6 Instrument Transformers
.7 25kV Switchgear and Circuit Breakers

.8 2.4kV Switchgear and Circuit Breakers
.9 Dry Type Transformer: Preventable Inspection
.10 Meggering and Hi-Pot Report
.11 DC Battery and Charging System
.12 Main switchboard
.13 Lighting Fixtures
.14 Lighting Controls
.15 Pole Mounted Fixtures
.16 Exterior lighting- control panel
.17 Emergency lighting Battery Unit
.18 Low Voltage lighting Control
.19 Motor Control Centre: Preventable Inspection
.20 Wiring Devices Checklist
.21 Security Door System
.22 Building Entrance/Door Supervision
.23 Fire Alarm System
.24 Telecommunication System (Cabling, raceway & rack)
.25 Implementation of Coordination Study Settings
.26 Consolidated Load Balance Report
.27 Certificates and/or Equipment Test Report
.28 Equipment Spare Parts Report
.29 Generic Acceptance Report
.30 Twelve Step Final Acceptance Report

1.8 DELIVERABLES RELATING TO O&M PERSPECTIVES

.1 General requirements:
.1 Compile English documentation.
.2 Documentation to be computer-compatible format ready for inputting for data management.

.2 Provide deliverables:
.1 Warranties.
.2 Project record documentation.
.3 Inventory of spare parts, special tools and maintenance materials.
.4 Maintenance Management System (MMS) identification system used.
.5 WHMIS information.
.6 MSDS data sheets.
.7 Electrical Panel inventory containing detailed inventory of electrical circuitry for each panel board. Duplicate of inventory inside each panel.

1.9 DELIVERABLES RELATING TO THE CX PROCESS

.1 General:
.1 Start-up, testing and Cx requirements, conditions for acceptance and specifications form part of relevant technical sections of these specifications.

.2 Definitions:
.1 Cx as used in this section includes:
.1 Cx of components, equipment, systems, subsystems, and integrated systems.
.2 Factory inspections and performance verification tests.

.3 Deliverables: provide:
.1 Cx Specifications.

.2 Startup, pre-Cx activities and documentation for systems, and equipment.
.3 Completed installation checklists (ICL).
.4 Completed product information (PI) report forms.
.5 Completed performance verification (PV) report forms.
.6 Results of Performance Verification Tests and Inspections.
.7 Description of Cx activities and documentation.
.8 Description of Cx of integrated systems and documentation.
.9 Tests witnessed by Departmental Representative
.10 Training Plans.
.11 Cx Reports.
.12 Prescribed activities during warranty period.

1.10 PRE-CX ACTIVITIES AND RELATED DOCUMENTATION

.1 Items listed in this Cx Plan include the following:
.1 Pre-Start-Up inspections: by Departmental Representative prior to permission to start up and rectification of deficiencies to Departmental Representative's satisfaction.
.2 Departmental Representative to use approved check lists.
.3 Departmental Representative will monitor some of these pre-start-up inspections.
.4 Include completed documentation with Cx report.
.5 Conduct pre-start-up tests: conduct pressure, static, flushing, cleaning, and "bumping" during construction as specified in technical sections. To be witnessed and certified by Departmental Representative and does not form part of Cx specifications.
.6 Departmental Representative will monitor some of these inspections and tests.
.7 Include completed documentation in Cx report.

.2 Pre-Cx Activities - MECHANICAL:
.1 Plumbing systems:
.1 "Bump" each item of equipment in its "stand-alone" mode.
.2 Complete pre-start-up checks and complete relevant documentation.
.3 After equipment has been started, test related systems in conjunction with control systems on a system-by-system basis.

.2 HVAC equipment and systems:
.1 "Bump" each item of equipment in its "stand-alone" mode.
.2 Complete pre-start-up checks and complete relevant documentation.
.3 After equipment has been started, test related systems in conjunction with control systems on a system-by-system basis.
.4 Perform TAB on systems. TAB reports to be approved by Departmental Representative.

.3 Pre-Cx Activities - ELECTRICAL:
.1 Low voltage, medium voltage and high voltage distribution systems require independent testing agency to perform pre-energization and post-energization tests.
.2 Fire alarm systems: test after other safety and security systems are completed. Testing to include a complete verification in accordance with ULC requirements.Departmental Representative has witnessed and certified report, demonstrate devices and zones to Departmental Representative.

1.11 START-UP

.1 Start up components, equipment and systems.

.2 Equipment manufacturer, supplier, installing specialist sub-contractor, as appropriate, to start-up,

under Contractor's direction, following equipment, systems:

.3 Commissioning Authority to monitor some of these start-up activities.

.1 Rectify start-up deficiencies to satisfaction of Commissioning Authority.

.4 Performance Verification (PV):

.1 Approved Cx Agent to perform.

.1 Repeat when necessary until results are acceptable to Commissioning Authority.

.2 Use procedures modified generic procedures to suit project requirements.

.3 Commissioning Authority to witness and certify reported results using approved PI and PV forms.

.4 Commissioning Authority to approve completed PV reports and provide to Departmental Representative.

.5 Commissioning Authority reserves right to will verify up to 30% of reported results at random.

.6 Failure of randomly selected item shall result in rejection of PV report or report of system startup and testing.

1.12 CX ACTIVITIES AND RELATED DOCUMENTATION

.1 Perform Cx by specified Cx agency using procedures developed by Commissioning Authority and approved by Departmental Representative.

.2 Commissioning Authority to monitor Cx activities.

.3 Upon satisfactory completion, Cx agency performing tests to prepare Cx Report using approved PV forms.

.4 Commissioning Authority and Departmental Representative reserves right to verify a percentage of reported results at no cost to contract.

1.13 MECHANICAL SYSTEMS TESTING, ADJUSTING AND BALANCING

.1 Testing:

.1 Quality Assurance;

.1 Test equipment and material where specified or required by authority having jurisdiction to demonstrate its proper and safe operation.

.2 Test procedures shall be in accordance with applicable portions of ASME, ASHRAE, SMACNA, NFPA, CSA and other recognized test codes as far as field conditions permit.

.3 Provide notice to the Commissioning Authority before tests.

.2 Liability: During tests, assume responsibility for damages in the event of injury to personnel, building or equipment and bear costs for liability, repairs and restoration.

.3 Pressure Tests:

.1 Provide equipment, materials and labour for tests. Use test instruments from approved laboratory or manufacturer and furnish certificate showing degree of

accuracy. Install permanent gauges and thermometers just prior to tests to avoid changes in calibration.

.2 Carry out hydraulic tests for 8 hours and maintain pressure. Where leakage occurs, repair and re-test.

.3 Domestic Water Piping: Test to 1.5 times maximum working pressure or 1034 kPa water pressure measured at system low point.

.4 Drainage Systems: Test by filling with water to produce water pressure of 30 kPa minimum and 75 kPa maximum. Check for proper grade and obstruction by ball test.

.5 Compressed Air: Test to 1.5 time's maximum working pressure or minimum 1035 kPa pressure with air. Maintain pressure for 24 hours with maximum 1 percent pressure drop.

.6 Refrigerant Piping: Test with nitrogen to 2070 kPa on high pressure side and 1035 kPa on low side and refrigerant halide torch test.

.7 Low Pressure Ducts: Test for tightness such that leakage is inaudible and not detectable by feel.

.8 Check systems during application of test pressure including visual check for leakage of water test medium, soap bubble test for air or nitrogen test medium and halide torch for refrigerant medium.

.9 When using water as test medium for system not using water or steam, evacuate and dehydrate the piping and certify the lines are dry. Use agency specializing in this type of work.

.10 Should tests indicate defective work or variance with specified requirements, make changes immediately to correct the defects. Correct leaks by re-making joints in screwed fittings, cutting out and re-welding welded joints, re-making joints in copper lines. Do not caulk.

.2 Mechanical Systems Balancing :

.1 Quality Assurance :

.1 Balance air and water system terminals to provide flow rates within +10% of those specified when equipment is operating at design conditions.

.2 Adjust and balance major equipment components to provide flow rates within *5%* of those specified when equipment is operating at design conditions.

.3 Make adjustments to air terminals, fan speeds, pump impellers as instructed by the Commissioning Authority to suit field operating conditions which may differ from the design parameters listed.

.4 Prepare report in accordance with procedures, format and information required.

.2 Procedures and Reporting Format: Procedures and reporting format shall be in accordance with current edition of AABC or NEBB.

.3 Instruments: For testing and balancing of air and hydronic systems; all instruments shall have been calibrated within a period of six months and verified for accuracy prior to start of work .

.4 Acceptance:

.1 The TAB Contractor shall be available to accompany Commissioning Authority who shall test and confirm 30% of readings Mechanical systems shall not be considered ready for final inspection until balancing results acceptable to the Commissioning Authority are obtained. If it is found that the specified airflows cannot be achieved on portions of the system, the actual conditions shall be reported to the Commissioning Authority for consideration of corrective action before continuing the balancing procedure. If measured flow at final inspection shows deviation of 10% or more or mean sound level deviation of 10 db or more from the certified report listings, by more than 10% of selected areas, the

report shall be rejected. If report is rejected, systems shall be re-balanced and a new certified report submitted at no extra cost.

1.14 EMCS START·UP AND TESTING

.1 System Testing:

.1 This testing should not be confused with testing and commissioning subsequent to contract compliance. The Control Sub-trade shall confirm that the system meets all the requirements of the Contract Documents before calling for final inspection.

. 2 The Control Contractor shall demonstrate to the Commissioning Authority and Departmental Representative that equipment, networks, installation programs and services as installed under this contract meet the requirements of the Contract Documents.

.3 The Contractor shall complete all necessary documentation and testing forms prior to scheduling any test.

.4 The Commissioning Authority and Departmental Representative shall have the option of additional special testing to ensure the proper functioning of the EMCS at no cost to this Contractor.

.2 Co-ordination: Where there is a possibility of voiding the warranty on equipment supplied by others but requiring the tie-in to the building automation system, assist the Contractor in coordinating that tie-in with the supplier of the related equipment.

.3 Site Acceptance Testing:

.1 Have installation, engineering, software, system and sub-contractor personnel, as applicable, available on site during the course of these tests .

.2 Any deficiencies or defects noted shall be corrected and a new time for re- test shall be scheduled.

.3 Provide the necessary manpower and test equipment to demonstrate the operation of the EMCS at all levels from individual end devices through to total system operation.

.4 Final acceptance testing shall include provision for demonstration of function of all software facilities including those as related to future expansion and equipment features. Provisions must be made to provide for testing of features which may not be fully supported by commissioned field devices and/or hardware.

.5 Submit for acceptance a total demonstration test plan before commencement of each test. All hardware and software system components shall be fully tested during the course of the demonstration.

.6 System test procedures shall include those specifically oriented to demonstrating the satisfactory operation of all aspects of the EMCS operator interfaces.

.7 Perform a complete and detailed calibration and operational check for each individual point and for each individual function as contained within the supplied system. These checks shall ensure that all equipment, software, network elements, modules and circuits, as provided under the terms of this test, shall be carried out with the use of point/function log sheets.

.8 Provide fmal record documentation prior to commencement of substantial performance testing in order to assist in the execution of the substantial performance testing.

.4 System Documentation: Provide following documentation prior to start of testing:

.1 System manuals including hardware, software, maintenance and operations.

.2 Interlock and control diagrams for all systems controlled.

.3 Shop drawings and calibration procedures.

.4 Written description of control strategy for each system.

.5 Table of operating set points and alarm limits for each system.
.6 Listing of actual data file for each point and for control strategies.
.7 Certification of operation and list calibration of all hardware components.

.5 Hardware Starting:
.1 This testing must be completed and verified before any software logic and control is added to the system.
.2 Calibrate the following components as per manufacturer's recommendations:
.1 Thermostats.
.2 Damper motor operators and positioners.
.3 Transmitters.
.4 Gauges, thermometers, etc.
.5 Pressure/electric switches.
.6 Static sensors and transmitters.
.7 Flow switches.
.8 Alarm settings.
.9 Interposing relays.
.10 Current sensitive relays.
.3 Gauge all wiring used to ensure conformance to CSA. Ensure all circuits are complete and all terminal wiring connections are tight.
.4 Adjust control dampers. Ensure uniform mixing. Ensure tight shut-off closure and measure leakage. Fail-safe operation.
.5 Put all electronic hardware into operation in accordance with mannfacturer's Recommendations. Replace all defective components. Prove proper operation with software starting and printout.
.6 Test and ensure all interface with Division 26 is complete. Test and ensure all interface with other "package control" is complete.
.7 Ensure point identification is completed and all wire labelling is completed. As a minimum standard, the point tag should contain the following information: Logical Point N arne, Point Multiplexer Address, Associated System Identification, Point Description.
.8 If dynamic graphics are included, ensure the proper operation of:
.1 Dynamic valves displayed on screen.
.2 Update period.
.3 Colour change or status change.
.4 Proper identification of system and points on screen.
.5 Reaction to alarms.
.9 Check out each point through the terminal device end-to-end. This checkout to include tests for range, reliability and repeatability.
.10 Check all interface cabinetry to ensure compliance with the specifications and all applicable codes.

.6 Software Starting:
.1 Ensure all hardware is completely installed and started and fully operational before software start-up .
.2 Compare shop drawings and specifications to final software and check:
.1 Flow charts.
.2 Hardcopy printouts.
.3 Control flow logic diagrams.
.3 Enter software and operating set points and schedules into terminal device.
.4 Check out each system through the terminal by:
.1 Simulation of system start/stop functions.

.2 Simulation of systems operation including:
.1 High limit functions.
.2 Low limit functions.
.3 Safety features (override values).
.4 Operation sequences specified.
.3 Verification of system component hardwired interlocks.
.5 Verify operation of specific routines such as:
.1 Optimization.
.2 Demand limiting.
.3 Peak shaving.
.4 Night setback, morning warm-up.
.5 Building dynamic control.
.6 Variable volume air systems supply/return fan tracking control.
.7 Power fail recovery.
.6 Simulate alarm conditions and verify alarm printouts.
.7 Check out reports generation.
.8 Check out communication network, input and output.
.9 Check operation of system under failure modes.
.1 Component failure.
.2 2 Smart remote failure.
.3 Communication failure.
.4 Host failure.
.5 Outside air sensor failure.

.7 Operation Acceptance Tests:
.1 Conduct the operational acceptance test for 30 consecutive days, 24 hours per day, on the complete and total installed and operational DDC system to demonstrate that it functions in accordance with all requirements .
.2 Demonstrate the correct operation of all monitor and control points, as well as operational and capability of all software. The equipment shall operate continuously for a 30 consecutive calendar day period with no unexplained shutdowns.
.3 Outages to mean whenever the DDC system is unable to fulfill all required functions due to any malfunction of hardware or software. Outages of the system resulting from the following causes will not be considered failures:
.1 An outage of building power in excess of the capability of any back- up power source provided that the automatic shutdown and re-start of the DDC system fulfills the requirements.
.2 Failure resulting from any sensor or controller failure provided the system has recorded the fault and no more than one percent of the sensors and controllers are out of service at any time .
.3 A system hardware failure provided that the initiation of the DDC system functional requirements for back-up provisions are accomplished and hardware is restored to service within 24 hours .
.4 Software: Upon successful completion of the operational acceptance test, provide both source and object modules of all accepted software on a rigid CD or DVD disk. Provide a duplicate copy of each media containing the source and object modules of the software in a magnetically shielded case. Provide 2 sets of media usable with the bulk loader with the duplicated copy in magnetically shielded case.

.8 Room Controls:

.1 Air handling units shall be checked for correct control action and minimum air setting.
.2 Terminal heating units shall be checked for proper zoning and operation.
.3 Calibrate room temperature controllers.

1.15 ELECTRICAL TESTING, ADJUSTING AND BALANCING

.1 Conduct and pay for tests of the following:
.1 Distribution system including phasing, voltage, grounding, load balancing, hi-pot testing of the 12.5/25kV system and transformer prior to energizing.
.2 Circuits originating from branch distribution panels.
.3 Lightning protection systems.
.4 Lighting systems and controls, and light level readings.
.5 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
.6 Systems: fire alarm system, cable TV system.
.2 Furnish manufacturers certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer' s instructions .
.3 Carry out tests in presence of the Commissioning Authority.
.4 Give advance notice of proposed time of tests so that the Commissioning Authority can be represented at the tests.
.5 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
.6 Submit test results for review by the Commissioning Authority.
.7 Test all systems in accordance with details in appropriate sections.
.8 Testing methods and test results: in accordance with CSA, CEC, NETA MTS, and regulations of the supply authority and other authorities having jurisdiction.
.9 Liability: During tests, assume responsibility for damages in the event of injury to personnel, building or equipment and bear costs for liability, repairs and restoration .
.10 Remove and replace with new materials all conductors that are found to be shorted or grounded.
.11 Conduct dielectric tests, hi-pot tests, insulation resistance tests and ground continuity tests as required by the nature of the various systems and equipment.
.12 With the systems completely connected and lamped, conduct the following tests on the power system:
.1 Control and Switching: test all circuits for the correct operation of devices, switches and controls .
.2 Polarity Tests: test all circuits for correct operation of devices, switches and controls.
.3 Voltage Tests: make a voltage test at the last outlet of each circuit. Maximum drop in potential permitted will be 2% on 120V, and 208V branch circuits. 2% on 208V feeder circuits, and 5% on 600V feeder circuits. Correct any deficiency in this respect.
.4 Phase Balance: measure the load on each phase at each switchboard, splitter, distribution panel board and lighting and power panel board. Report results in writing to the Commissioning Authority. Re-arrange phase connections as necessary to balance the load on each phase as instructed by the Commissioning Authority with the re-arrangement being restricted to the exchanging of connections at the distribution points mentioned in this paragraph. After marking any such changes, make available to the Commissioning Authority, drawings or marked prints showing the modified connections.
.5 Supply Voltage: measure the line voltage of each phase at the load terminals of the main breakers and report the results in writing to Commissioning Authority. Perform this test with the majority of electrical equipment in use.
.6 Motor Loading: measure the line current of each phase of each motor with the

motor operating under load and report the results in writing to the Commissioning Authority. Upon indications of any imbalance or overload, thoroughly examine electrical connections and rectify any defective parts or wiring. If electrical connections are correct, overloads due to defects in the driven machines shall be reported in writing to the Commissioning Authority. Verify motor full load amps and overload relays are properly sized and adjusted accordingly.

.7 General Operations: energize and put into operation each and every electrical circuit and item. Make repairs, alterations, replacements, tests and adjustments necessary for a complete and satisfactory operating electrical system .

.13 Carry out tests covering "General Operation" at the time of acceptance of the work.

.14 Test all systems and obtain written confirmation from the manufacturer of each system that all components have been installed correctly and that the system is functioning as intended. Present separate certification for all systems including: fire alarm, power distribution, to the Commissioning Authority.

.15 Provide labour, instruments, apparatus and pay all expenses required for the tests. The Commissioning Authority reserves the right to demand proof of the accuracy of all instruments used.

.16 When tests are performed, the Commissioning Authority may require that equipment be opened and removed from their housings to examine interior of equipment, terminations and connections. Provide all required labour and tools.

.17 Co-ordinate the testing of motors with the trades providing the equipment driven by the motors so that they are carried out at the time the driven equipment is put on test. In addition to the motor loading tests, provide labour and instruments to take and record all motor load readings required to supplement the tests on the driven equipment through various load sequences, as required by the trades involved.

.18 Immediately prior to building occupancy, test the entire electrical system by performing a loss and return of utility power test. Demonstrate the operation of:

.1 High and low voltage service equipment and metering.

.2 Exit and emergency lighting.

.3 Fire alarm operation during power outage, including remote monitoring system.

.4 EMCS system shut down and auto restart, including re-stabilization of systems after power return. Attach printouts as evidence of expected operation on all systems including all air handling systems and pump systems .

.5 User equipment shutdown and auto-restart.

.19 Insulation Resistance Testing:

.1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.

.2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.

.3 Megger 600-2.4kV circuits, feeder and equipment with 5000 V instrument.

.4 Check resistance to ground before energizing.

.20 Harmonic Testing and Report:

.1 Conduct a harmonic test of the system and individual CDP' s utilizing the DMS systems. Ensure all available loads are fully operational.

. 2 Prepare a harmonic analysis report to IEEE 519 requirements, duly signed and stamped by a Professional Engineer.

.21 Fire Alarm System Testing and Adjusting:

.1 Ensure that the manufacturer makes an inspection of the fire alarm and smoke comprise an examination of such equipment for the following:
detection system and equipment including those components necessary to the direct operation of the system such as manual stations, heat detectors, smoke detectors and controls whether or not manufactured by the manufacturer. The inspection and tests to conform to CANIULC-S536 Inspection and Testing of Fire Alarm System and CANIULC S537 Verification of Fire Alarm Systems and also to.comprise an examination of such

equipment for the following :

.1 That the type of equipment installed is as described by these electrical specifications.

.2 That the wiring connections to all equipment components show that the installer undertook to have observed ULC and CSA requirements.

.3 That equipment of the manufacturer has been installed in accordance with the manufacturer's recommendations and that all signaling devices of whatever manufacturer have been operated or tested to verify their operation.

.4 That the supervisory wiring of those items of equipment connected to a supervised circuit is operating and that the governmental regulations, if any, concerning such supervisory wiring have been met to the satisfaction of inspection authorities.

.2 On completion of the inspection and when all of the above conditions have been complied with, the manufacturer shall issue to the Commissioning Agent the following:

.1 A copy of the inspecting technician's report showing the location of each device and certifying the test results of each device .

.2 A certificate of verification confirming that the inspection has been completed and showing the conditions upon which such inspection and certification have been rendered.

.3 Proof of liability insurance for the inspection.

.3 Verification procedures, testing requirements, documentation required, etc. shall be in accordance with the requirement of ULC Standard CAN/ULC-S537.

.4 The Commissioning Agent must be present at and during the verification and certification in order for the verification to be valid.

.5 Start-up:

.1 The verification and certification hereinafter described shall include the following tests:

.1 Initiate alarm from each manual pull station.

.2 Initiate alarm from each automatic heat and/or smoke detector by operation of device or by jumpering out device in the case of fixed temperature heat detectors.

.3 Initiate alarm at control panel to check supervisory function.

.4 Initiate one test alarm to central supervisory station after notice of test is given .

.5 Check correctness of identification of annunciator wnes for each device.

.6 Check operation of all auxiliary contacts and devices and verify that auxiliary control of door holders, fans, etc. is fully operational.

.7 Above noted system shall be compatible with Base system.

.8 After verification of the fire alarm system, demonstrate the system to the satisfaction of the Departmental Representative.

1.16 INSTALLATION CHECK LISTS (ICL)

.1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

1.17 PRODUCT INFORMATION (PI) REPORT FORMS

.1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

1.18 PERFORAMNCE VERIFICATION (PV) REPORT

.1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product

Information (PI) / Performance Verification (PV) Forms.

1.29 DELIVERABLES RELATING TO ADMINISTRATION OF CX

.1 General:

.1 Because of risk assessment, complete Cx of occupancy, weather and seasonal-sensitive equipment and systems in these areas before building is occupied.

1.20 CX SCHEDULES

.1 Prepare detailed Cx Schedule and submit to Departmental Representative and Commissioning Authority for review and approval same time as project Construction Schedule. Include:

.1 Milestones, testing, documentation, training and Cx activities of components, equipment, subsystems, systems and integrated systems, including:

.1 Design criteria, design intents.
.2 Pre-TAB review: 28 days after contract award, and before construction starts.
.3 Cx agents' credentials: 60 days before start of Cx.
.4 Cx procedures: 3 months after award of contract.
.5 Cx Report format: 3 months after contract award.
.6 Discussion of heating/cooling loads for Cx: 3 months before start-up.
.7 Submission of list of instrumentation with relevant certificates: 21 days before start of Cx.
.8 Notification of intention to start TAB: 21 days before start of TAB.
.9 TAB: after successful start-up, correction of deficiencies and verification of normal and safe operation.
.10 Notification of intention to start Cx: 14 days before start of Cx.
.11 Notification of intention to start Cx of integrated systems: after Cx of related systems is completed 14 days before start of integrated system Cx.
.12 Identification of deferred Cx.
.13 Implementation of training plans.
.14 Cx reports: immediately upon successful completion of Cx.

.2 Detailed training schedule to demonstrate no conflicts with testing, completion of project and hand-over to Property Manager.

.3 6 months in Cx schedule for verification of performance in all seasons and wear conditions.

.2 After approval, incorporate Cx Schedule into Construction Schedule.

.3 Consultant, Contractor, Contractor's Cx agent, Commissioning Authority and Departmental Representative will monitor progress of Cx against this schedule.

1.21 CX REPORTS

.1 The Cx Agent to submit reports of tests to the Commissioning Authority who will verify reported results and submit to the Department Representative.

.2 Include completed and certified PV reports in properly formatted Cx Reports.

.3 Before reports are accepted, reported results to be subject to verification by Departmental Representative.

1.22 ACTIVITIES DURING WARRANTY PERIOD

.1 Cx activities must be completed before issuance of Interim Certificate, it is anticipated that certain Cx activities may be necessary during Warranty Period, including:

.1 Fine tuning of HVAC systems.

.2 Adjustment of ventilation rates to promote good indoor air quality and reduce deleterious effects of VOCs generated by off-gassing from construction materials and furnishings.

.3 Full-scale emergency evacuation exercises.

1.23 TESTS TO BE PERFORMED BY OWNER/USER

.1 None is anticipated on this project.

1.24 TRANING PLANS

.1 Refer to Section 01 91 41 - Commissioning (Cx) - Training.

1.25 FINAL SETTINGS

.1 Upon completion of Cx to satisfaction of Departmental Representative lock control devices in their final positions, indelibly mark settings marked and include in Cx Reports.

END OF SECTION 01 91 31

1.0 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Commissioning forms to be completed for equipment, system and integrated system.

1.2 INSTALLATION/START-UP CHECK LISTS

.1 Include the following data:

.1 Product manufacturer's installation instructions and recommended checks.

.2 Special procedures as specified in relevant technical sections.

.3 Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.

.2 Equipment manufacturer's installation/start-up check lists are acceptable for use. As deemed necessary by Departmental Representative supplemental additional data lists will be required for specific project conditions.

.3 Use check lists for equipment installation. Document check list verifying checks have been made, indicate deficiencies and corrective action taken.

.4 Installer to sign check lists upon completion, certifying stated checks and inspections have been performed. Return completed check lists to Cx Authority. Check lists will be required during Commissioning and will be included in Building Management Manual (BMM) at completion of project.

.5 Use of check lists will not be considered part of commissioning process but will be stringently used for equipment pre-start and start-up procedures.

1.3 PRODUCT INFORMATION (PI) REPORT FORMS

.1 Product Information (PI) forms compiles gathered data on items of equipment produced by equipment manufacturer, includes nameplate information, parts list, operating instructions, maintenance guidelines and pertinent technical data and recommended checks that is necessary to prepare for start-up and functional testing and used during operation and maintenance of equipment. This documentation is included in the BMM at completion of work.

.2 Prior to Performance Verification (PV) of systems complete items on PI forms related to systems and obtain Commissioning Authority`s approval.

1.4 PERFORMANCE VERIFICATION (PV) FORMS

.1 PV forms to be used for checks, running dynamic tests and adjustments carried out on equipment and systems to ensure correct operation, efficiently and function independently and interactively with other systems as intended with project requirements.

.2 PV report forms include those developed by Contractor records measured data and readings taken during functional testing and Performance Verification procedures.

.3 Prior to PV of integrated system, complete PV forms of related systems and obtain Commissioning Authority`s approval.

1.5 COMMISSIONING FORMS

.1 Use Commissioning forms to verify installation and record performance when starting equipment and systems.

.2 Strategy for Use:

.1 Contractor provides project-specific Commissioning forms with Specification data included.

.2 Contractor will provide required shop drawings information and verify correct installation and operation of items indicated on these forms.

.3 Confirm operation as per design criteria and intent.

.4 Identify variances between design and operation and reasons for variances.

.5 Verify operation in specified normal and emergency modes and under specified load conditions.

.6 Record analytical and substantiating data.

.7 Verify reported results.

.8 Form to bear signatures of recording technician.

.9 Submit immediately after tests are performed.

.10 Reported results in true measured SI unit values.

.11 Provide Commissioning Authority with originals of completed forms.

.12 Maintain copy on site during start-up, testing and commissioning period.

.13 Forms to be both hard copy and electronic format with typed written results in Building Management Manual in accordance with Section 01 91 51 - Building Management Manual (BMM).

1.6 LANGUAGE

.1 To suit the language profile of the awarded contract.

END OF SECTION 01 91 33

1.0 GENERAL

1.1 SUMMARY

.1 Section Includes:
This Section specifies roles and responsibilities of Commissioning Training.

.2 Related Sections:

.1	General Commissioning Cx Requirements	Section 01 91 13
.2	Commissioning Plan	Section 01 91 31

1.2 TRAINEES

.1 Trainees: personnel selected for operating and maintaining this facility. Includes Facility Manager, building operators, maintenance staff, security staff, and technical specialists as required.

.2 Trainees will be available for training during later stages of construction for purposes of familiarization with systems.

1.3 INSTRUCTORS

.1 Engineer will provide:
- .1 Descriptions of systems.
- .2 Instruction on design philosophy, design criteria, and design intent.

.2 Contractor and certified factory-trained manufacturers' personnel: to provide instruction on the following:
- .1 Start-Up, operation, shut-down of equipment, components and systems.
- .2 Control features, reasons for, results of, implications on associated systems of, adjustment of set points of control and safety devices.
- .3 Instructions on servicing, maintenance and adjustment of systems, equipment and components.

.3 Contractor and equipment manufacturer to provide instruction on:
- .1 Start-up, operation, maintenance and shut-down of equipment they have certified installation, started up and carried out PV tests.

1.4 TRAINING OBJECTIVES

.1 Training to be detailed and duration to ensure:
- .1 Safe, reliable, cost-effective, energy-efficient operation of systems in normal and emergency modes under all conditions.
- .2 Effective on-going inspection, measurements of system performance.
- .3 Proper preventive maintenance, diagnosis and trouble-shooting.
- .4 Ability to update documentation.
- .5 Ability to operate equipment and systems under emergency conditions until appropriate qualified assistance arrives.

1.5 TRAINING MATERIALS

.1 Instructors to be responsible for content and quality.

.2 Training materials to include:
- .1 "As-Built" Contract Documents.
- .2 Operating Manual.
- .3 Maintenance Manual.
- .4 Management Manual.
- .5 TAB and PV Reports.

.3 Project Manager, Commissioning Manager and Facility Manager will review training manuals.
.4 Training materials to be in a format that permits future training procedures to same degree of detail.

.5 Supplement training materials:
.1 Transparencies for overhead projectors.
.2 Multimedia presentations.
.3 Manufacturer's training videos.
.4 Equipment models.

1.6 SCHEDULING

.1 Include in Commissioning Schedule time for training.

.2 Deliver training during regular working hours, training sessions to be 8 hours in length.

.3 Training to be completed prior to acceptance of facility.

1.7 RESPONSIBILITIES

.1 Be responsible for:
.1 Implementation of training activities,
.2 Coordination among instructors,
.3 Quality of training, training materials.

.2 Commissioning Agent will evaluate training and materials.

.3 Upon completion of training, provide written report, signed by Instructors, witnessed by Commissioning Agent.

1.8 MECHANICAL SYSTEM TRAINING

.1 Organize and conduct training courses to instruct the Departmental Representative in the operation and preventative maintenance of equipment and systems provided at the completion of the project.

.2 Provide services of qualified personnel, including each sub-trade, each major equipment supplier and design engineer to and instruct on their equipment or systems.

.3 One-person day shall be eight hours including one half hour for breaks, and one person week shall be five person days.

.4 Submit sessions schedule and list of representatives to the Departmental Representative for approval 30 days prior to course starting date. Confirm attendance of course by written notification to all participants, followed by verbal confirmation just prior to course starting date .

.5 Submit final copies of record drawings and operating and maintenance manuals to Departmental Representative.

.6 Submit a written follow-up of all courses, complete with an attendants list to the Departmental Representative.

.7 Systems Course: Allow a minimum of 8 hours of instruction to conduct systems training courses addressing the following topics:
.1 Air Systems:
.1 Review operation of systems and equipment:
.1 Air systems
.2 All exhaust systems

.2 Review equipment maintenance.
.3 Air system site tour (air handling units/ventilation/ fans)
.1 Demonstrate start/stop
.2 Components.
.3 Maintenance.

.2 Cooling Systems:
.1 Review operation of system and equipment
.2 Review condensing unit and maintenance
.3 Review system maintenance.
.4 Cooling system site tour.
.5 Demonstrate start/stop.
.1 Auto control.
.2 Maintenance.

.3 Heating System:
.1 Review operation of system and equipment.
.2 Review equipment maintenance.
.3 Heating system site tour.

.4 Plumbing:
.1 Review system operation equipment.
.2 Review equipment maintenance including:
.1 Fixtures including adjustment of TP.
.2 Domestic cold water including PRV.
.3 Sanitary waste and venting.

.5 Site Services:
.1 Sanitary/storm/domestic water.

.8 Controls Course: Allow a minimum of 8 hours of instruction and an additional 8 hours of instructions to conduct the controls systems training courses as follows:
.1 Provide the services of competent instructors who will give instruction to designated personnel in the adjustment, operation and maintenance, including pertinent safety requirements of the equipment and system specified. The training shall be specifically for the system installed rather than being a general "canned" training course. The Departmental Representative shall have the right to approve/reject the instructors based on their qualifications. All equipment and material required for classroom training shall be provided by the General Contractor.
. 2 Training Program: provide in two phases over a 6 month period, the time interval specified for each phase.
.1 First phase: this phase shall be for a period of 1 day prior to the 30 day test period. Operating personnel will be trained in the functional operations of the system installed and the procedures that the operators will employ for system operation. First phase training shall include the following:
.1 General EMCS Architectural (overview).
.2 System Communications (overview) .
.3 Operation of computer and peripherals (overview) .
.4 Operator Interface functions for control of HV AC systems (detailed).
.5 Control Logic (detailed for each system).
.6 Report Generation (overview).
.7 Colour graphics generation.
.8 Elementary preventive maintenance (detailed).

.2 Second Phase: this phase of training shall be conducted eight weeks after system acceptance for a period of one day. Training will be provided for three categories of personnel: operators, equipment maintenance personnel. The training shall include as a minimum, but not be limited to:

.1 Operator Training and Equipment Maintainer's Training include:

.1 General equipment layout.

.2 Troubleshooting of all EMCS components.

.3 Preventive maintenance of all EMCS components.

.4 Sensors and controls maintenance and calibration

1.9 ELECTRICAL SYSTEM TRAINING

.1 Organize and conduct training courses to instruct the Departmental Representative in the operation and preventative maintenance of equipment and systems provided at the completion of the project.

.2 Provide services of qualified personnel, including each sub-trade, each major equipment supplier and design engineer to and instruct on their equipment or systems.

.3 One-person day shall be eight hours including one half hour for breaks, and one person week shall be five person days.

.4 Submit sessions schedule and list of representatives to the Departmental Representative for approval 30 days prior to course starting date. Confirm attendance of course by written notification to all participants, followed by verbal confirmation just prior to course starting date .

.5 Submit final copies of record drawings and operating and maintenance manuals to Departmental Representative. Submit a written follow-up of all courses, complete with an attendants list to the Departmental Representative.

.6 Systems Course: Allow a minimum of 64hours of instruction (Eight 8-hour training sessions) to conduct systems training courses addressing the following topics

.1 Standard Power Systems:

.1 Review operation of systems and equipment.

.2 Static Uninterruptible Power Supply:

.1 Review operation of systems and equipment.

.3 Digital Metering & Power Systems SCADA:

.1 Review operation of systems and equipment.

.4 Emergency Lighting:

.1 Review operation of systems and equipment.

.5 Electronic Safety and Security:

.1 Review operation of systems and equipment.

.6 Communications Pedestals:

.1 Review operation of systems and equipment.

.7 Fire Alarm Equipment:

.1 Review operation of systems and equipment.

.8 Fire Alarm Receiving Equipment:

.1 Review operation of systems and equipment.

.9 Protective Relay System:

.1 Review operation of systems and equipment.

.2 Review of setting adjustment.

.3 Review of control software.

.10 Power System SCADA System

.1 Review operation of systems and equipment.

.2 Review of programming setup and hardware setup.

.3 Review of HMI screens, trending functions, alarm operations.
.4 Refer to Section 26 29 23.02 for additional requirements.

.11 Voltage Regulator and Power Connections
.1 Review operation of systems and equipment.
.2 Review of setting adjustment.
.3 Review of control software.

END OF SECTION 01 91 41

1.0 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 This section is limited to portions of the Building Management Manual (BMM) provided to Departmental Representative by Contractor.

.2 Acronyms:

.1 BMM - Building Management Manual.
.2 Cx - Commissioning.
.3 HVAC - Heating, Ventilation and Air Conditioning.
.4 PI - Product Information.
.5 PV - Performance Verification.
.6 TAB - Testing, Adjusting and Balancing.
.7 WHMIS - Workplace Hazardous Materials Information System.

1.2 GENERAL REQUIREMENTS

.1 Standard letter size paper 216 mm x 279 mm.

.2 Methodology used to facilitate updating.

.3 Drawings, diagrams and schematics to be professionally developed.

.4 Electronic copy of data to be in a PDF with hyperlink from content page to individual sections.

1.3 APPROVALS

.1 Prior to commencement, co-ordinate requirements for preparation, submission and approval with Departmental Representative.

1.4 GENERAL INFORMATION

.1 Provide Departmental Representative the following for insertion into appropriate Part and Section of BMM:

.1 Complete list of names, addresses, telephone and fax numbers of contractor, sub-contractors that participated in delivery of project - as indicated in Section 1.2 of BMM.
.2 Summary of architectural, structural, fire protection, mechanical and electrical systems installed and commissioned - as indicated in Section 1.4 of BMM.
.1 Including sequence of operation as finalized after commissioning is complete as indicated in Section 2.0 of BMM.
.3 System, equipment and components Maintenance Management System (MMS) identification - Section 2.1 of BMM.
.4 Information on operation and maintenance of architectural systems and equipment installed and commissioned - Section 2.0 of BMM.
.5 Information on operation and maintenance of fire protection and life safety systems and equipment installed and commissioned - Section 2.0 of BMM.
.6 Information on operation and maintenance of mechanical systems and equipment installed and commissioned - Section 2.0 of BMM.
.7 Operating and maintenance manual - Section 3.2 of BMM.
.8 Final commissioning plan as actually implemented.
.9 Completed commissioning checklists.
.10 Commissioning test procedures employed.
.11 Completed Product Information (PI) and Performance Verification (PV) report

forms, approved and accepted by Departmental Representative.

.12 Commissioning reports.

1.5 CONTENTS OF OPERATING AND MAINTENANCE MANUAL

.1 For detailed requirements refer to Section 01 78 00 - Closeout Submittals.

.2 Departmental Representative to review and approve format and organization within 12 weeks of award of contract.

.3 Include original manufactures brochures and written information on products and equipment installed on this project.

.4 Record and organize for easy access and retrieval of information contained in BMM.

.5 Include completed PI report forms, data and information from other sources as required.

.6 Inventory directory relating to information on installed systems, equipment and components.

.7 Approved project shop-drawings, product and maintenance data.

.8 Manufacturer's data and recommendations relating: manufacturing process, installation, commissioning, start-up, O&M, shutdown and training materials.

.9 Inventory and location of spare parts, special tools and maintenance materials.

.10 Warranty information.

.11 Inspection certificates with expiration dates, which require on-going re-certification inspections.

.12 Maintenance program supporting information including:

.1 Recommended maintenance procedures and schedule.

.2 Information to removal and replacement of equipment including, required equipment, points of lift and means of entry and egress.

1.6 LIFE SAFETY COMPLIANCE (LSC) MANUAL

.1 Samples of LSC Manual will be available from Departmental Representative.

.2 Content of Manual:

.1 All possible Emergency situations modes including: presence of fire and smoke, power failure, lose of water or pressure, chemical spills and refrigerant release.

.2 HVAC emergencies and fuel supply failures.

.3 Intrusion and security breach.

.4 Emergency provisions for natural disasters, bomb threats and other disruptive situations.

.5 Dedicated emergency generators for high security projects, medical facilities and computer systems.

.6 Emergency control procedures for fire, power and major equipment failure.

.7 Emergency contacts and numbers.

.8 Manual to be readily available and comprehensible to non- technical readers.

1.7 SUPPORTING DOCUMENTATION FOR INSERTION INTO SUPPORTING APPENDICES

.1 Provide Departmental Representative supporting documentation relating to installed equipment and system, including:
- .1 General:
  - .1 Finalized commissioning plan.
  - .2 WHMIS information manual.
  - .3 Approved "as-built" drawings and specifications.
  - .4 Procedures used during commissioning.
  - .5 Cross-Reference to specification sections.
- .2 Architectural and structural:
  - .1 Inspection certificates, construction permits.
  - .2 PV reports.
- .3 Fire prevention, suppression and protection:
  - .1 Test reports.
  - .2 Smoke test reports.
  - .3 PV reports.
- .4 Mechanical:
  - .1 Installation permits, inspection certificates.
  - .2 Piping pressure test certificates.
  - .3 Ducting leakage test reports.
  - .4 TAB and PV reports.
  - .5 Charts of valves and steam traps.
  - .6 Copies of posted instructions.
- .5 Electrical:
  - .1 Installation permits, inspection certificates.
  - .2 TAB and PV reports.
  - .3 Electrical work log book.
  - .4 Charts and schedules.
  - .5 Locations of cables and components.
  - .6 Copies of posted instructions.

.2 Assist Departmental Representative with preparation of BMM.

1.8 LANGUAGE

.1 Provide documentation in English only.

1.9 IDENTIFICATION OF FACILITY

.1 When submitting information to Departmental Representative for incorporation into BMM, use following system for identification of documentation:
- .1 As advised by Departmental Representative.

1.10 USE OF CURRENT TECHNOLOGY

.1 Use current technology for production of documentation. Emphasis on ease of accessibility at all times, maintain in up-to-date state, compatibility with user's requirements.

.2 Obtain Departmental Representative's approval before starting Work.

END OF SECTION 01 91 51

1.1 RELATED REQUIREMENTS

.1 Section 02 41 99 - Demolition for Minor Works

1.2 REFERENCES

.1 Definitions:

.1 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, include but not limited to: poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or materials that endanger human health or environment if handled improperly.

.2 Waste Management Co-ordinator (WMC): contractor representative responsible for supervising waste management activities as well as co-ordinating related, required submittal and reporting requirements.

.3 Waste Audit (WA): detailed inventory of materials in building. Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project. Indicates quantities of reuse, recycling and landfill.

.4 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. WRW is based on information acquired from WA.

.2 Reference Standards:

.1 Canada Green Building Council (CaGBC)

.1 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.

.2 CSA International

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

.3 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S660-08, Standard for Nonmetallic Underground Piping for Flammable and Combustible Liquids.

.2 ULC/ORD-C58.15-1992, Overfill Protection Devices for Flammable Liquid Storage Tanks.

.3 ULC/ORD-C58.19-1992, Spill Containment Devices for Underground Flammable Liquid Storage Tanks.

1.3 ADMINISTRATIVE REQUIRMENTS

.1 Pre-Installation Meetings:

.1 Convene pre-installation meeting 1 week prior to beginning work of this Section with Contractor's Representative and Departmental Representative in accordance with Section 01 31 19 - Project Meetings to:

.1 Verify project requirements.

.2 Verify existing site conditions adjacent to demolition work.

.3 Co-ordination with other construction subtrades.

.2 Hold project meetings every 2 weeks.

.3 Ensure key personnel site supervisor, project manager and subcontractor representatives WMC attend.

.4 WMC must provide written report on status of waste diversion activity at each meeting.

.5 Departmental Representative will provide written notification of change to meeting schedule established upon contract award 24 hours prior to scheduled meeting.

.2 Scheduling:

.1 Employ necessary means to meet project time lines without compromising specified minimum rates of material diversion.

.1 In event of unforeseen delay notify Consultant in writing.

1.4 ACTION & INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures and Section 01 74 21 - Construction/Demolition Waste Management Disposal.

.2 WMC is responsible for fulfilment of reporting requirements.

.3 Prior to beginning of Work on site submit detailed Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal and indicate:
- .1 Descriptions of and anticipated quantities in percentages of materials to be salvaged reused, recycled and landfilled.
- .2 Schedule of selective demolition.
- .3 Number and location of dumpsters.
- .4 Anticipated frequency of tippage.
- .5 Name and address of waste receiving organizations.

.4 Submit PDF copies of receipts from authorized disposal sites and reuse and recycling facilities for material removed from site on a bi-weekly basis upon request of Consultant.
- .1 Written authorization from Departmental Representative is required to deviate from receiving organizations listed in Waste Reduction Workplan.

.5 Shop Drawings:
- .1 Submit for review and approval demolition drawings, diagrams or details showing sequence of demolition work and supporting structures and underpinning.
- .2 Submit demolition drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia, Canada.

.6 Sustainable Design Submittals:
- .1 Construction Waste Management:
  - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
  - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.

1.5 QUALITY ASSURANCE

.1 Regulatory Requirements: Ensure Work is performed in compliance with applicable Provincial and Municipal regulations.

1.6 SITE CONDITIONS

.1 Environmental protection:
- .1 Ensure Work is done in accordance with Section 01 35 43 - Environmental Procedures.
- .2 Ensure Work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
- .3 Fires and burning of waste or materials is not permitted on site.
- .4 Do not bury rubbish waste materials.
- .5 Do not dispose of waste or volatile materials including but not limited to: mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into storm or sanitary sewers.
  - .1 Ensure proper disposal procedures are maintained throughout project.

.6 Do not pump water containing suspended materials into storm or sanitary sewers, or onto adjacent properties.

.7 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with authorities having jurisdiction.

.8 Prevent extraneous materials from contaminating air beyond application area, by providing temporary enclosures during demolition work.

.9 Cover or wet down dry materials and waste to prevent blowing dust and debris. Control dust on all interior and exterior public areas.

1.7 EXISTING CONDITIONS

.1 If material resembling spray or trowel applied asbestos or other designated substance listed as hazardous be encountered in course of demolition, stop work, take preventative measures, and notify Departmental Representative immediately. Proceed only after receipt of written instructions has been received from Consultant.

.2 Structures to be demolished are based on their condition at time of examination prior to tendering.

2.0 PRODUCTS

2.1 EQUIPMENT

.1 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

3.0 EXECUTION

3.1 PREPARATION

.1 Protection of in-place conditions:

.1 Work in accordance with Section 01 35 43 - Environmental Procedures.

.2 Prevent movement, settlement or damage of adjacent structures, services and parts of existing building to remain.

.1 Provide bracing, shoring and underpinning as required.

.2 Repair damage caused by demolition as directed by Departmental Representative

.3 Support affected structures and, if safety of structure being demolished or adjacent structures or services appears to be endangered, take preventative measures, stop Work and immediately notify Departmental Representative

.4 Prevent debris from blocking surface drainage system, elevators, mechanical and electrical systems which must remain in operation.

.1 Disconnect and cap mechanical services.

.2 Natural gas supply lines: remove in accordance with gas company requirements.

.3 Sewer and water lines: remove or provide temporary support if they are to remain as indicated on drawings.

.4 Other underground services: remove and dispose of as indicated on drawings.

3.2 DEMOLITION

.1 Do demolition work in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

.2 Blasting operations not permitted during demolition.

.3 Remove contaminated or dangerous materials as defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimize danger at site or during disposal.

.4 Prior to start of Work, remove contaminated or hazardous materials as indicated in Hazardous Material Report from site and dispose of at designated disposal facilities in safe manner and in accordance with recommendation in report.

.5 Demolish structural work as indicated on drawings.

.6 Crush concrete generated due to demolition of concrete structure to size suitable for recycling
.1 Where possible identify markets which will accept crushed material as aggregate.

.7 Remove existing equipment, services, and obstacles where required for refinishing or making good of existing surfaces, and replace as work progresses.

.8 At end of each day's work, leave Work in safe and stable condition.

.9 Demolish to minimize dusting. Keep materials wetted as directed by Departmental Representative.

.10 Use natural lighting to do Work where possible.
.1 Shut off lighting except those required for security purposes at end of each day.

3.3 CLEANING

.1 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

.2 Divert excess materials from landfill to site approved, and Departmental Representative.

.3 Designate appropriate security resources / measures to prevent vandalism, damage and theft.

END OF SECTION 02 41 16

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 02 41 16 - Structure Demolition

1.2 REFERENCES

.1 Canada Green Building Council (CaGBC)

.1 LEED Canada-CI Version 1.0- 2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.

.2 CSA International

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

1.3 ACTION & INFORMATIONS SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures and 01 74 21 - Construction/Demolition Waste Management Disposal.

.2 Submit hoarding layout plan for approval by Departmental Representative at each stage of work.

.3 Sustainable Design Submittals:

.1 Construction Waste Management:

.1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

.2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.

1.4 SITE CONDITIONS

.1 If material resembling spray or trowel-applied asbestos or other designated substance listed as hazardous is encountered, stop work, take preventative measures, and notify Departmental Representative immediately.

.1 Proceed only after receipt of written instructions have been received from Consultant.

.2 Notify Departmental Representative before disrupting building access or services.

.3 Extent of Demolition - refer to drawing.

3.0 EXECUTION

3.1 EXAMINATION

.1 Inspect building with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.

.2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.

.3 Notify and obtain approval of utility companies before starting demolition.

.4 Disconnect, cap, plug or divert, as required, existing utilities within the building where they interfere with the execution of the work, in conformity with the requirements of the authorities having jurisdiction. Mark the location of these and previously capped or plugged services on the site and indicate location (horizontal and vertical) on the record drawings. Support, shore up and maintain pipes and conduits encountered.

.1 Immediately notify Departmental Representative and the Owner concerned in case of

damage to any utility or service designated to remain in place.

.2 Immediately notify the Departmental Representative should uncharted utility or service be encountered, and await instruction in writing regarding remedial action.

3.2 PREPARATION

.1 Protection of In-Place Conditions:

.1 Prevent movement, settlement, or damage to adjacent structures, and utilities.

.2 Keep noise, dust, and inconvenience to occupants to minimum.

.3 Protect building systems, services and equipment.

.4 Provide temporary dust screens, covers, railings, supports and other protection as required.

.5 Do Work in accordance with Section 01 35 33 - Health and Safety Requirements.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

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

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION 02 41 99

1.0 GENERAL

1.1 RELATED WORK

.1	Excavating, Trenching and Backfilling	Section 31 33 00.01
.2	Concrete Reinforcing	Section 03 20 00
.3	Cast-In-Place Concrete	Section 03 30 00

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CSA-O86-09, Engineering Design in Wood.
- .3 CSA O121-08, Douglas Fir Plywood.
- .4 CSA O151-09, Canadian Softwood Plywood.
- .5 CSA O153-13, Poplar Plywood.
- .6 CAN/CSA-O325-07, Construction Sheathing.
- .7 CSA O437 Series-93 (R2006), Standards for OSB and Waferboard.
- .8 CSA S269.1- Falsework for Construction Purposes.
- .9 CAN/CSA-S269.3-M92 (R2003), Concrete Formwork, National Standard of Canada

.2 Underwriters' Laboratories of Canada (ULC)
- .1 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.3 SUBMITTALS

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

.2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 33 – Health and Safety Requirements.

.3 Co-ordinate submittal requirements and provide submittals required by Section 01 33 00.

.4 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings and Comply with CAN/CSA-S269.3 for formwork drawings.

.5 Indicate formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms.

.6 Indicate sequence of erection and removal of formwork/falsework as directed by Departmental Representative.

.7 The contractor is responsible for the design of all formwork and shoring and for complying with all Workers' Compensation Board regulations pertaining to formwork construction, design and inspection. Formwork and shoring shall be designed by a qualified professional engineer registered or licensed in British Columbia.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Store and manage hazardous materials in accordance with Section 01 51 00 – Temporary Facilities.

.2 Waste Management and Disposal:

.1 Separate and recycle waste materials in accordance with Section 01 74 19 – Waste Management and Disposal.

2.0 PRODUCTS

2.1 MATERIALS

.1 Materials and resources in accordance with Section 01 61 00 – Product Requirements.

.2 Formwork materials:

.1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121, CAN/CSA-O86, CSA O437 Series, CSA-O153.

.2 Rigid insulation board: to CAN/ULC-S701.

.3 Form ties:

.1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.

.4 Form liner:

.1 Plywood: high density overlay, medium density overlay, Douglas Fir to CSA O121, Canadian Softwood Plywood to CSA O151 or Poplar to CSA O153 grade, square edge, 20 mm thick.

.5 Form release agent: non-toxic, biodegradable, low VOC.

.6 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 70 and 110s Saybolt Universal 15 to 24 mm^2/s at 40 degrees C, flashpoint minimum 150 degrees C, open cup.

.7 Falsework materials: to CSA-S269.1.

.8 Sealant: to Section 07 92 00 – Joint Sealants.

3.0 EXECUTION

3.1 FABRICATION AND ERECTION

.1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.

.2 Obtain Departmental Representative's approval for use of earth forms framing openings not indicated on drawings.

.3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.

.4 Fabricate and erect falsework in accordance with CSA S269.1.

.5 Do not place shores and mud sills on frozen ground.

.6 Provide site drainage to prevent washout of soil supporting mud sills and shores.

.7 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.

.8 Align form joints and make watertight.
- .1 Keep form joints to minimum.

.9 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.

.10 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

.11 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.
- .1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

.12 Line forms for following surfaces:
- .1 Exposed faces of abutments, wingwalls, piers and pylons: do not stagger joints of form lining material and align joints to obtain uniform pattern. Secure lining taut to formwork to prevent folds.
- .2 Pull down lining over edges of formwork panels.
- .3 Ensure lining is new and not reused material.
- .4 Ensure lining is dry and free of oil when concrete is poured.
- .5 Application of form release agents on formwork surface is prohibited where drainage lining is used.
- .6 If concrete surfaces require cleaning after form removal, use only pressurized water stream so as not to alter concrete's smooth finish.
- .7 Cost of textile lining is included in price of concrete for corresponding portion of Work.

.13 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

3.2 REMOVAL AND SHORING

.1 Leave formwork in place for following minimum periods of time after placing concrete.
- .1 Three days for walls and sides of beams.
- .2 Three days for columns.
- .3 Twenty eight days for beam soffits, slabs, decks and other structural members, or one days when replaced immediately with adequate shoring to standard specified for falsework.
- .4 One days for footings and abutments.

.2 Remove formwork when concrete has reached 75% of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.

.3 Provide necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.

.4 Space reshoring in each principal direction at not more than 3000 mm apart.

.5 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

END OF SECTION 03 10 00

1.0 GENERAL

1.1 RELATED WORK

.1 Concrete Forming and Accessories — Section 03 10 00

.2 Cast-In-Place Concrete — Section 03 30 00

1.2 REFERENCES

.1 American Concrete Institute (ACI)

- .1 SP-66-04, ACI Detailing Manual 2004.
  - .1 ACI 315-99, Details and Detailing of Concrete Reinforcement.
  - .2 ACI 315R-04, Manual of Engineering and Placing Drawings for Reinforced Concrete Structures.

.2 American Society for Testing and Materials International (ASTM)

- .1 ASTM A143/A143M-03, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
- .2 ASTM A185/A185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
- .3 ASTM A497/A497M-07, Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.

.3 Canadian Standards Association (CSA International)

- .1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CSA-A23.3-04, Design of Concrete Structures.
- .3 CAN/CSA-G30.18-M92(R2002), Billet-Steel Bars for Concrete Reinforcement, A National Standard of Canada.
- .4 CSA-G40.20/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .5 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles, A National Standard of Canada.
- .6 CSA W186-M1990(R2012), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.4 Reinforcing Steel Institute of Canada (RSIC)

- .1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.3 SUBMITTALS

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

.2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice and ACI 315.

.3 Submit shop drawings including placing of reinforcement and indicate:

.1 Bar bending details.

.2 Lists.

.3 Quantities of reinforcement.

.4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.

.5 Indicate sizes, spacings and locations of chairs, spacers and hangers.

.4 Detail lap lengths and bar development lengths to CSA-A23.3, unless otherwise indicated.

.1 Provide type A tension lap splices where indicated unless otherwise indicated.

.5 When Chromate solution is used as replacement for galvanizing non-prestressed reinforcement, provide product description for review by Departmental Representative prior to its use.

.6 Quality Assurance: Provide the following to the Departmental Representative.

.1 Mill Test Report: upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.

.2 Upon request submit in writing to Departmental Representative proposed source of reinforcement material to be supplied.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Store and manage hazardous materials in accordance with Section 01 51 00 – Temporary Facilities.

.2 Waste Management and Disposal:

.1 Separate and recycle waste materials in accordance with Section 01 74 19 – Waste Management and Disposal.

2.0 PRODUCTS

2.1 MATERIALS

.1 Materials and resources in accordance with Section 01 61 00- Product Requirements.

.2 Substitute different size bars only if permitted in writing by Departmental Representative.

.3 Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.

.4 Reinforcing steel: weldable low alloy steel deformed bars to CAN/CSA-G30.18.

.5 Cold-drawn annealed steel wire ties: to ASTM A497/A497M.

.6 Deformed steel wire for concrete reinforcement: to ASTM A497/A497M.

.7 Welded steel wire fabric: to ASTM A185/A185M.

.1 Provide in flat sheets only.

.8 Welded deformed steel wire fabric: to ASTM A497/A497M.

.1 Provide in flat sheets only.

.9 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.

.10 Mechanical splices: subject to approval of Departmental Representative.

.11 Plain round bars: to CSA-G40.20/G40.21.

2.2 FABRICATION

.1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2, ACI 315 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.

.1 ACI 315R unless indicated otherwise.

.2 Obtain Departmental Representative's approval for locations of reinforcement splices other than those shown on placing drawings.

.3 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186.

.4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

2.3 SOURCE QUALITY CONTROL

.1 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to beginning reinforcing work.

.2 Upon request inform Departmental Representative of proposed source of material to be supplied.

3.0 EXECUTION

3.1 PREPARATION

.1 Conduct bending tests to verify bar fragility in accordance with ASTM A143/A143M.

3.2 FIELD BENDING

.1 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.

.2 When field bending is authorized, bend without heat, applying slow and steady pressure.

.3 Replace bars, which develop cracks or splits.

3.3 PLACING REINFORCEMENT

.1 Place reinforcing steel as indicated on placing drawings and in accordance with CSA-A23.1/A23.2.

.2 Use plain round bars as slip dowels in concrete.

.1 Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint.

.1 When paint is dry, apply thick even film of mineral lubricating grease.

.3 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.

.4 Ensure cover to reinforcement is maintained during concrete pour.

END OF SECTION 03 20 00

1.0 GENERAL

1.1 RELATED WORK

.1	Concrete Forming and Accessories	Section 03 10 00
.2	Concrete Reinforcing	Section 03 20 00
.3	Architectural Concrete	Section 03 33 00
.4	Concrete Finishing	Section 03 35 00

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

- .1 ASTM C109-12, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or 50-mm Cube Specimens). ASTM D260-86 (2001), Standard Specification for Boiled Linseed Oil.
- .2 ASTM C309-11, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- .3 ASTM C332-09, Specification for Lightweight Aggregates for Insulating Concrete.
- .4 ASTM C827-10, Test Method for Early Volume Change of Cementitious Mixtures.
- .5 ASTM D1751-04(R2008), Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
- .6 ASTM D1752-04a(2008), Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
- .7 ASTM C 260 – 10a, Specifications for Air-Entraining Admixtures for Concrete.
- .8 ASTM C 494M – 13, Specifications for Chemical Admixtures for Concrete.

.2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-19.24-M90, Multicomponent, Chemical-Curing Sealing Compound.

.3 Canadian Standards Association (CSA International)

- .1 CSA-A23.1-09 Concrete Materials and Methods of Concrete Construction.
- .2 CSA-A23.2-09, Methods of Test for Concrete.
- .3 CAN/CSA-A3000-08, Cementitious Materials Compendium.
- .4 CSA-A3001-03, Cementitious Materials for Use in Concrete.
- .5 CAN/CSA-G30.18-M92(R2002), Billet-Steel Bars for Concrete Reinforcement.

1.3 CERTIFICATES

.1 Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CAN/CSA-A23.1.

.2 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CAN/CSA-A23.1.

1.4 QUALITY ASSURANCE

.1 Minimum 2 weeks prior to starting concrete work, submit proposed quality control procedures for Departmental Representative's approval for following items:

- .1 Falsework erection.
- .2 Hot weather concrete.
- .3 Cold weather concrete.
- .4 Curing.
- .5 Finishes.
- .6 Formwork removal.
- .7 Joints.

.2 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 Concrete hauling time: maximum allowable time limit for concrete to be delivered to site of Work and discharged not to exceed 120 minutes after batching.
  .1 Modifications to maximum time limit must be agreed to by the Departmental Representative and concrete producer as described in CSA A23.1/A23.2.
  .2 Deviations to be submitted for review by the Departmental Representative.

.2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 – Waste Management and Disposal.

2.0 PRODUCTS

2.1 MATERIALS

.1 Portland cement: to CAN/CSA-A3000.

.2 Supplementary cementing materials: with minimum 10% Type F fly ash replacement, by mass of total cementitious materials to CAN/CSA A3000.

.3 Water: to CAN/CSA-A23.1.

.4 Aggregates: to CAN/CSA-A23.1. Coarse aggregates to normal density.

.5 Air entraining admixture: to CAN/CSA-A3000.

.6 Chemical admixtures: to CAN/CSA-A3000. Departmental Representative to approve accelerating or set retarding admixtures during code and hot weather placing.

.7 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents.
  .1 Compressive strength: 50 MPa at 28 days.
  .2 Consistency:
    .1 Fluid: to ASTM C827. Time of efflux through flow cone (ASTM C939), under 30 s.
    .2 Flowable: to ASTM C827. Flow table, 5 drops in 3 s, (ASTM C109, applicable portion) 125 to 145%.
    .3 Plastic: to ASTM C827. Flow table, 5 drops in 3 s, (ASTM C109, applicable portions) 100 to 125%.
    .4 Dry pack to manufacturer's requirements.

.7 Non premixed dry pack grout: composition of non metallic aggregate Portland cement with sufficient water for the mixture to retain its shape when made into a ball by hand and capable of developing compressive strength of 50 MPa at 28 days.

.8 Curing compound: to CAN/CSA-A23.1 white and to ASTM C309, Type 1-chlorinated rubber.

.9 Cushion pads: tough, resilient, weather, moisture, and oil resistant material that will not corrode or cause corrosion, consisting of either layers of approved cotton duck saturated and bound together by approved rubber or synthetic compounds, or made from specially compounded synthetic materials.

.10 Ribbed waterstops: extruded PVC [Arctic Grade] of sizes indicated with welded corner and intersecting pieces:

.1 Tensile strength: to ASTM D412, method A, Die "C", minimum 11.4 MPa.
.2 Elongation: to ASTM D412, method A, Die "C", minimum 275%.
.3 Tear resistance: to ASTM D624, method A, Die "B", minimum 48 kN/m.

.11 Premoulded joint filler:

.1 Bituminous impregnated fibreboard: to ASTM D1751.
.2 Sponge rubber: to ASTM D1752, Type I, flexible grade.

.12 Weep hole tubes: plastic.

.13 Dovetail anchor slots: minimum 0.6 mm thick galvanized steel with insulation filled slots.

.14 Dampproof membrane:

.1 Kraft/polyethylene membrane:
.1 Plain: .05 mm thick polyethylene film bonded to 2.44 kg/m^2 asphalt treated creped kraft.
.2 Reinforced: two .05 mm thick polyethylene films bonded each side of 2.44 kg/m^2 asphalt treated creped kraft paper, reinforced with 13 x 13 mm fibreglass scrim.
.3 Membrane adhesive: as recommended by membrane manufacturer.

.15 Dampproofing: Emulsified asphalt, mineral colloid type, unfilled: to CAN/CGSB-37.2, and to Section 07 13 52 – Modified Bituminous Sheet Waterproofing.

.16 Polyethylene film: 0.25mm (6 mil) thickness to CAN/CGSB-51.34.

2.2 MIXES

.1 Proportion normal density concrete in accordance with CAN/CSA-A23.1, Alternative 1 to give the following properties:

.1 Cement: Type GU Portland cement.

.2 Minimum compressive strength at 28 days, class of exposure and nominal size of coarse aggregate:

Member	minimum 28-days strength (MPa)	maximum aggregate size (mm)	exposure class	air content Category
Concrete Topping (Interior)	25	10	C-1	1
Slab on grade (Interior)	25	20	C-4	2
Slab on Grade (Exterior)	32	20	C-2	1

.3 Slump at time and point of discharge: To CSA-A23.1 Clause 4.3.2.3. When super plasticizers are used, the slump may be increased by shall kept below the point where segregation will occur. The cost of super plasticizers shall be included in the cost of the concrete. Smaller aggregate size may be used where necessary to increase slump.

.4 Air content: To CSA-A23.1 Table 2 & 4 to suit appropriate exposure class.

.5 Chemical admixtures: following admixtures in accordance with to ASTM C494M. Admixtures shall contain no salts or acids.

.6 Concrete mix designs shall be submitted to a material consultant for approval and to Departmental representative for review prior to any concrete work.

3.0 EXECUTION

3.1 PREPARATION

.1 Obtain Departmental Representative's approval before placing concrete. Provide 72 h notice prior to placing of concrete.

.2 Pumping of concrete is permitted only after approval of equipment and mix.

.3 Ensure reinforcement and inserts are not disturbed during concrete placement.

.4 Prior to placing of concrete obtain Departmental Representative 's approval of proposed method for protection of concrete during placing and curing.

.5 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

.6 In locations where new concrete is dowelled to existing work, drill holes in existing concrete. Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated.

.7 Do not place load upon new concrete until authorized by Departmental Representative.

3.2 CONSTRUCTION

.1 Perform cast-in-place concrete work in accordance with CSA-A23.1.

.2 Sleeves and inserts.

.1 No sleeves, ducts, pipes or other openings shall pass through joists, beams, column capitals or columns, except where indicated or approved by Departmental Representative.

.2 Where approved by Departmental Representative, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere. Sleeves and openings greater than 100 x 100 mm not indicated, must be approved by Departmental Representative.

.3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Departmental Representative before placing of concrete.

.4 Check locations and sizes of sleeves and openings shown on drawings.

.5 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.

.3 Anchor bolts.

.1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.
.2 With approval of Departmental Representative, grout anchor bolts in holes drilled after concrete has set. Drilled holes to be to manufacturer's recommendations.
.3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
.4 Set bolts and fill holes with epoxy grout.
.5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.

.4 Drainage holes and weep holes:

.1 Form weep holes and drainage holes in accordance with Section 03 10 00 - Concrete Forms and Accessories. If wood forms are used, remove them after concrete has set.
.2 Install weep hole tubes and drains as indicated.

.5 Dovetail anchor slots:

.1 Install continuous vertical anchor slot to forms where masonry abuts concrete wall or columns.
.2 Install continuous vertical anchor slots at [800] mm oc where concrete walls are masonry faced.

.6 Grout under base plates using procedures in accordance with manufacturer's recommendations which result in 100% contact over grouted area.

.7 Finishing:

.1 Finish concrete in accordance with CAN/CSA-A23.1.
.2 Use procedures acceptable to Departmental Representative or those noted in CAN/CSA-A23.1 to remove excess bleed water. Ensure surface is not damaged.

.8 Waterstops:

.1 Install waterstops to provide continuous water seal. Do not distort or pierce waterstop in such a way as to hamper performance. Do not displace reinforcement when installing waterstops. Use equipment to manufacturer's requirements to field splice waterstops. Tie waterstops rigidly in place.
.2 Use only straight, heat sealed butt joints in field. Use factory welded corners and intersections unless otherwise approved by Departmental Representative.

.9 Joint fillers:

.1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Departmental Representative. When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
.2 Locate and form isolation, construction and expansion joints as indicated. Install joint filler.

.3 Use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.

.10 Dampproof membrane:

.1 Install dampproof membrane under concrete slabs-on-grade inside building.
.2 Lap dampproof membrane minimum 150 mm at joints and seal.
.3 Seal punctures in dampproof membrane before placing concrete. Use patching material at least 150 mm larger than puncture and seal.

.11 Locations of construction joins shall be submitted to the departmental representative for review in advance and prior to commencement of construction.

.12 Supply and set anchor bolts, sleeves, pipe hangers, expansion joints and other inserts and openings as indicated in the structural drawings and specifications or in documents by other consultants.

.13 All dowels, anchor bolts, embedded plates and other inserts shall be placed before the concrete is poured.

.14 Slab on grade joints shall be 35mm deep sawcuts spaced maximum 4500mm apart, layout of joins shall be approved by the Departmental representative, seal with flexible joint sealer to prevent ingress of water.

3.3 SITE TOLERANCE

.1 All horizontal surfaces shall meet the Class A Slab and Floor Finish classification (+/- 8mm) in accordance with Table 22 of CAN/CSA-A23.1 straight edge method.

.2 Tolerance closer than those specified in CSA-A23.1 may be required at certain locations for structural, architectural and construction requirements.

3.4 FIELD QUALITY CONTROL

.1 Inspection and testing of concrete and concrete materials will be carried out by a CSA certified Testing Laboratory designated by Departmental Representative in accordance with CAN/CSA-A23.1. Submit all concrete testing results to the departmental representative.

.2 Contractor will pay for costs of tests as specified in Section 01 11 55 – General Instructions.

.3 Departmental Representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.

.4 Non-destructive Methods for Testing Concrete shall be in accordance with CAN/CSA-A23.2.

.5 Inspection or testing by Departmental Representative will not augment or replace Contractor quality control nor relieve him of his contractual responsibility

3.5 VERIFICATION

.1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established in PART 2 - PRODUCTS, by Departmental Representative and provide verification of compliance.

3.6 CLEANING

.1 Use trigger operated spray nozzles for water hoses.

.2 Designate cleaning area for tools to limit water use and runoff.

.3 Cleaning of concrete equipment to be done in accordance with Section 01 35 43: Environmental Procedures.

END OF SECTION 03 30 00

1.0 GENERAL

1.1 RELATED SECTIONS

.1 Section 05 31 00 – Steel Decking.

.2 Section 05 50 00 – Metal Fabrication.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)

- .1 ASTM A 36/A 36M-12, Specification for Carbon Structural Steel.
- .2 ASTM A 307-12, Specification for Carbon Steel Bolts and Studs, 60,000psi Tensile.
- .3 ASTM A 325-10e1, Specification for Structural Bolts, Steel, Heat Treated,120/105 ksi Minimum Tensile Strength.
- .4 ASTM A 325M-13, Standard Specification for Structural Bolts, Steel, Heat Treated, 830 MPa Minimum Tensile Strength Metric.

.2 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturer's Association (CPMA).

- .1 CISC/CPMA 1-73a, Quick-Drying, One-Coat Paint for Use on Structural Steel.
- .2 CISC/CPMA 2-75, Quick-Drying, Primer for Use on Structural Steel.

.3 Canadian Standards Association (CSA International)

- .1 CAN/CSA-G40.20-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel.
- .2 CAN/CSA-G40.21-04 (R2009), Structural Quality Steels.
- .3 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .4 CAN/CSA-S16-09, Design of Steel Structures.
- .5 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.
- .6 CSA W48-06 (R2011), Electrodes.
- .7 CSA W55.3-08, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
- .8 CSA W59-03 R(2008), Welded Steel Construction (Metal Arc Welding)

1.3 DESIGN OF DETAILS AND CONNECTIONS

.1 Design details and connections in accordance with requirements of CAN/CSA-S16-09 to resist forces, moments, shears and allow for movements indicated.

.2 If connection for shear only (standard connection) is required:

- .1 Select framed beam shear connections from an industry accepted publication such as "Handbook of the Canadian Institute of Steel Construction".

.3 If shears are not indicated, select or design connections to support reaction from 120% maximum uniformly distributed load that can be safely supported by beam in bending (60% each end), provided no point loads act on beam.

.4 At the Departmental Representative's request, submit sketches and design calculations for non-standard connections, stamped and signed by qualified professional engineer licensed in the Province of British Columbia, Canada.

1.4 SHOP DRAWINGS

.1 Submit shop drawings including fabrication and erection documents and materials list in accordance with Section 01 33 00 – Submittal Procedures.

.2 On erection drawings, indicate all details and information necessary for assembly and erection purposes such as, description of methods, sequence of erection, type of equipment used in erection and temporary bracings.

.3 All shop drawings to be signed, sealed by professional engineer licensed in British Columbia, Canada.

.4 The Professional Engineer responsible for the shop drawings shall inspect the installation of the work for conformance with the design and the shop drawings, and shall upon completion of the work submit to the Consultant a completed Schedule S-B: Assurance of Professional Design and Commitment for Field Review by Supporting Registered Professional, and Schedule S-C: Assurance of Professional Field Review and Compliance by Supporting Registered Professional.

1.5 QUALITY ASSURANCE

.1 Submit 2 copies of mill test reports showing chemical and physical properties and other details of steel to be incorporated into work at least 2 weeks prior to fabrication of structural steel. Mill test reports shall be certified by metallurgists qualified to practice in British Columbia, Canada.

.2 Fabricator of structural steel shall, in addition, provide an affidavit stating that materials and products used in fabrication conform to applicable material and products standards called for by design drawings and specifications.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 –Waste Management and Disposal.

2.0 PRODUCTS

2.1 MATERIALS

.1 Structural steel: to CAN/CSA-G40.21 Grade as indicated on drawings.

.2 Anchor bolts: ASTM A307 unless noted otherwise on drawings.

.3 Bolts, nuts and washers: to ASTM A325.

.4 Welding materials: to CSA W48 Series and CSA W59 and certified by Canadian Welding Bureau.

.5 Shop paint primer: to CISC/CPMA 1.

.6 Hot dip galvanizing: galvanize steel, where indicated, to CAN/CSA-G164, minimum zinc coating of 600 g/m^2.

.7 Galvanize touch-up primer: to CISC/CPMA 1.

.8 Shear studs: to CSA W59, Appendix H.

2.2 FABRICATION

.1 Fabricate structural steel in accordance with CAN/CSA-S16 and in accordance with reviewed shop drawings.

.2 Install shear studs in accordance with CSA W59.

.3 Continuously seal members that required by remediation with continuous field welds where appropriate. Grind smooth.

2.3 SHOP PAINTING

.1 Clean, prepare surfaces and field prime structural steel in accordance with CAN/CSA-S16 except where members to be encased in concrete.

.2 Clean members, remove loose mill scale, rust, oil, dirt and other foreign matter. Prepare surface according to SSPC SP7 brush off blast.

.3 Apply one coat of CISC/CMPD2-75 primer in shop to steel surfaces to achieve minimum dry film thickness of 3 to 4 mils, except:

.1 Surfaces to be encased in concrete.
.2 Surfaces to receive field installed stud shear connections.
.3 Surfaces and edges to be field welded.
.4 Faying surfaces of friction-type connections.
.5 Below grade surfaces in contact with soil.

.4 Apply paint under cover, on dry surfaces when surface and air temperatures are above 5 degrees C.

.5 Maintain dry condition and 5 degrees C minimum temperature until paint is thoroughly dry.

.6 Strip paint from bolts, nuts, sharp edges and corners before prime coat is dry.

3.0 EXECUTION

3.1 GENERAL

.1 Structural steel work: in accordance with CAN/CSA-S16.

.2 Welding: in accordance with CSA W59.

.3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.

3.2 CONNECTION TO EXISTING WORK

.1 Verify dimensions and condition of existing work, report discrepancies and potential problem areas to Departmental Representative for direction before commencing fabrication.

3.3 MARKING

.1 Mark materials in accordance with CAN/CSA G40.20/G40.21. Do not use die stamping. If steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection.

.2 Match marking: shop mark, bearing assemblies and splices for fit and match.

3.4 ERECTION

.1 Erect structural steel, as indicated and in accordance with CAN/CSA-S16 and in accordance with reviewed erection drawings.

.2 Field cutting or altering structural members: to approval of Departmental Representative.

.3 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.

.4 Continuously seal members by continuous welds where indicated. Grind smooth.

3.5 FIELD QUALITY CONTROL

.1 The Departmental Representative will not be responsible for inspection of the Contractor's work as described in Clause 7.12 of the CISC Code of Standard Practice for Structural Steel. The Contractor is responsible for the accuracy and completeness of his own work and shall verify that the structural steel has been fabricated, erected and finished in accordance with the contract specifications.

.2 Inspection and testing of materials and workmanship will be carried out by testing laboratory designated by Departmental Representative.

.3 Testing requirements are as follows:

.1 Visual Field Inspection and Bolt Torque Testing (Random 10% of Bolts) of all bolted connections.

.2 Non-Destructive Testing of Welds:

- 100% of all welds to be visually inspected
- 10% of all moment connections to be ultrasonically tested.
- 10% of all full-strength splice connections to be ultrasonically tested.

.3 Verify the certification and conformance of the steel fabricator and erector to any relevant CSA Standards.

.4 Provide safe access and working areas for testing on site, as required by testing agency and as authorized by Departmental Representative.

.5 Submit test reports to Departmental Representative within 1 week of completion of inspection.

.6 Costs of tests will be borne by Contractor as specified in Section 01 11 00 – General Instructions.

3.6 FIELD PAINTING

.1 Paint in accordance with Section 09 91 13 – Exterior Painting and Section 09 91 23 – Interior Painting.

.1 Touch up all damaged surfaces and surfaces without shop coat with primer to MPI Product #76 except as specified otherwise. Apply in accordance with MPI system INT5.1A.

END OF SECTION 05 12 23

1.0 GENERAL

1.1 RELATED WORK

.1 Structural Steel for Buildings Section 05 12 23

.2 Fire stopping Section 07 84 00

1.2 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA)

.1 CAN/CSA-S136-07, North American Specification for the design of Cold Formed Steel Structural Members.

.2

.2 Canadian Sheet Steel Building Institute (CSSBI)

.1 CSSBI 10M-08, Standard for Steel Roof Deck.

.3 American Society for Testing and Materials International, (ASTM)

.1 ASTM A 653/A653M-11, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 ASTM A792/A 792M-05, Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

1.3 DESIGN REQUIREMENTS

.1 Design steel deck using limit states design in accordance with CSA S136 and, CSSBI 10M and CSSBI 12M.

.2 Steel deck and connections to steel framing to carry dead, live and other loads including lateral loads, diaphragm action and uplift as indicated.

.3 Deflection under specified live load not to exceed 1/240 of span, except that when gypsum board ceilings are hung directly from deck, live load deflection not to exceed 1/360 of span.

1.4 SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

.1 Indicate deck plan, profile, dimensions, base steel thickness, metallic coating designation, connections to supports and spacings, projections, openings, reinforcement details and accessories.

.2 Submit drawings stamped and signed by qualified professional engineer registered or licensed in Provinces of British Columbia, Canada.

.3 Submit design calculations if requested by Departmental Represenative.

1.5 WASTE MANAGEMENT AND DISPOSAL

Separate and recycle waste materials in accordance with Section 01 74 19 –Waste Management and Disposal.

2.0 PRODUCTS

2.1 MATERIALS

.1 Zinc-iron Alloy (ZF) coated steel sheet: to ASTMA653/A653M structural quality Grade 230, with ZF75 coating, for interior surfaces not exposed to weather, unpainted finish, 1.21mm minimum base steel thickness and as indicated on drawing 5606.

.2 Decks to be painted: zinc-iron alloy coated decks suitable for finish painting.

.3 Zinc (Z) coated steel sheet: to ASTMA653/A653M structural quality Grade 230, with Z275, coating, regular spangle surface, not chemically treated for paint finish, for exterior surfaces exposed to weather, 1.21mm minimum base steel thickness.

.4 Aluminum-zinc alloy (AZ) coated steel sheet: to ASTMA 792/A 792M structural quality grade 230, with AZ 150 coating, surface not chemically treated for paint finish, for exterior surfaces exposed to weather, 1.21mm minimum base steel thickness.

.5 Closures: as indicated.

.6 Cover plates, deck flute closures and flashings: steel sheet with minimum base steel thickness of 1.21 mm. Metallic coating same as deck material.

.7 Primer: zinc rich, ready mix to MPI #200.

.8 Caulking: to Section 07 92 00 Joint Sealants.

.9 Fire stopping: to Section 07 84 00 Fire stopping.

2.2 TYPES OF DECKING

.1 Floor deck: 1.21 mm minimum base steel thickness or as indicated on drawing, 38 mm deep profile, non-cellular interlocking side laps.

3. 0 EXECUTION

3.1 GENERAL

.1 Structural steel work: in accordance with CAN/CSA-S136 and CSSBI 10M.

.2 Weld studs of 20mm diameter x 75mm long spaced at maximum 300 on center to structural member or approved alternative and as shown on plans.

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3.2 ERECTION

.1 Erect steel deck as indicated and in accordance with CSSBI 10M and in accordance with reviewed erection drawings.

.2 Where possible, supply and install decking in length that will permit continuity over a minimum of three spans.

.3 Butt ends: to 1.5 to 3 mm gap. Install steel cover plates over gaps wider than 3 mm.

.4 Lap ends: to 50 mm minimum.

.5 Provide minimum welded studs of 20mm diameter at 300 o/c for steel member as indicated on structural drawings.

.6 Deck edge and chord members. All edges of steel decking shall be supported by edge angles fastened to main structural members, unless noted otherwise, use L150x100x5 at roofs.

.7 Unless noted otherwise, all members designated as diaphragm chord members and all perimeter edge angles shall be connected by full strength grove welds or by full strength splice plates on each leg to form continuous compression and tension members. Weld edge angles and chords to Beams, joists and shear connectors and weld deck to angles chords and structural members as shown on drawings or as detailed by decking contractor.

3.3 OPENINGS AND AREAS OF CONCENTRATED LOADS

.1 No reinforcement required for openings cut in deck which are smaller than 150 mm square.

.2 For larger openings, detail framing as follows:

Location	Opening Size (In any direction)	Reinforcing
Roof/Floor	<150mm but < 500mm	L51x51x6.4 running perpendicular to Flutes and welded to minimum two flutes Each side of opening
Roof/Floor	>500mm but < 1000mm	L76x76x6.4 all around and extending to Structural members
Roof/Floor	>1000mm	See special details.

3.4 CONNECTIONS

.1 Install connections in accordance with CSSB1-10M.

END OF SECTION 05 31 00

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1	CIP Concrete	Section 03 30 00
.2	Rough Carpentry for Minor Works	Section 06 08 99
.3	Exterior Painting	Section 09 91 13
.4	Interior Painting	Section 09 91 23

1.2 REFERENCES

1 ASTM International
- .1 ASTM A 53/A 53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
- .2 ASTM A 269 08, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
- .3 ASTM A 307-07v, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .4 ASTM B 209, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- .5 ASTM B 221, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes.

.2 CSA International
- .1 CSA G40.20/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .2 CAN/CSA G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .3 CSA S16-09, Design of Steel Structures.
- .4 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
- .5 CSA W59-M03(R2008), Welded Steel Construction (Metal Arc Welding) [Metric].
  - .1 GS-11-2008, 2nd Edition], Paints and Coatings.

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

.4 The Master Painters Institute (MPI)
- .1 Architectural Painting Specification Manual - current edition.

.5 Green Seal Environmental Standard GS 03 (anti-corrosive primer).

1.3 SUBMITTALS

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

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for sections, plates, pipe, tubing, bolts and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 33 - Health and Safety Requirements
  - .1 For finishes, coatings, primers, and paints applied on site: indicate VOC concentration in g/L.

.3 Shop Drawings:
.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia, Canada. Submit BCBC 2012 Schedule B and C-B and Federal letter of Assurance Schedule B1, B2 and C-B as per Appendix L.
.2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

1.4 QUALITY ASSURANCE

.1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.5 DELIVERY, STORAGE & HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Replace defective or damaged materials with new.

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

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

2.0 PRODUCTS

2.1 MATERIALS

.1 Steel sections and plates: to CSA G40.20/G40.21, Grade 350W.

.2 Exterior Steel, stair stringers and pipe rails: to ASTM A 53/A 53M standard weight galvanized finish.

.3 Welding materials: to CSA W59.

.4 Welding electrodes: to CSA W48 Series.

.5 Bolts and anchor bolts: to ASTM A 307.

.6 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

.7 Aluminum: to ASTM B209, clear anodized finish.

.8 Unistrut: unistrut P1100 or similar profile embedded in concrete, 1.9mm (14ga) hot-dipped galvanized finish conforming to ASTM A123.

.9 Grout: non-shrink, non-metallic flowable, 15MPC at 24 hours.

.10 Stainless Steel Sheet: Conforming to ASTM A167, Type 304, #4 Satin Finish.12 Gauge for use in seismic joint cover plate.

.11 Security fasteners: screws and bolts with spanner type heads to prevent removal except with special tools; non-corrosive type.

.12 Shop coat primer: to CAN/CGSB-1.40M.

.13 Galvanize touch-up primer: zinc rich, read mix to CGSB-1-GP-181M.

.14 Stair treads- Galvanized welded steel stair tread with checkered plate noising maximum spacing between bearing bars to be 13mm, cross bar spacing to be about 100mm, serrated.

.15 Stair Landing Bar Grating- Galvanized welded steel bar grating for stair landing, maximum spacing between bearing bars to be 13mm, cross bar spacing to be about 100mm, serrated.

.16 Aluminum Trench Covers at PHS – ASTM 209 Aluminum 3003-H22 tread plate 6mm minimum thickness, checker pattern; Frames – 6061-T6 aluminum flat bar, 19mm minimum thickness, run flat bars in both direction. Edge of cover to be reinforced with 40x40x6mm thick Aluminum angle.

2.2 FABRICATION

.1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

.2 Use self-tapping shake-proof flat headed screws on items requiring assembly by screws or as indicated.

.3 Where possible, fit and shop assemble work, ready for erection.

.4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

2.3 FINISHES

.1 Galvanizing: hot dipped galvanizing with zinc coating 610 g/m² to CAN/CSA-G164.

.2 Shop coat primer: CGSB 1GP 40M in accordance with chemical component limits and restrictions requirements and VOC limits of GC-03. Prepare surface to an abrasive blast specification SSPC-SP10.

.3 Zinc primer: To CGSB 1GP 48, CISC/CPMA 1-73A, CISC/CPMA 2-75 in accordance with chemical component limits and restrictions requirements and VOC limits of GC-03. Prepare surface to an abrasive blast SSPC-SP10.

2.4 ISOLATION COATING

.1 Isolate 2 different metals from following components, by means of bituminous paint:
- .1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.
- .2 Concrete, mortar and masonry.
- .3 Wood.

2.5 SHOP PAINTING

.1 Primer: VOC limit 250 g/L maximum to GC-03.

.2 Apply one shop coat of primer to metal items, with exception of aluminum, galvanized or concrete encased items.

.3 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 degrees C.

.4 Clean surfaces to be field welded; do not paint.

2.6 RAILINGS AND GUARDRAILS

.1 Steel fabrications: formed to shapes and sizes as indicated.

.2 Galvanize exterior pipe railings after fabrication. Shop coat prime all interior steel work after fabrication.

3.0 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for metal fabrications installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

.4 Contractor shall verify field measurements are as shown on shop drawings prior to fabrication.

3.2 ERECTION

.1 Do welding work in accordance with CSA W59 unless specified otherwise.

.2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.

.3 Provide suitable means of anchorage acceptable to Departmental Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.

.4 Exposed fastening devices to match finish and be compatible with material through which they pass.

.5 Supply components for work by other trades in accordance with shop drawings and schedule.

.6 Weld field connection.

.7 Deliver items over for casting into concrete and building into masonry together with setting templates to appropriate location and construction personnel.

.8 Touch-up rivets, field welds, bolts and burnt or scratched surfaces with primer after completion of:

.1 Primer: maximum VOC limit 250 g/L to GC-03.

.9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.
.1 Primer: maximum VOC limit 250 g/L to GC-03.

3.3 RAILINGS & GUARDRAILS

.1 Install steel railings and guardrails and locations as indicated.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

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

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by metal fabrications installation.

END OF SECTION 05 50 00

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1 Finish Carpentry Section 06 20 00

1.2 REFERENCES

.1 LEED Canada-CI Version 1.0-2007, LEED Green Building Rating System and Reference Guide For Commercial Interiors.

.2 CSA International
- .1 CSA B111- 1974 (R2003), Wire Nails, Spikes and Staples.
- .2 CSA O121- 08, Douglas Fir Plywood.
- .3 CAN/CSA-O141- 05, Softwood Lumber.
- .4 CSA O151- 09, Canadian Softwood Plywood.
- .5 CAN/CSA-O325.0- 07, Construction Sheathing.

.3 Forest Stewardship Council (FSC)
- .1 FSC-STD-01-001- 2004, FSC Principle and Criteria for Forest Stewardship.
- .2 FSC-STD-20-002- 2004, Structure and Content of Forest Stewardship Standards V2-1.
- .3 FSC Accredited Certified Bodies.

.4 Green Seal Environmental Standards (GS)
- .1 GS-11- 2008, 2nd Edition, Paints and Coatings.

.5 National Lumber Grades Authority (NLGA)
- .1 Standard Grading Rules for Canadian Lumber 2000.

.6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
- .1 SCAQMD Rule 1113- A2007, Architectural Coatings.

1.3 ACTION & INFORMATIONAL SUBMITTALS

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

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for rough carpentry work and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Sustainable Design Submittals:
- .1 Construction Waste Management:
  - .1 Submit project Waste Reduction Workplan highlighting recycling and salvage requirements.
  - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.
- .2 Low-Emitting Materials:
  - .1 Submit listing of paints and coatings used in building, comply with VOC and chemical component limits or restriction requirements.
  - .2 Submit listing of composite wood products used in building, stating that they contain no added urea-formaldehyde resins, and laminate adhesives used in building, stating that they contain no urea-formaldehyde.

1.4 QUALITY ASSURANCE

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

.2 Plywood identification: by grade mark in accordance with applicable CSA standards.

.3 Plywood, OSB and wood based composite panel construction sheathing identification: by grademark in accordance with applicable CSA standards.

.4 Sustainable Standards Certification:

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

1.5 DELIVERY, STORAGE & HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect wood from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section.

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

2 .0 PRODUCTS

2.1 MATERIALS

.1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% or less in accordance with following standards:

.1 CAN/CSA-O141.

.2 NLGA Standard Grading Rules for Canadian Lumber.

.3 FSC certified.

.2 Furring, blocking, nailing strips, grounds, rough bucks, curbs, fascia backing and sleepers:

.1 Board sizes: "Standard" or better grade.

.2 Dimension sizes: "Standard" light framing or better grade.

.3 Post and timbers sizes: "Standard" or better grade.

.3 Panel Materials:

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

.1 Urea-formaldehyde free.

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

.1 Urea-formaldehyde free.

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

.1 Urea-formaldehyde free.

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

.5 Primers: in accordance with manufacturer's recommendations for surface conditions:
.1 Primer: VOC limit 100 g/L maximum to GS-11 and SCAQMD Rule 1113.
.2 Paint: VOC limit 50 g/L maximum to GS-11 SCAQMD Rule 1113.
.3 Coating: VOC limit 100 g/L maximum to GS-11 SCAQMD Rule 1113.

2.2 ACCESSORIES

.1 Fasteners: to CAN/CSA-G164, for interior highly humid areas pressure-preservative, fire-retardant treated lumber.

.2 Nails, spikes and staples: to CSA B111.

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

.4 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs recommended for purpose by manufacturer.

3.0 EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

.1 Treat surfaces of material with wood preservative, before installation.

.2 Apply preservative by dipping, or by brush to completely saturate and maintain wet film on surface for minimum 3 minute soak on lumber and 1 minute soak on plywood.

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

3.3 INSTALLATION

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

.2 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding and other work as required.

.3 Align and plumb faces of furring and blocking to tolerance of 1:600.

.4 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.

.5 Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using galvanized steel fasteners.

.6 Install wood backing, dressed, tapered and recessed slightly below top surface of roof insulation for roof hopper.

.7 Install sleepers as indicated.

.8 Use caution when working with particle board. Use dust collectors and high quality respirator masks.

.9 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

.10 Countersink bolts where necessary to provide clearance for other work.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

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

END OF SECTION 06 08 99

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1 Rough Carpentry for Minor Works Section 06 08 99

.2 Door Hardware Section 08 71 00

.3 Toilet & Bath Accessories Section 10 28 13

1.2 REFERENCES

.1 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)
- .1 Architectural Woodwork Quality Standards, 1st edition, 2009.

.2 Canada Green Building Council (CaGBC)
- .1 LEED Canada- CI Version 1.0, LEED (Leadership in Energy and Environmental Design): Green Building Rating System and Reference Package For Commercial Interiors.

.3 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-11.3-M87, Hardboard.

.4 CSA International
- .1 CSA B111-74(R2003), Wire Nails, Spikes and Staples.
- .2 CAN/CSA G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .3 CSA O121-08, Douglas Fir Plywood.
- .4 CSA O141-05, Softwood Lumber.
- .5 CSA O151-09, Canadian Softwood Plywood.
- .6 CSA O153-M1980 (R2008), Poplar Plywood.

.5 Forest Stewardship Council (FSC)
- .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.
- .2 FSC-STD-20-002-2004, Structure and Content of Forest Stewardship Standards V2-1.
- .3 FSC Accredited Certified Bodies.

.6 National Lumber Grades Authority (NLGA)
- .1 NLGA Standard Grading Rules for Canadian Lumber 2008.

.7 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
- .1 SCAQMD Rule 1168 2005, Adhesives and Sealants Applications.

.8 Underwriters Laboratories of Canada (ULC)
- .1 CAN4-S104-80(R1985), Standard Method for Fire Tests of Door Assemblies.
- .2 CAN/ULC-S105-09, Standard Specification for Fire Door Frames.

1.3 SUBMITTALS

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

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for plywood

MDF and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 33- Health and Safety Requirements.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia, Canada.

.2 Indicate details of construction, profiles, jointing, fastening and other related details.

.3 Indicate materials, thicknesses, finishes and hardware.

.4 Samples:

.1 Submit for review and acceptance of each unit.

.2 Samples will be returned for inclusion into work.

.3 Submit duplicate 300 x 300 mm samples of handrails, soffits and cedar siding, wood trim.

.5 Certifications: submit certificates signed by manufacturer certifying materials comply with specified performance characteristics and physical properties.

.6 Test and Evaluation Reports: submit certified test reports for composite wood from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.

.7 Sustainable Design Submittals:

.1 Construction Waste Management:

.1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

.2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.

.2 Recycled Content:

.1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.

.3 Regional Materials: submit evidence that project incorporates required percentage 10% of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.

.4 Certified Wood:

.1 Submit listing of wood products and materials used, produced from wood obtained from forests certified by FSC Accredited Certification Body in accordance with FSC-STD-01-001.

.2 Submit manufacturer's FSC Chain-of-Custody Certificate number.

.5 Low-Emitting Materials:

.1 Submit listing of adhesives and sealants used in building, showing compliance with VOC and chemical component limits or restrictions requirements.

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

1.4 QUALITY ASSURANCE

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

(CLSAB).

.2 Plywood, particleboard, OSB and wood based composite panels to CSA and ANSI standards.

.3 Wood fire rated frames and panels: listed and labelled by an organization accredited by Standards Council of Canada to CAN4-S104 and CAN/ULC-S105.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials off ground and in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect wood products from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan Waste Reduction Workplan related to Work of this Section

.5 Packaging Waste Management: remove for reuse of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal

2.0 PRODUCTS

2.1 MATERIALS

.1 Softwood lumber: S4S, moisture content 19% or less in accordance with following standards:
- .1 CSA O141.
- .2 NLGA Standard Grading Rules for Canadian Lumber
- .3 AWMAC custom or premium grade, where noted, moisture content as specified.
- .4 Machine stress-rated lumber is acceptable.
- .5 Hardwood lumber: moisture content in accordance:
  - .1 AWMAC custom grade, moisture content as specified.

.2 Panel Material: Urea-formaldehyde free
- .1 Recycled content: provide information indicating recycled content on a % (Post-Consumer + ½ Post-Industrial)
- .2 FSC certified.
- .3 Douglas fir plywood (DFP): to CSA O121, standard construction. 6.1.5 and 6.2.5 where both sides exposed to view.
- .4 Hardwood plywood: to ANSI/HPVA HP-1.
- .5 Medium density fibreboard (MDF): to ANSI A208.2, density 640-800 kg/m^3.
- .6 Decorative overlaid composite panels.
  - .1 Decorative overlay, heat and pressure laminated with suitable resin to thickness indicated mm thick MDF urea-formaldehyde free core.
  - .2 Overlay bonded to both faces where exposed two sides, and when panel material require surface on one side only, reverse side to be overlaid with a plain (buff)

balancing sheet.

.3 Furniture finish: stain wood grain pattern selected by Departmental Representative

.4 Edge finishing: edges dadoed or saw kerfed to take plastic "T" moulding in width and colour to match melamine finish.

2.2 ACCESSORIES

.1 Nails and staples: to CSA B111; galvanized to CAN/CSA-G164 for exterior work, interior humid areas and for treated lumber; plain finish elsewhere.

.2 Wood screws: plain, type and size to suit application.

.3 Splines: wood

.4 Adhesive and Sealants: in accordance with Section 07 92 00 - Joint Sealants.

3 .0 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for wood products installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied [and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Do finish carpentry to Quality Standards of (AWMAC).

.2 Scribe and cut as required, fit to abutting walls, and surfaces, fit properly into recesses and to accommodate piping, columns, fixtures, outlets, or other projecting, intersecting or penetrating objects.

.3 Form joints to conceal shrinkage.

3.3 CONSTRUCTION

.1 Fastening:

.1 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.

.2 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.

.3 Set finishing nails to receive filler. Where screws are used to secure members, countersink screw in round smooth cut hole and plug with wood plug to match material being secured.

.4 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.

.2 Interior frames:

.1 Set frames with plumb sides and level heads and sills and secure.

.3 Shelving:

.1 Install shelving on ledgers or shelf brackets as indicated.

3.4 INSTALLATION OF SHELVING

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

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

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

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by finish carpentry installation.

END OF SECTION 06 20 00

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1 Rough Carpentry for Minor Works Section 06 08 99

.2 Finish Carpentry Section 06 20 00

.3 Painting Section 09 91 23

1.2 REFERENCES

.1 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)
- .1 Architectural Woodwork Quality Standards Illustrated, 8th edition, Version 1.0 2009.

.2 Canada Green Building Council (CaGBC)
- .1 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For Commercial Interiors.

.3 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-71.20-M88, Adhesive, Contact, Brushable.

.4 CSA International
- .1 CSA B111-74 (R2003), Wire Nails, Spikes and Staples.
- .2 CSA O112.4 SERIES-M1977 (R2006), Standards for Wood Adhesives.
- .3 CSA O121-08, Douglas Fir Plywood.
- .4 CSA O141-05, Softwood Lumber.
- .5 CSA O151-09, Canadian Softwood Plywood.
- .6 CSA O153-M1980 (R2008), Poplar Plywood.

.5 American National Standards Institute (ANSI)
- .1 ANSI/NPA A208.1-09, Particleboard.
- .2 ANSI/NPA A208.2-09, Medium Density Fiberboard (MDF) for Interior Applications.
- .3 ANSI/HPVA HP-1 04, Standard for Hardwood and Decorative Plywood.

.6 ASTM International
- .1 ASTM E 1333-96 (2002), Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates From Wood Products Using A Large Chamber.
- .2 ASTM D 2832-92 (R2005), Standard Guide for Determining Volatile and Nonvolatile Content of Paint and Related Coatings.

.7 ASTM D 5116-06, Standard Guide For Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products.

.8 Forest Stewardship Council (FSC)
- .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.
- .2 FSC-STD-20-002-2004, Structure and Content of Forest Stewardship Standards V2-1.

.9 Green Seal Environmental Standards (GS)
- .1 GS-11-2008, 2nd Edition, Paints and Coatings.
- .2 GS-36-00, Commercial Adhesives.

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

.1 Material Safety Data Sheets (MSDS).

.11 National Electrical Manufacturers Association (NEMA)
.1 ANSI/NEMA LD-3-05, High-Pressure Decorative Laminates (HPDL).

.12 National Hardwood Lumber Association (NHLA)
.1 Rules for the Measurement and Inspection of Hardwood and Cypress 1998.

.13 National Lumber Grades Authority (NLGA)
.1 Standard Grading Rules for Canadian Lumber 2003(R2007).

.14 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
.1 SCAQMD Rule 1113-A2007, Architectural Coatings.
.2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

1.3 SUBMITTALS

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

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

.3 Shop Drawings:
.1 Indicate details of construction, profiles, jointing, fastening and other related details.
.1 Scales: profiles half-full sized, details quarter-full sized.
.2 Indicate materials, thicknesses, finishes and hardware.
.3 Indicate locations of service outlets in casework, typical and special installation conditions, and connections, attachments, anchorage and location of exposed fastenings.

.4 Samples:
.1 Submit for review and acceptance of each unit.
.2 Samples will be returned for inclusion into work.
.3 Submit duplicate samples of laminated plastic
.4 Submit duplicate samples of laminated plastic joints, edging, cutouts and post formed profiles.

.5 Certifications: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.6 Sustainable Design Submittals:
.1 Construction Waste Management:
.1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
.2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating amount of construction wastes that are recycled or salvaged.

.2 Low-Emitting Materials:
.1 Submit listing of adhesives and sealants and paints and coatings used in

building, comply with VOC and chemical component limits or restrictions requirements.

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

1.4 QUALITY ASSURANCE

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

.2 Plywood, particleboard, OSB and wood based composite panels to CSA and ANSI standards.

.3 Mock-ups:

.1 Construct mock-ups in accordance with Section 01 45 00 - Quality Control.

.1 Shop prepare one base cabinet unit, wall cabinet, counter top and shelving unit complete with hardware and shop applied finishes, and install where directed by Departmental Representative.

.2 Allow 72 hours for inspection of mock-up by Departmental Representative before proceeding with Work.

.3 When accepted, mock-up will demonstrate minimum standard for Work.

.4 Do not proceed with work prior to receipt of written acceptance of mock-up by Departmental Representative.

.5 Mock-up may remain as part of finished work.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.1 Protect millwork against dampness and damage during and after delivery.

.2 Store millwork in ventilated areas, protected from extreme changes of temperature or humidity.

.3 Storage and Handling Requirements:

.1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect architectural woodwork from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work

.5 Packaging Waste Management: remove for reuse by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.6 COORDINATION & VERIFICATION

.1 Verify all dimensions & existing conditions on job site prior to all shop fabrication and work on site. Where major discrepancies occur, alert Departmental Representative.

.2 Coordinate work of this section with that of wall, electrical and mechanical sections where millwork interfaces with drywall partitions, plumbing, electrical outlets, etc.

.3 It shall be the responsibility of this section to verify the dimensions and installation details for all Departmental Representative supplied equipment and furnishings requiring cut-outs, adaptations and interfacing with millwork items.

1.7 INSPECTION

.1 Architectural woodwork shall be manufactured and/or installed to AWMAC Quality Standards (Custom Grade) and shall be subject to an inspection at the plant and/or site, by an appointed inspector approved by the M.M.A.B.C. (the BC Chapter of AWMAC). Such inspection costs shall be included in the tender price for this project. Shop drawings shall be submitted for review or approval before any work is commenced. Where it is deemed necessary by the Departmental Representative, a sample cabinet (consisting of a minimum of 1 drawer, 1 door, showing precisely the materials, hardware and the type of construction the manufacturer intends to use), shall be submitted for inspection.

.2 Any work which does not meet AWMAC Quality Standards as specified, shall be replaced by this Section at no additional cost to the Department Representative and to the satisfaction of the Departmental Representative and the inspector.

1.8 GUARANTEE

.1 This section shall furnish the Departmental Representative with a two (2) year M.M.A.B.C. (The BC Chapter of AWMAC) Guarantee Certificate or an equivalent maintenance bond, to the full value of the architectural woodwork sub-contract, certifying that the architectural woodwork supplied will be in accordance with the Standards incorporated in the AWMAC Quality Standards manual, latest edition.

.2 The Guarantee shall cover replacing and refinishing to make good any defects in architectural woodwork due to faulty workmanship or defective materials supplied by this Section, which appear during a two (2) year period following the substantial completion of the Project.

2.0 PRODUCTS

2.1 MATERIALS

.1 Softwood lumber: unless specified otherwise, S4S, moisture content 15% or less in accordance with following standards:
- .1 CSA O141.
- .2 NLGA Standard Grading Rules for Canadian Lumber.
- .3 AWMAC custom grade, moisture content as specified.
- .4 Forestry Stewardship Council (FSC) certified.

.2 Machine stress-rated lumber is acceptable for all purposes.

.3 Hardwood lumber: moisture content 15% or less in accordance with following standards:
- .1 National Hardwood Lumber Association (NHLA).
- .2 AWMAC custom grade, moisture content as specified.

.5 Douglas fir plywood (DFP): to CSA O121, standard construction, FSC certified.
- .1 Plywood resin to contain no added urea-formaldehyde.

.6 Canadian softwood plywood (CSP): to CSA O151, standard construction, FSC certified.
- .1 Plywood resin to contain no added urea-formaldehyde.

.7 Hardwood plywood: to ANSI/HPVA HP-1, FSC certified.

.1 Plywood resin to contain no added urea-formaldehyde.

.8 Poplar plywood (PP): to CSA 0153, standard construction, FSC certified.
.1 Plywood resin to contain no added urea-formaldehyde.

.9 Hardboard:
.1 To CAN/CGSB-11.3, FSC certified.
.2 Hardboard resin to contain no added urea-formaldehyde.

.10 MDF (medium density fibreboard) core: to ANSI/NPA A208.2, Grade Custom, density 769 kg/m², FSC certified.
.1 Medium density fibreboard performance requirements to: ANSI/NPA A208.2.
.2 MDF resin to contain no added urea-formaldehyde.

.11 Laminated plastic for flatwork: to NEMA LD3, Type: General Purpose. Colours, pattern and finish, refer to schedule.
.1 For Cabinet tops, rigid plastic bases, countertops, backsplashes: Grade HGS, Size 1.27mm thick.
.2 For exposed vertical surfaces including front of doors, drawers and outside of gables: Grade VGS, Size 0.76m thick.

.12 Laminated plastic for post forming work: to NEMA LD3, Type: Postforming, Grade HGP, size 1mm thick. Colours, pattern and finish, refer to schedule.

.13 Laminated plastic backing sheet: Grade BK, Type S minimum of 0.5 mm thick or same thickness as face laminate, colour same as face laminate.

.14 Laminated plastic liner sheet: Grade GP, Type S, size 0.5mm thick, white colour U.N.O.

.15 Thermofused Melamine: to NEMA LD3 Grade VGL.
.1 High wear resistant thermofused melamine: equal or exceed 400 cycles (Minimum standard for HPL abrasion test).

.16 Nails and staples: to CSA B111.

.17 Wood screws: stainless steel, type and size to suit application.

.18 Splines: metal.

.19 Sealant: in accordance with Section 07 92 00 - Joint Sealants.
.1 Sealants: VOC limit 250 g/L maximum to SCAQMD Rule 1168.

.20 Laminated plastic adhesive:
.1 Adhesive: contact adhesive to CAN/CGSB-71.20.
.2 Adhesives: VOC limit 30 g/L maximum to SCAQMD Rule 1168 GS-36.
.3 Clear Wood Finishes: VOC limit 250 g/L maximum to GS-11
.4 Paints: VOC limit 50 g/L maximum to GS-11.

2.2 MANUFACTURED UNITS

.1 Casework with Plastic Laminate Finish:
.1 AWMAC Quality Grade: Custom. Locations as noted on the drawings.
.2 Construction: Conform to Section 400 of the manual for Flush Overlay Casework. Close voids and cavities at inside corners and behind end fillers of upper cabinets.

.3 Exposed Parts: Plastic laminate on MDF, U.N.O.
.4 Semi-Exposed Parts: Plastic Laminate on MDF core. Color, pattern and finish to match exposed parts, U.N.O.
.5 Interior Shelving, U.N.O: 19mm melamine with finished edges. All interior gables and interior backing to be melamine on closed units. All doors, drawers would be plastic laminate on both sides; on open units al interior to be plastic laminate.
.6 Edge Banding, U.N.O.: matching laminate face material finish in colour, pattern, and finish as per AWMAC Standard.
.7 Concealed Parts: backer to manufacturer's option.

2.3 CASEWORK HARDWARE

.1 Hinges: fully concealed, all metal construction, 3-way adjustment, one (1) hinge in each pair to be spring activated, 170 degree opening.

.2 Door and Drawer pulls: Stainless Steel Finish, 191mm c/c, 248mm length, 1 3/8" (35mm) projection.

.4 Drawer Slides: Full extension with 25mm over travel, side mounting, telescopic action on ball bearings, 100 lb class, chrome finish, lift or lever disconnect for drawer removal, non-handed.

.5 Shelf Supports: Metal Supports and socket, support 6mm dia hole, socket 8mm dia hole, Nickel Finish.

.6 Pull-Out Garbage/Recycle Bin: Top-Mounting recycling centre with soft-closing mechanism. Bin Quantity: 1; capacity: 50 Qt; Colour: Grey; Product Material: plastic. Dimension: 305 W x 591 D x 552 H mm (12" W x 23.25" D x 21.75" H). Slide Extension: Over travel 1.5". Load Rating: 68 kg.(150 lb.). Come as a complete set with door mounting brackets pre-assembled.

.7 Finish to all cabinet hardware-Satin chrome finish unless otherwise specified.

.8 All millwork hardware as required to complete work.

2.4 WORKSURFACES

.1 Plastic Laminate on MDF core.

.2 Self edge countertop, conform to AWI/AWMAC QSI Manual Section 400C.

.3 Backer sheets to be applied to reverse side of all laminated work surfaces.

.4 Edge Treatment: Same as laminate cladding on horizontal surfaces, U.N.O.

.5 Core Materials: 19mm MDF generally, and non-telegraphing plywood at countertops with sink or other plumbing cut-outs. 25mm thick for longer span as per AWMAC requirement.

2.5 COUNTERTOPS & BACK/SIDE SPLASHES:

.1 Plastic laminate on plywood core.

.2 Self edge countertop for counter, conform to AWI/AWMAC AS1 Manual Section 400C.

.3 Backer sheets to be applied to the reverse side of all laminated countertops.

.4 Edge treatment: Same as laminate on horizontal surfaces, U.N.O.

.5 Core Materials: 19mm minimum non-telegraphing plywood at countertops with sink or other plumbing cut-outs. 25mm thick for longer span as per AWMAC requirement.

.6 Caulking at all edges.

2.6 FABRICATION

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

.2 Shop install cabinet hardware for doors, shelves and drawers. Recess shelf standards unless noted otherwise.

.3 Shelving to cabinetwork to be adjustable unless otherwise noted.

.4 Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes and other fixtures.

.5 Shop assemble work for delivery to site in size easily handled and to ensure passage through building openings.

.6 Obtain governing dimensions before fabricating items which are to accommodate or abut appliances, equipment and other materials.

.7 Ensure adjacent parts of continuous laminate work match in colour and pattern.

.8 Veneer laminated plastic to core material in accordance with adhesive manufacturer's instructions. Ensure core and laminate profiles coincide to provide continuous support and bond over entire surface. Use continuous lengths up to 2400mm. Keep joints 600 mm from sink cutouts.

.9 Form shaped profiles and bends as indicated, using post forming grade laminate to laminate manufacturer's instructions.

.10 Use straight self-edging laminate strip for flatwork to cover exposed edge of core material. Chamfer exposed edges uniformly at approximately 20 degrees. Do not mitre laminate edges.

.11 Apply laminate backing sheet to reverse side of core of plastic laminate work.

.12 Apply laminated plastic liner sheet to interior of cabinetry.

2.6 FINISHING

.1 Finish in accordance with Section 09 91 23 - Painting.

3.0 EXECUTION

3.1 EXAMINATION

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Do architectural woodwork to Quality Standards of AWMAC.

.2 Install prefinished millwork at locations shown on drawings.
.1 Position accurately, level, plumb straight.

.3 Fasten and anchor millwork securely.
.1 Supply and install heavy duty fixture attachments for wall mounted cabinets.

.4 Use draw bolts in countertop joints.

.5 Scribe and cut as required to fit abutting walls and to fit properly into recesses and to accommodate piping, columns, fixtures, outlets or other projecting, intersecting or penetrating objects.

.6 At junction of plastic laminate counter back splash and adjacent wall finish, apply small bead of sealant in accordance with Section 07 92 00 - Joint Sealants.

.7 Apply water resistant building paper over wood framing members in contact with masonry or cementitious construction.

.8 Fit hardware accurately and securely in accordance with manufacturer's written instructions.

.9 Install cabinet hardware, at location as indicated, and as required.

.10 For site application, offset joints in plastic laminate facing from joints in core.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
.1 Clean millwork and cabinet work inside cupboards and drawers and outside surfaces.
.2 Remove excess glue from surfaces.
.3 Engineered resin to be cleaned as per manufacturer’s instructions.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

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

.2 Protect installed products and components from damage during construction.

.3 Repair damage to adjacent materials caused by architectural woodwork installation.

END OF SECTION 06 40 00.

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1 Windows Section 08 50 00

.2 Gypsum Board Assemblies Section 09 21 16

.3 Non-Structural Metal Framing Section 09 22 16

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
- .1 ASTM C 553-02, Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.
- .2 ASTM C 665-01e1, Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- .3 ASTM C 1320-05, Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.

.2 Canadian Gas Association (CGA)
- .1 CAN/CGA-B149.1-05, Natural Gas and Propane Installation Code Handbook.
- .2 CAN/CGA-B149.2-05, Propane Storage and Handling Code.

.3 Canadian Standards Association (CSA International)
- .1 CSA B111-1974 (R2003), Wire Nails, Spikes and Staples.

.4 Underwriters Laboratories of Canada (ULC)
- .1 CAN/ULC-S604-M1991, Type A Chimneys.
- .2 CAN/ULC-S702-1997, Standard for Mineral Fibre Insulation

1.3 SUBMITTALS

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

.2 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.

.2 Manufacturer's Instructions:
- .1 Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

.1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.3 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar GANTT Chart.
- .1 Verify project requirements.
- .2 Review installation and substrate conditions.
- .3 Co-ordinate with other building sub-trades.

.4 Review manufacturer's installation instructions and warranty requirements.

.4 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.5 WASTE MANAGEMENT & DISPOSAL

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

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

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

2.0 PRODUCTS

2.1 INSULATION

.1 Thermal Batt and blanket mineral wool: non-combustible to ULC CAN 4-S114, zero flame spread and smoke development to ULC S102, comply CAN/ULC-S702-97 Type 1.

.1 Thickness: as indicated.

.2 Density: more than 32 kg/m^3 , 184 mm thk = 5.9 kg/m^3, 150 mm thk = 4.8 kg/m^3, 89 mm thk = 2.8 kg/m^3

.3 Minimum Insulation Value:
R10 (RSI 1.76) = 64 mm thk
R14 (RSI 2.47) = 89 mm thk
R22.5 (RSI 3.96) = 152 mm thk

.2 Acoustic Batt & blanket mineral wool: Comply Type 1 CAN/ULC-5702-09, Type 1 for ASTM C665, Comply ASTM C553.

.1 Fire Performance:

CAN4 S114	Test for Non-Combustibility	Non-Combustible
ASTM E 136	Behavior of Materials at 750°C (1382°F)	Non-Combustible
CAN/ULC S102	Surface Burning Characteristics	Flame Spread = 0 Smoke Developed = 0
ASTM E84 (UL 723)	Surface Burning Characteristics	Flame Spread = 0 Smoke Developed = 0
CAN/ULC S129	Smolder Resistance	0.09%

.2 Acoustical Performance:

ASTM E 90	Airborne Sound Transmission	Tested
ASTM # 413	Rating Sound Insulation	Tested
ASTM C 423	Sound Absorption coefficients	Tested
ASTM E 1050	Impedance and Absorption of Acoustical Materials	Tested

.3 Density: 45 kg/m^3 minimum

2.2 ACCESSORIES

.1 Insulation clips:

.1 Impale type, perforated 50 x 50 mm cold rolled carbon steel 0.8 mm thick, adhesive back, spindle of 2.5 mm diameter annealed steel, length to suit insulation, 25 mm diameter washers of self-locking type.

.2 Nails: galvanized steel, length to suit insulation plus 25 mm, to CSA B111.

.3 Staples: 12 mm minimum leg.

.4 Tape: as recommended by manufacturer.

3.0 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSULATION INSTALLATION

.1 Install insulation to maintain continuity of thermal protection to building elements and spaces.

.2 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.

.3 Do not compress insulation to fit into spaces.

.4 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from CAN/CGA-B149.1 and CAN/CGA-B149.2 Type B and L vents.

.5 Do not enclose insulation until it has been reviewed and approved by Departmental Representative.

3.4 CLEANING

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

END OF SECTION 07 21 16

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1 Blanket Insulation — Section 07 21 16

.2 Sheet Metal Flashing & Trim — Section 07 62 00

.3 Windows — Section 08 50 00

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-19.13M-M87, Sealing Compound, One Component, Elastomeric Chemical Curing.
- .2 CAN/CGSB-19.24M-M90, Multi-Component, Chemical Curing Sealing Compound.
- .3 CGSB 19-GP-14M-84, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing.

.2 Sealant and Waterproofer's Institute - Sealant and Caulking Guide Specification.

1.3 SUBMITTALS

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

.2 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 33 – Health Safety Requirements.

.3 Quality Assurance Submittals: submit following in accordance with Section 01 45 00 - Quality Control.
- .1 Existing Substrate Condition: report deviations, as described in PART 3 -EXAMINATION in writing to Departmental Representative.
- .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

1.4 QUALITY ASSURANCE

.1 Qualifications:
- .1 Applicator: company specializing in performing work of this section with minimum 5 years documented experience with installation of air/vapour barrier systems.

.2 Mock-Up:
- .1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
- .2 Construct typical exterior wall panel, incorporating louvre and door frame, insulation, illustrating materials interface and seals.
- .3 Locate in location as agreed to with Departmental Representative.
- .4 Mock-up may remain as part of finished work.
- .5 Allow 72hours for inspection of mock-up by Departmental Representative before proceeding with air/vapour barrier Work.

.3 Schedule site visits with Departmental Representative, to review Work, at stages listed:
- .1 After delivery and storage of products, and when preparatory Work is complete, but before

installation begins.
.2 Minimum twice during progress of Work at 25% and 60% complete.
.3 Upon completion of Work, after cleaning is carried out, prior to cover up by other building component.

1.5 DELIVERY STORAGE AND HANDLING

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

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

.3 Avoid spillage: immediately notify Departmental Representative if spillage occurs and start clean up procedures.

.4 Clean spills and leave area as it was prior to spill.

1.6 WASTE MANAGEMENT AND DISPOSAL

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

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

1.7 AMBIENT CONDITIONS

.1 Install solvent curing sealants and vapour release adhesive materials in open spaces with ventilation.

.2 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.

.3 Maintain temperature and humidity recommended by materials manufactures before, during and after installation.

1.8 SEQUENCING

.1 Sequence work in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Charts.

.2 Sequence work to permit installation of materials in conjunction with related materials and seals.

1.9 WARRANTY

.1 For sealant and sheet materials the 12 months warranty period is extended to 24 months.

2.0 PRODUCTS

2.1 SELF ADHESIVE MEMBRANE

.1 Membrane composed of high temperature grade SBS modified bitumen and a Tri-laminate woven polyethylene face on the top surface. The self-adhesive bottom surface is protected by a silicone release sheet.
.1 Water Vapour transmission 202 g/m² /24 hours/ASTM E96/B (Dessicant).
.2 Dry Tensile Strength 41 lbf/182N MD, 29 lbf/129N CD, ASTM D 828.
.3 Average Dry Breaking Force 127 lbf/565N MD, 91 lbf/405N CD, ASTM D 5034.
.4 Accelerated Aging, Pass, ICC-ES AC 48, 25 cycles.
.5 Cycling and Elongation, Pass, ICC-ES AC48, 100 cycles at -29°C (20°F).

.6 Application Temperature Minimum 5°C (41°F).
.7 Flame Spread Index 0, Class A, ASTM E-84.
.8 Smoke Developed 105, Class A, ASTM E-84.
.9 Membrane thickness, Minimum 40 mil.
.10 Air Permeance, Pass, ASTM E 2178 (Maximum 0.02 L/m²s @ 75Pa or 0.004 cfm/ft² @ 1.57pcf) ASTM E 2357 – assembly, Pass.
.11 Criteria for Water Resistive Barriers, Pass, ICC-ES AV 38.
.12 Low Temp Flexibility, Pass, ICC-AC38/3.3.4.
.13 Peel-adhesion to Unprimed Plywood, PASS, ICC-ES AC48, Control 62 lbf/ft-905N/m, After 7 day water immersion 54 lbf/ft-788N/m, After accelerated aging 72 lbf/ft-1051N/m, After UV exposure 77 lbf/ft-1124N/m
.14 Water Penetration Resistance around Nails, PASS, AAMA 711-05 and ASTM D 1970 modified.

2.2 SEALANTS

.1 Sealants in accordance with Section 07 92 10 - Joint Sealing.

.2 Sealant compatible with membrane as recommended by the manufacturer:
.1 Silicone Sealant specifically for use with self-adhered membrane.

.3 Primer: recommended by sealant manufacturer as appropriate to application.

.4 Substrate Cleaner: non-corrosive type recommended by sealant manufacturer and compatible with adjacent materials.

2.3 PRIMER

.1 Apply primer to plywood according to manufacturer’s specification. Ensure proper adhesion and compatibility to the membrane.

2.4 ACCESSORIES

.1 Provide mechanically fastened stainless steel termination bar with gumlip edge.

3.0 EXECUTION

3.1 MANUFACTURER’S INSTRUCTIONS

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

3.2 GENERAL

.1 Perform Work in accordance with Sealant and Waterproofer's Institute - Sealant and Caulking Guide Specification requirements for materials.

3.3 EXAMINATION

.1 Verify that surfaces and conditions are ready to accept work of this section.

.2 Ensure surfaces are clean, dry, sound, smooth, continuous and comply with air barrier manufacturer's requirements.

.3 Report unsatisfactory conditions to Departmental Representative in writing.

.4 Do not start work until deficiencies have been corrected.
.1 Beginning of Work implies acceptance of conditions.

3.4 PREPARATION

.1 All surfaces to receive the membrane must be thoroughly cleaned so as to have removed all concrete spatter, job dirt, laitance, from release agents, curing compounds, or any other substance which could inhibit the adhesion, and long term performance of the membrane.

.2 All honeycombing in concrete shall be grouted flush prior to application of primer.

.3 Apply primer as per manufacturer's recommendation to all surfaces to receive the membrane. Use a 2 coat application on gypsum board or plywood substrate.

.4 Prepare in accordance with manufacturer's instructions.

.5 Apply a horizontal membrane strip over vertical leg and fasteners of all horizontal cladding supports. Seal top with mastic regular.

.6 Fill all joints or gaps wider than ¼" with galvanized steel sheet steel or wood backing and apply 12" strip of membrane over joints prior to application of the field membrane. Seal all side laps without factory bitumen self-adhering edge and all top laps with mastic.

3.5 APPLICATIONS

.1 Apply in accordance with manufacturer's instructions.

.2 All joints within and between back up walls and window frames shall be sealed according to detail drawings.

.3 Ensure continuity of air barrier. Co-ordinate construction of roof/wall junction to maintain continuity of air barrier from wall to roof. Co-ordinate with construction of exterior walls to maintain continuity of air barrier between various exterior wall construction types.

.4 Shingle laps to drain. Minimum side and end laps as per manufacturer's recommendation with a minimum of 75mm.

.5 Membrane should be adhered onto window frame section as per detail drawings.

.6 Lap and seal air barrier membrane over through-wall flashing at base of wall and at all horizontal wall flashings.

.7 Lap roof membrane flashing over air/vapour barrier membrane at parapets and seal.

.8 Seal all through-wall equipment flanges with air barrier membrane flashing strips; apply mastic to edges.

.9 Seal all metal fabrication flanges with air/vapour barrier membrane flashing strips; apply mastic to edges.

.10 Seal all horizontal drip flashings to air/vapour barrier membrane with minimum 150 mm strips of membrane flashing applied horizontally; apply mastic to edges of flashing membrane.

3.6 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

3.7 PROTECTION OF WORK

.1 Protect finished work in accordance with Section 01 61 00 - Common Product Requirements.

.2 Do not permit adjacent work to damage work of this section.

.3 Ensure finished work is protected from climatic conditions.

END OF SECTION 07 27 00.01

1.0 GENERAL

1.1 SECTION INCLUDES

.1 Supply and install preformed metal cladding panels, including all necessary supporting structure, girts, clips, flashings, sealants, gaskets, caulking and accessories to full extent shown on drawings and as specified herein.

1.2 RELATED SECTIONS

.1	Rough Carpentry for Minor Works	Section 06 08 99
.2	Blanket Insulation	Section 07 21 16
.3	Air Barriers- Descriptive or Proprietary	Section 07 27 00.01
.4	Sheet Metal Flashing and Trims	Section 07 62 00
.5	Joint Sealants	Section 07 92 00
.6	Windows	Section 08 50 00
.7	Gypsum Board Assemblies	Section 09 21 16

1.4 SUBMITTALS

.1 Submit 300 x 300 mm size sample of wall cladding material, of color and profile specified, in accordance with Section 01 33 00 Submittal Procedures.

.2 Submit product data or shop drawings in accordance with Section 01 33 00 showing the profiles of preformed metal cladding units, and the detail of forming, jointing (gaskets if any), internal supports, anchorages, trim, flashing and accessories. Show details of weatherproofing at edges, terminations and penetrations of the metal cladding work. Show small scale layout and elevations of entire work.

.3 Shop drawings to be designed and prepared under the supervision of a registered Professional Engineer registered in British Columbia. All submitted shop drawings shall be sealed and signed by the said Professional Engineer. The same Professional Engineer shall provide a letter of Assurance Schedule B and C-B as per B.C.B.C. 2012 or Model Schedule B and C confirming the work is designed and installed in conformance with the structural design criteria.

1.5 EXISTING CONDITIONS

.1 Before commencing erection, examine the structure carefully. Notify the Consultant of any defects and have the base surfaces corrected as required. Do not work until corrective measures are taken.

.2 Commencement of work signifies acceptance of all base surfaces.

1.6 WARRANTY

.1 The metal cladding installation and material shall be warranted against the penetration of rain, snow, ice or environmental elements, to be rigid and safely able to withstand all wind and snow loads, not to deflect, buckle, twist or pull away from fastenings over a period of two (2) years from the date of Substantial Performance. Defects occurring within the two year warranty period shall be rectified at no cost to the Owner.

2.0 PRODUCTS

2.1 MATERIALS

.1 Exterior Cladding and Trim Materials

.1 Minimum 0.759mm (22ga) sheet steel.

.2 Minimum 0.912mm (20ga) for flat stock sheet metal installed behind fixtuers or wall penetration.

.3 All exposed sheet metal or cladding material to be polyurethane pre-painted finish to match adjoining profile metal cladding.

.2 Profile:

.1 2 2/3" x 7/8" Corrugated Metal Cladding polyurethane pre-painted finish.

.3 Assembly and Installation Accessories: Provide manufacturer's standard fasteners, brackets, clips, anchoring devices, furring strips, spacers, flashings, closures, adhesives, joint sealers, expansion joints and other components needed for a complete permanently weather proof installation. Use materials which are non-corrosive, non-deteriorating, and compatible with the panel faces. All exposed fasteners shall be painted to match siding panels.

.4 Trims and Custom Break Shapes: Provide trim components as part of the preformed metal cladding work, including all flashing and collars, capping, seam covers, end stops and filler pieces, etc. Match the material and finish of the exterior panels, thickness minimum 0.61 mm (22 ga).

.5 Flashings: shall be of the same material and finish as metal cladding, thickness minimum 0.759 mm.

.6 Closure Strips: shall be of same material and finish as metal cladding, thickness minimum 0.759 mm.

.7 Sealant: for metal cladding system with the colour to match adjoining surfaces, field applied around all openings, and to side of all cladding. Sealant shall comply with Section 07 92 00.

.8 Z-Girt: Stainless steel.

2.2 PANEL FABRICATION

.1 Determine the section properties of the metal cladding panel systems in strict accordance with the requirements of the National Building Code, BC Building Code; Canadian Structural Design Manual including CSA S136, Design of Light Gauge Steel Structured Members.

.2 Metal cladding panel systems shall withstand all live loads resulting from wind or a combination of wind and temperature as defined in the National Building Code, BC Building Code without exceeding the maximum working stress of 20,000 psi for steel members or the maximum deflection of 1/180th of the span.

.3 Form sections square, true and accurate to size, free of distortion and other defects detrimental to appearance or performance.

.4 Provide resilient gaskets or spacers between metal components of panel assemblies, and between panels, as required to eliminate metal-to-metal contact and movement noises in the completed work, which might result from thermal or structural movements.

3.0 EXECUTION

3.1 PREPARATION

.1 Wherever possible, take field measurements prior to completion of shop fabrication and finishing of preformed metal cladding. Do not delay job progress; allow for trimming where final dimensions cannot be established before fabrication.

3.2 INSTALLATION

.1 Comply with panel manufacturer's instructions and approved Engineered shop drawing for assembly, installation and erection of preformed metal cladding.

.2 Apply a coat of bituminous paint, concealed, on one or both surfaces wherever dissimilar metals would otherwise be in contact. Use gasket fasteners where needed to eliminate the possibility of corrosive or electrolytic action between metals.

.3 Anchor component parts of the preformed metal cladding securely in place, providing for necessary thermal and structural movement as recommended by manufacturer and as indicated on Engineered Shop Drawings. Make corners square, surfaces true and straight in all planes and lines accurate to profiles.

.4 Tolerances: Erect the Work plumb, level and true to line with tolerances not exceeding 6 mm in runs of 6 m.

.5 Install exterior corners, fillers and closure strips with individually formed and profiled work using concealed fasteners.

.6 Install sealants for the preformed metal cladding work as indicated and as required for performance. Comply with sealant manufacturer's instructions for installation and curing.

.7 Install starter strips, backer plates, drip caps, outside custom corners and other trims and flashings, as indicated on the drawings and as required to provide a complete and finished product.

.8 All flashing in contact with steel preformed metal cladding as herein described shall be steel and by this trade, escept as noted otherwise.

.9 Isolate all dissimilar materials.

.10 Apply waterproof membrane between all members/supports for metal cladding connecting to back-up structure and weather barrier. Ensure membrane projects 25 mm beyond all sides of every member to provide a complete seal around fastenings.

.11 Do not install cladding in direct contact with lead or copper or in areas where run off from these metals on to the cladding surface may occur.

3.3 CLEANING

.1 Clean exposed surfaces of preformed metal cladding work promptly after completion of installation. Comply with recommendations of both the panel and coating manufacturers.

.2 Clean up and remove from the site all surplus materials and rubbish resulting from the Work of this Section.

END OF SECTION 07 42 13

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1 Air Barriers Descriptive or Proprietary — Section 07 27 00.01.

.2 Metal Wall Panels — Section 07 42 13

.3 Windows — Section 08 50 00

1.2 REFERENCES

.1 The Aluminum Association Inc. (AAI)
- .1 AAI-Aluminum Sheet Metal Work in Building Construction-2002.
- .2 AAI DAF45-03, Designation System for Aluminum Finishes.

.2 American Society for Testing and Materials International (ASTM)
- .1 ASTM A 653/A 653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 ASTM A 792/A 792M-10, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

.3 Roofing Contractors Association of B.C. (RCABC)
- .1 RGC Roofing Practice Manual.

.4 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.

.5 Canadian Standards Association (CSA International)
- .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.

.7 Green Seal Environmental Standards
- .1 Standard GS-03-93, Anti-Corrosive Paints.
- .2 Standard GS-11-97, Architectural Paints.
- .3 Standard GS-36-00, Commercial Adhesives.

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

.9 British Columbia Sheet Metal Association (SMACNA-BC)
- .1 Architectural Sheet Metal Manual- 6th Edition 2003.

1.3 SUBMITTALS

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

.2 Product Data:
- .1 Submit manufacturer's printed product literature for sheet metal flashing systems materials, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit two copies WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 33- - Health and Safety Requirements.

.3 Samples:
- .1 Submit duplicate 50 x 50 mm samples of each type of sheet metal material, finishes and

colours.

.4 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.
.1 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures.

1.4 QUALITY ASSURANCE
.1 Pre-Installation Meetings: convene pre-installation meeting [one] week prior to beginning work of this Section and, with contractor's representative , Departmental Representative in accordance with Section 01 32 16.07 - Construction Progress Schedule - Bar (GANTT) Chart to:
.1 Verify project requirements.
.2 Review installation and substrate conditions.
.3 Co-ordination with other building sub trades.
.4 Review manufacturer's installation instructions and warranty requirements.

1.5 DELIVERY, STORAGE AND HANDLING
.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

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

2.0 PRODUCTS

2.1 PRE-FINISHED SHEET METAL
.1 Zinc coated steel sheet: 0.91 mm (20ga) thickness, commercial quality to ASTM A 792, with Z275 designation zinc coating, finish enamel coated factory applied coating to CGSB 93-GP-3m Class F29, color to match profiled metal panels as shown on drawing.

2.2 PREFINISHED ALUMINUM SHEET
.1 Prefinished aluminum sheet: 0.81mm (20 gauge).

2.3 ACCESSORIES
.1 Isolation coating: alkali resistant bituminous paint.

.2 Plastic cement: to CAN/CGSB 37.5.
.1 Maximum VOC limit 50 g/L to SCAQMD Rule 1168.

.3 Underlay for metal flashing: asphalt laminated 3.6 to 4.5 kg kraft paper.

.4 Sealants.
.1 Maximum VOC limit 50 g/L to SCAQMD Rule 1168.

.5 Cleats: of same material, and temper as sheet metal, minimum 50 mm wide. Thickness same as sheet metal being secured.

.6 Fasteners: stainless steel, flat head roofing nails of length and thickness suitable for metal flashing application.

.7 Washers: of same material as sheet metal, 1 mm thick with rubber packings.

.8 Touch-up paint: as recommended by prefinished material manufacturer.
.1 Maximum VOC limit 50 g/L to SCAQMD Rule 1113.

2.4 FABRICATION

.1 Fabricate metal flashings and other sheet metal work in accordance with applicable RCABC and SMACNA Standards. Guarantee standard as specified in 1.4 Quality Assurance.

.2 Form pieces in 2400 mm maximum lengths.
.1 Make allowance for expansion at joints.

.3 Hem exposed edges on underside 12 mm.
.1 Mitre and seal corners with sealant.

.4 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.5 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

2.5 METAL FLASHINGS

.1 Form flashings, copings and fascias to profiles indicated of galvanized steel as indicated on drawings.

.2 Caulk perimeter flashings with specified sealant where necessary to make a proper seal.

.3 'S' Lock and caulk end joints in flashing. Provide standing seams with concealed clips at corners. Hem exposed edges of flashing a minimum of 12.5 mm for rigidity.

.4 Provide flashings with edges turned to form a drip. Make proper allowance for expansion and contraction. Face clip flashings with concealed clips (600 mm) on centres.

.5 Provide flashings at vents, chimneys and control joints.

.6 Carry face metal down exterior face a minimum of 100 mm or as indicated on drawings.

.7 Provide metal base and cap flashings to extend to within 25 mm of roof surface.

.8 At vent stacks, install aluminum vent stacks and include for aluminum metal caps.

3.0 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Use concealed fastenings except where approved before installation.

.2 Lock end joints and caulk with sealant.

3.3 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 On completion and verification of performance of installation, remove surplus materials, excess

materials, rubbish, tools and equipment.

.3 Leave work areas clean, free from grease, finger marks and stains.

END OF SECTION 07 62 00

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1 Structural Steel for Buildings Section 05 12 33

.2 Steel Decking Section 05 31 00

1.2 REFERENCES

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

.2 Underwriter's Laboratories of Canada (ULC)
- .1 CAN-ULC-S101- 04, Standard Methods of fire Endurance Tests of Building Construction and Materials.
- .2 CAN-ULC-S102- 03, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.3 ACTION AND INFORMAL SUBMITTALS

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

.2 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 33 – Health and Safety Requirements

.3 Samples: submit duplicate 300 x 300 mm size sample of exposed fireproofing for approval of texture and colour.

.4 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.
- .1 Test Reports:
  - .1 Submit product data including certified copies of test reports verifying fireproofing applied to substrate as constructed on project will meet or exceed requirements of Specification.
  - .2 Submit test results in accordance with CAN- ULC-S101 for fire endurance and CAN-ULC-S102 for surface burning characteristics.
  - .3 For assemblies not tested and rated, submit proposals based on related designs using accepted fireproofing design criteria.
- .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures.
- .4 Manufacturer's Field Reports: submit to manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

1.4 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer: company person specializing in sprayed-on fireproofing with 5 years documented experience approved by manufacturer.

.2 Mock-ups:

.1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.

.2 Mock-up will be used:

.1 To judge workmanship, substrate preparation, operation of equipment and material application.

.2 For testing to determine compliance with performance requirements.

.3 Locate where directed where indicated.

.4 Allow 24 hours for inspection of mock-up by Departmental Representative before proceeding with fireproofing work.

.5 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work. Remove mock-up and dispose of materials when no longer required and when directed by Departmental Representative.

.3 Site Meetings:

.1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations, with contractor's representative and Departmental Representative in accordance with Section 01 32 16.07 - Construction Progress Schedule - Bar (GANTT) Charts to:

.1 Verify Project requirements.

.2 Review installation and substrate conditions.

.3 Co-ordination with other building subtrades.

.4 Review manufacturer's installation instructions and warranty requirements.

.2 Prior to start of Work arrange for site visit with Departmental Representative to examine existing site conditions adjacent to demolition work.

.4 Site Meetings: as part of Manufacturer's Services described in PART 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed.

.1 After delivery and storage of products, and when preparatory Work is complete but before installation begins.

.2 Twice during progress of Work at 25% and 60% complete.

.3 Upon completion of Work, after cleaning is carried out.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:

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

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

.3 Deliver packaged materials in original unopened containers, marked to indicate brand name, manufacturer, ULC markings.

.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 Damaged or opened containers will be rejected.

.4 Packaging to indicate shelf-life and materials to be applied prior to expiration of shelf-life.
.5 Provide temporary enclosures to prevent spray from contaminating air beyond application area.
.6 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of fireproofing materials.

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

1.6 AMBIENT CONDITIONS

.1 At temperatures less than 5 degrees C, ensure that 5 degrees C air and substrate temperature is maintained during and for 24 hours after application. Ensure that natural ventilation to properly dry the fireproofing during and subsequent to its application is provided. In enclosed areas lacking openings for natural ventilation, ensure that interior air is circulated and exhausted to the outside.

.2 Maintain relative humidity within limits recommended fireproofing manufacturer.

.3 Ensure that natural ventilation to properly dry fireproofing during and subsequent to its application is provided.

.4 In enclosed areas lacking openings for natural ventilation, provide minimum of 4 air exchanges per hour by forced air circulation.

2.0 PRODUCTS

2.1 MATERIALS

.1 Sprayed fireproofing: ULC certified cementitious or asbestos-free mineral fibre fireproofing qualified for use in ULC Designs specified and fungus resistant for 28 days.

.2 Curing compound: type recommended by fireproofing manufacturer, qualified for use in ULC Designs specified.

.3 Sealer: type recommended by fireproofing manufacturer, qualified for use in ULC Design specified.
.1 Colour: white, green.

.4 Fireproofing: minimum dry density and cohesion/adhesion properties as follows:
.1 Fireproofing for structural components concealed above ceiling, or within wall, chase, or furred space: minimum average applied dry density of 240 kg per cubic meter and cohesion/adhesion strength of 9.57 kPa.
.2 Fireproofing for exposed structural components, except where otherwise specified or indicated: minimum applied dry density of 350 kg per cubic meter and cohesion/adhesion strength of 20.83 kPa.
.3 Fireproofing for structural components located in mechanical rooms and storage areas: minimum applied dry density of 640 kg per cubic meter and cohesion/adhesion strength of 350 kPa.
.4 Ensure spray-applied fireproofing: does not crack, spall or delaminate under downward deflection conditions over 3 m clear span.
.5 Minimum compressive strength: 48 kPa.
.6 Spray-Applied fireproofing material: not contribute to corrosion of test panels.
.7 Dust removal: not exceed 0.25 gram per square meter.

3.0 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PREPARATION

.1 Substrate: free of material, which would impair bond.

.2 Verify that painted substrates are compatible and have suitable bonding characteristics to receive fireproofing.

.3 Remove incompatible materials.

.4 Ensure that items required to penetrate fireproofing are placed before installation of fireproofing.

.5 Ensure that ducts, piping, equipment, or other items which would interfere with application of fireproofing are not positioned until fireproofing work is completed.

3.3 APPLICATION

.1 Apply bonding adhesive or primer to substrate if recommended by manufacturer.

.2 Apply fireproofing to correspond with tested assemblies, or acceptable calculation procedures to provide following fire resistance ratings. Fireproofing to be applied to the underside of 2nd floor assembly and supporting beams, new and existing.

LOCATION	ULC RATING
Columns supporting 1 floor	N/A
Columns supporting more than 1 floor	N/A
Columns supporting roof	N/A
Floor decks	1 hr FRR
Floor beams	1 hr FRR
Roof decks	N/A
Roof supports	N/A

.3 Apply fireproofing over substrate, building up to required thickness to cover substrate with monolithic blanket of uniform density and texture.

.4 Tamp smooth, surfaces visible in finished work as indicated.

.5 Apply curing compound to surface of cementitious fireproofing as required by manufacturer.

.6 Apply sealer to surface of mineral fibre fireproofing as required by manufacturer in ventilation plenums where fireproofing is to be painted and as indicated.

3.4 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and

periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

.2 Inspection and Site Tests:

.1 Inspection and testing of fireproofing will be carried out by Testing Laboratory designated by Departmental Representative if required.

3.5 PATCHING

.1 Patch damage to fireproofing caused by testing or by other trades before fireproofing is concealed, or if exposed, before final inspection.

3.6 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 Clean surfaces not indicated to receive fireproofing of sprayed material within 24 hours period after application.

.3 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION 07 81 00

1 .0 GENERAL

1.1 RELATED REQUIREMENTS

.1 Mechanical Divisions 21-25

.2 Electrical Communications/Electronics/Security Divisions 26-28

1.2 REFERENCES

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

.2 Underwriter's Laboratories of Canada (ULC)
- .1 ULC-S115-11(R2016), Standard Method of Fire Tests of Fire stop Systems.

1.3 DEFINITIONS

.1 Fire Stop Material: device intended to close off opening or penetration during fire or materials that fill openings in wall or floor assembly where penetration is by cables, cable trays, conduits, ducts and pipes and poke-through termination devices, including electrical outlet boxes along with their means of support through wall or floor openings.

.2 Single Component Fire Stop System: fire stop material that has Listed Systems Design and is used individually without use of high temperature insulation or other materials to create fire stop system.

.3 Multiple Component Fire Stop System: exact group of fire stop materials that are identified within Listed Systems Design to create on site fire stop system.

.4 Tightly Fitted; (ref: NBC Part 3.1.9.1.1): penetrating items that are cast in place in buildings of noncombustible construction or have "0" annular space in buildings of combustible construction.
- .1 Words "tightly fitted" should ensure that integrity of fire separation is such that it prevents passage of smoke and hot gases to unexposed side of fire separation.

1.4 SUBMITTALS

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

.2 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 33 Health and Safety Requirements.

.3 Shop Drawings:
- .1 Submit shop drawings to show location, proposed material, reinforcement, anchorage, fastenings and method of installation.
- .2 Construction details should accurately reflect actual job conditions.

.4 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.
- .1 Test reports: in accordance with CAN-ULC-S101 for fire endurance and CAN-ULC-S102 for surface burning characteristics.
  - .1 Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with specifications for specified performance characteristics and physical properties.
- .2 Certificates: submit certificates signed by manufacturer certifying that materials comply

with specified performance characteristics and physical properties.

.3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

.4 Manufacturer's Field Reports: submit to manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

1.5 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer: company specializing in fire stopping installations with 5 years documented experience.

.2 Pre-Installation Meetings: convene pre-installation meeting two weeks prior to beginning work of this Section, with contractor's representative and Departmental Representative in accordance with Section 01 32 16.07 - Construction Progress Schedule - Bar (GANTT) Chart to:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Co-ordination with other building sub trades.

.4 Review manufacturer's installation instructions and warranty requirements.

.3 Site Meetings: as part of Manufacturer's Services described in PART 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed.

.1 After delivery and storage of products, and when preparatory Work is complete, but before installation begins.

.2 Twice during progress of Work at 25% and 60% complete.

.3 Upon completion of Work, after cleaning is carried out.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:

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

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

.3 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, ULC markings.

.2 Storage and Protection:

.1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

.3 Waste Management and Disposal:

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

2.0 PRODUCTS

.1 Fire stopping and smoke seal systems: in accordance with CAN-ULC-S115.

.1 Asbestos-free materials and systems capable of maintaining effective barrier against flame, smoke and gases in compliance with requirements of CAN- ULC-S115 and not to exceed opening sizes for which they are intended and conforming to specified special requirements described in PART 3.

.2 Fire stop system rating: 1 hour FRR, F rating.

.2 Service penetration assemblies: systems tested to CAN-ULC-S115.

.3 Service penetration fire stop components: certified by test laboratory to CAN-ULC-S115.

.4 Fire-resistance rating of installed fire stopping assembly in accordance with NBC.

.5 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.

.6 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.

.7 Primers: to manufacturer's recommendation for specific material, substrate, and end use.

.8 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.

.9 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.

.10 Sealants for vertical joints: non-sagging.

3.0 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PREPARATION

.1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.

.1 Ensure that substrates and surfaces are clean, dry and frost free.

.2 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.

.3 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier.

.4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.3 INSTALLATION

.1 Install fire stopping and smoke seal material and components in accordance with manufacturer's certified tested system listing.

.2 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.

.3 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.

.4 Tool or trowel exposed surfaces to neat finish.

.5 Remove excess compound promptly as work progresses and upon completion.

3.4 SEQUENCES OF OPERATION

.1 Proceed with installation only when submittals have been reviewed by Departmental Representative.

.2 Install floor fire stopping before interior partition erections.

.3 Metal deck bonding: fire stopping to precede spray applied fireproofing to ensure required bonding.

.4 Mechanical pipe insulation: fire stop system component.

.1 Ensure pipe insulation installation precedes fire stopping.

3.6 FIELD QUALITY CONTROL

.1 Inspections: notify Departmental Representative when ready for inspection and prior to concealing or enclosing fire stopping materials and service penetration assemblies.

.2 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.7 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

.3 Remove temporary dams after initial set of fire stopping and smoke seal materials.

3.8 SCHEDULE

.1 Fire stop and smoke seal at:

.1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.

.2 Top of fire-resistance rated masonry and gypsum board partitions.

.3 Intersection of fire-resistance rated masonry and gypsum board partitions.

.4 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.

.5 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.

.6 Openings and sleeves installed for future use through fire separations.

.7 Around mechanical and electrical assemblies penetrating fire separations.

.8 Rigid ducts: fire stopping to consist of bead of fire stopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

END OF SECTION 07 84 00

1 .0 GENERAL

1.1 RELATED REQUIREMENTS

.1 Mechanical Divisions 21-25

.2 Electrical Communications/Electronics/Security Divisions 26-28

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)
- .1 ASTM C 919- 02, Standard Practice for Use of Sealants in Acoustical Applications.

.2 Canadian General Standards Board (CGSB)
- .1 CGSB 19-GP-5M- 1984 , Sealing Compound, One Component, Acrylic Base, Solvent Curing (Issue of 1976 reaffirmed, incorporating Amendment No. 1).
- .2 CAN/CGSB-19.13- M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.
- .3 CGSB 19-GP-14M- 1984, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing (Reaffirmation of April 1976).
- .4 CAN/CGSB-19.17- M90, One-Component Acrylic Emulsion Base Sealing Compound.
- .5 CAN/CGSB-19.24- M90, Multi-component, Chemical Curing Sealing Compound.

.3 Department of Justice Canada (Jus)
- .1 Canadian Environmental Protection Act, 1999 (CEPA).

.4 General Services Administration (GSA) - Federal Specifications (FS)
- .1 FS-SS-S-200- E (2)1993 , Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold Applied, for Portland Cement Concrete Pavement.

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

.6 Transport Canada (TC)
- .1 Transportation of Dangerous Goods Act, 1992 (TDGA).

1.3 SUBMITTALS

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

.2 Manufacturer's product to describe.
- .1 Caulking compound.
- .2 Primers.
- .3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.

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

.4 Submit duplicate samples of each type of material and colour.

.5 Cured samples of exposed sealants for each color where required to match adjacent material.

.6 Submit manufacturer's instructions in accordance with Section 01 33 00 - Submittal Procedures.
- .1 Instructions to include installation instructions for each product used.

1.4 QUALITY ASSURANCE / MOCK-UPS

.1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.

.2 Construct mock-up to show location, size, shape and depth of joints complete with back-up material, primer, caulking and sealant.

.3 Mock-up will be used:

.1 To judge workmanship, substrate preparation, operation of equipment and material application.

.4 Location to be decided with Departmental Representative.

.5 Allow 24 hours for inspection of mock-up by Departmental Representative before proceeding with sealant work.

.6 When accepted, mock-up will demonstrate minimum standard of quality required for this Work. Approved mock-up may remain as part of finished Work.

1.5 DELIVERY, STORAGE & HANDLING

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

.2 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.

.3 Upon completion of Work, after cleaning is carried out.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management And Disposal.

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

.3 Collect and separate for disposal paper and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Place materials defined as hazardous or toxic in designated containers.

.5 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.

.6 Unused sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.

.7 Divert unused joint sealing material from landfill to official hazardous material collections site approved by Departmental Representative.

.8 Empty plastic joint sealer containers are not recyclable. Do not dispose of empty containers with plastic materials destined for recycling.

.9 Fold up metal banding, flatten, and place in designated area for recycling.

1.7 SITE CONDITIONS

.1 Environmental Limitations:

.1 Do not proceed with installation of joint sealants under following conditions:

.1 When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4 degrees C.

.2 When joint substrates are wet.

.2 Joint-Width Conditions:

.1 Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

.3 Joint-Substrate Conditions:

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

1.8 ENVIRONMENTAL REQUIREMENTS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Labour Canada.

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

.3 Ventilate area of work as directed by Departmental Representative by use of approved portable supply and exhaust fans.

2.0 PRODUCTS

2.1 SEALANT MATERIALS

.1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.

.2 When low toxicity caulks are not possible, confine usage to areas which offgas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize offgas time.

.3 Where sealants are qualified with primers use only these primers.

.4 Standard: for interior and exterior work unless otherwise specified, ensure compatibility of sealants being used and other materials in contact with them, meet VOC level of 250 g/L for architectural sealant, and conform to the latest editions of the specifications summarized below:

2.2 SEALANT TYPE

.1 Type 1: Multi-Component chemical cure sealants: unless otherwise specified conform to CAN/CGSB-219.24-M90(TT-00227E-Type 11, Class A) standard, sealing compounds and as otherwise specified to exceed that standard; deliver to site and bear in addition to the product identification name, the qualification number when tested under CAN/CGSB Standard, Type 1 (self-leveling-horizontal joints) Type 2 (non-sag-vertical joints), Class A for glazing standard, Class B for non-glazing standard.

.2 Type 2: Multi-component chemical sealants: unless otherwise specified conform to CAN/CGSB-1-19.24-M90 (TT-00227E-Type 11, Class A) standard, sealing compounds and as otherwise specified

to exceed that standard; deliver to site and bear in addition to the product identification name, the qualification number when tested under CAN/CGSB standard, Type 1 (self-leveling-horizontal joints) Type 2 (non-sag-vertical joints), Class A for glazing standard, Class B for non-glazing standard.

.3 Type 3: One component polyurethane sealants: conform at least to CAN/CGSB-2-19.13-M87 (TT-S-00230C) specifications; non-sag type; not fall cohesively or adhesively in a properly designed joint where total expansion does not exceed 25% of the minimum width.

.4 Type 4: Structural glazing sealant: two part, neutral cure, elastomeric silicone sealant conforming to ASTM C920, Type S, NS, Class 25 standard; designed for joint dynamic movement 25%.

.5 Type 5: One component elastomeric chemical cure silicone: for joints minimum 6 mm x 6 mm and maximum as directed by product manufacturer; conform to CAN/CGSB-2-19.13-M87 (TT 002230C Type 11, Class A) standard; one component silicone base. (Consultant's written approval shall be required prior to use of this sealant).

.6 Type 6: Acrylic sealant: conform to CGSB-19-GP-5M.

.7 Type 7: Silicone caulking: white, mildew resistant.

.8 Type 8: Partition sealant: acrylic sealant conforming to CGSB 19-GP-5M standard, for exposed to view sealing work; provide around electrical boxes, phone plugs, and other penetrations in partitions scheduled for acoustic separation.

2.3 SEALANT SELECTION

.1 Perimeters of exterior openings where frames meet exterior facade of building: Sealant type: 1 or 5.

.2 Metal flashing and metal soffit: Sealant type: 3.

.3 Perimeters of interior frames: Sealant type: 6.

.4 Perimeter of bath fixtures (e.g. sinks, waterclosets, basins, vanities): Sealant type: 7.

2.4 JOINT CLEANER

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

.2 Primer: as recommended by manufacturer.

3.0 EXECUTION

3.1 PROTECTION

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

3.2 SURFACE PREPARATION

.1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.

.2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.

.3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or

other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

.4 Ensure joint surfaces are dry and frost free.

.5 Prepare surfaces in accordance with manufacturer's directions.

3.3 PRIMING

.1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.

.2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

3.4 BACKUP MATERIAL

.1 Apply bond breaker tape where required to manufacturer's instructions.

.2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

3.5 MIXING

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

3.6 APPLICATION

.1 Sealant.
- .1 Apply sealant in accordance with manufacturer's written instructions.
- .2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
- .3 Apply sealant in continuous beads.
- .4 Apply sealant using gun with proper size nozzle.
- .5 Use sufficient pressure to fill voids and joints solid.
- .6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
- .7 Tool exposed surfaces before skinning begins to give slightly concave shape.
- .8 Remove excess compound promptly as work progresses and upon completion.

.2 Curing.
- .1 Cure sealants in accordance with sealant manufacturer's instructions.
- .2 Do not cover up sealants until proper curing has taken place.

.3 Cleanup.
- .1 Clean adjacent surfaces immediately and leave Work neat and clean.
- .2 Remove excess and droppings, using recommended cleaners as work progresses.
- .3 Remove masking tape after initial set of sealant.

3.7 CLEANING

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

END OF SECTION 07 92 00

DOOR							FRAME							
No.	Door W (mm)	Opening H (mm)	Type	Mat'l	Finish	Glass Type	Type	Mat'l	Finish	Glass Type	RATING	REMARKS	LOCATION	HDW SET
NC 102A	Existing Aluminum Door to Stay and Replaced with New Hardware												EX. Stair	001
NC 102B	Existing												EX. Stair	002
NC 102C	Existing Hollow Metal Door to Stay and Replaced with New Hardware											#1	EX. Stair	003
NC 103	915	2134	D4	HM	PTD	WG	F1	PSS	PTD	-	¾ hr		New Wheel Chair Lift Lobby	004
NC 117A	Existing												EX. Stair	-
NC 117B	915	2134	D2	HM	PTD	-	F1	PSS	PTD	-	¾ hr	#2	EX. Stair	005
NC 201	915	2134	D4	HM	PTD	TG	F2	PSS	PTD	TG		#1	Waiting Area	006
NC 202	Existing												Stair	-
NC 203	Existing												IT Room	-
NC 204	915	2134	D1	HM	PTD	TG	F4	PSS	PTD	TG	-	#1	Hallway	007
NC 205A	Existing												Mechanical	-
NC 205B	915	2134	D2	HM	PTD	-	F1	PSS	PTD	-	1 hr		Mechanical	008
NC 206	915	2134	D2	HM	PTD	-	F1	PSS	PTD	-	-		Accessible Washroom	009
NC 207	915	2134	D2	HM	PTD	-	F1	PSS	PTD	-	-		Washroom	010
NC 208	915	2134	D2	HM	PTD	-	F1	PSS	PTD	-	-		Locker	010
NC 209	915	2134	D2	WD	PTD	-	F2	PSS	PTD	TG	-		Kitchenette	009
NC 210	915	2134	D2	WD	PTD	-	F3	PSS	PTD	TG	-		Meeting Room	011
NC 211	915	2134	Aluminum Sliding Door (Refer Specification)										Quiet Room	012
NC 212	915	2134	D2	HM	PTD	-	F1	PSS	PTD	-	-		Archival Storage	013
NC 214	915	2134	D4	HM	PTD	-	F1	PSS	PTD	WG	¾ hr		New Stair	014
NC 217	915	2134	D2	WD	PTD	-	F2	PSS	PTD	TG	-		Office 1	015

DOOR							FRAME							
No.	Door W (mm)	Opening H (mm)	Type	Mat'l	Finish	Glass Type	Type	Mat'l	Finish	Glass Type	RATING	REMARKS	LOCATION	
NC 218	915	2134	D2	WD	PTD	-	F2	PSS	PTD	TG	-		Office 2	015
NC 219	915	2134	D2	WD	PTD	-	F1	PSS	PTD	TG	-		Office 3	015

LEGEND

AL	ALUMINUM
HM	HOLLOW METAL
PSS	PRESSED STEEL FRAME
PTD	PAINT FINISH
WD	SOLID CORE WOOD

Remarks

#1	Card Access / Electrical Strike
#2	Not Considered As Fire Exit

END OF SECTION 08 06 10

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1	Rough Carpentry for Minor Works	Section 06 08 99
.2	Finish Carpentry	Section 06 20 00
.3	Flush Wood Doors	Section 08 14 16
.4	Door Hardware	Section 08 71 00
.5	Glazing	Section 08 80 50
.6	Painting	Section 09 91 23

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .2 CGSB 41-GP-19Ma-84, Rigid Vinyl Extrusions for Windows and Doors.

.2 Canadian Standards Association (CSA International)
- .1 CSA-G40.20-04/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .2 CSA W59-03, Welded Steel Construction (Metal Arc Welding).

.3 Canadian Steel Door Manufacturers' Association (CSDMA)
- .1 CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, 2000.
- .2 CSDMA, Selection and Usage Guide for Commercial Steel Doors, 1990.

.4 National Fire Protection Association (NFPA)
- .1 NFPA 80-2007, Standard for Fire Doors and Fire Windows.
- .2 NFPA 252-2012, Standard Methods of Fire Tests of Door Assemblies.

.5 South Coast Air Quality Management District (SCAQMD), California State
- .1 SCAQMD Rule 1113-04, Architectural Coatings.
- .2 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.

.6 Underwriters' Laboratories of Canada (ULC)
- .1 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .2 CAN/ULC-S702-09, Standard for Thermal Insulation, Mineral Fibre, for Buildings.
- .3 CAN/ULC-S704-03, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
- .4 CAN4-S104-M80, Standard Method for Fire Tests of Door Assemblies.
- .5 CAN4-S105-M85, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN4-S104.

1.3 SYSTEM DESCRIPTION

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

1.4 SUBMITTALS

.1 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.

.1 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, glazed, arrangement of hardware and fire rating and finishes.

.2 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings and finishes.

.3 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.

1.5 DELIVERY, STORAGE AND HANDLING

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

.2 Waste Management and Disposal:

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

2.0 PRODUCTS

2.1 FRAME MATERIALS

.1 Hot dipped galvanized steel sheet: to ASTM A 653M, ZF75, minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts.

.2 Reinforcement to CSA G40.20/G40.21, Type 44W, coating designation to ASTM A 653M, ZF75.

.3 Interior Door and Window Frames: 16ga typical, 12ga for oversized door frame

2.2 DOOR CORE MATERIALS

.1 Honeycomb construction:

.1 Structural small cell, 24.5 mm maximum kraft paper 'honeycomb', weight: 36.3 kg per ream minimum, density: 16.5 kg/m³ minimum sanded to required thickness.

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

2.3 ADHESIVES

.1 Honeycomb cores and steel components: heat resistant, spray grade, resin reinforced neoprene/rubber (polychloroprene) based, low viscosity, contact cement.

.1 Adhesive: maximum VOC content 50 g/L to SCAQMD Rule 1168.

.2 Lock-seam doors: fire resistant, resin reinforced polychloroprene, high viscosity, and sealant/adhesive.

2.4 PRIMER

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

.1 Maximum VOC limit 50 g/L to GC-03.

2.5 PAINT

.1 Field paint steel doors and frames in accordance with Section 09 91 23 - Painting. Protect weatherstrips from paint. Provide final finish free of scratches or other blemishes.

.1 Maximum VOC emission level 50 g/L to GS-11 to SCAQMD Rule 1113.

2.6 ACCESSORIES

.1 Door silencers: single stud rubber/neoprene type.

.2 Interior top and bottom caps: rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19Ma.

.3 Fabricate glazing stops as formed channel, minimum 16 mm height, accurately fitted, butted at corners and fastened to frame sections with counter-sunk oval head sheet metal screws.

.4 Metallic paste filler: to manufacturer's standard.

.5 Fire labels for both frames and doors: metal riveted.

.6 Sealant:
- .1 Maximum VOC limit 250 g/L to SCAQMD Rule 1168.

.7 Glazing: Refer to Section 08 80 50.

.8 Make provisions for glazing as indicated and provide necessary glazing stops.
- .1 Provide removable steel glazing beads for use with glazing tapes and compounds and secured with countersunk stainless steel screws.
- .2 Design exterior glazing stops to be tamperproof.

2.7 FRAMES FABRICATION GENERAL

.1 Fabricate frames in accordance with CSDMA specifications.

.2 Fabricate frames to profiles and maximum face sizes as indicated.

.3 Interior frames: 1.2 mm welded type construction.

.4 Blank, reinforce, drill and tap frames for mortised, templated hardware, and electronic hardware using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.

.5 Prepare frame for door silencers, 3 for single door, 2 at head for double door.

.6 Manufacturer's nameplates on frames and screens are not permitted.

.7 Conceal fastenings except where exposed fastenings are indicated.

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

.9 Provide fire labelled frames for those openings requiring fire protection ratings, as scheduled. Test such products in conformance with and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.

2.8 FRAME ANCHORAGE

.1 Provide appropriate anchorage to floor and wall construction.

.2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.

.3 Provide 2 anchors for rebate opening heights up to 1520 mm and 1 additional anchor for each additional 760 mm of height or fraction thereof.

2.9 FRAMES: WELDED TYPE

.1 Welding in accordance with CSA W59.

.2 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.

.3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.

.4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.

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

.6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.

2.10 DOOR FABRICATION GENERAL

.1 Doors: swing type, flush, with provision for glass and/or louvre openings as indicated.

.2 Fabricate doors with longitudinal edges welded. Seams: grind welded joints to a flat plane, fill with metallic paste filler and sand to a uniform smooth finish.

.3 Blank, reinforce, drill doors and tap for mortised, templated hardware and electronic hardware.

.4 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.

.5 Reinforce doors where required, for surface mounted hardware. Provide flush steel top caps to exterior doors. Provide inverted, recessed, spot welded channels to top and bottom of interior doors.

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

.7 Provide fire labelled doors for those openings requiring fire protection ratings, as scheduled. Test such products in conformance with and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.

.8 Manufacturer's nameplates on doors are not permitted.

.9 Provide insulating core materials to doors in manufacturer’s standard for fire-rate ULC approved fire doors.

.10 Provide raceway in the interior of all doors at centre hinge height to accommodate future electrified locksets.

.11 Finish Hardware: Prepare door assemblies for installation of hardware specified in Section 08 71 00.

.12 Refer to Mechanical Drawings for doors with grilles or undercuts.

2.11 DOORS: HONEYCOMB CORE CONSTRUCTION

.1 Form face sheets for exterior and interior doors from 1.2 mm (18 gauge) sheet steel with honeycomb or laminated under pressure to face sheets. Coating designation to ASTM A 653M, ZF75.

.2 44.5mm thick flush panel design.

3.0 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION GENERAL

.1 Install labelled steel fire rated doors and frames to NFPA 80 except where specified otherwise.

.2 Install doors and frames to CSDMA Installation Guide.

3.3 FRAME INSTALLATION

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

.2 Secure anchorages and connections to adjacent construction.

.3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.

.4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.

.5 Caulk perimeter of frames between frame and adjacent material.

.6 Maintain continuity of air barrier and vapour retarder.

3.4 DOOR INSTALLATION

.1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 00 - Door Hardware.

.2 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows.

.1 Hinge side: 1.0 mm.
.2 Latchside and head: 1.5 mm.
.3 Finished floor: 13 mm.

.3 Adjust operable parts for correct function.

.4 Install window.

3.5 FINISH REPAIRS

.1 Touch up with primer finishes damaged during installation.

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

3.6 GLAZING

.1 Install glazing for doors and frames in accordance with Section 08 80 50 - Glazing.

END OF SECTION 08 11 00

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1	Rough Carpentry for Minor Works	Section 06 08 00
.2	Finish Carpentry	Section 06 20 00
.3	Metal Doors and Frames	Section 08 11 00
.4	Doors Hardware	Section 08 71 00
.5	Glazing	Section 08 80 50
.6	Painting	Section 09 91 23

1.2 REFERENCES

.1 Architectural Woodwork Manufacturers Association of Canada (AWMAC).
- .1 Quality Standards for Architectural Woodwork latest edition.

.2 Canadian General Standards Board (CGSB).
- .1 CAN/CGSB-71.19-M88, Adhesive, Contact, Sprayable.
- .2 CAN/CGSB-71.20-M88, Adhesive, Contact, Brushable.

.3 Canadian Standards Association (CSA International).
- .1 CSA A440.2-98, Energy Performance of Windows and Other Fenestration Systems.
- .2 CSA O115-M1982(R2001), Hardwood and Decorative Plywood.
- .3 CAN/CSA O132.2 Series-90 (R1998), Wood Flush Doors.
- .4 CAN/CSA-O132.5-M1992 (R1998), Stile and Rail Wood Doors.
- .5 CAN/CSA-Z808-96, A Sustainable Forest Management System: Guidance Document.
- .6 CSA Certification Program for Windows and Doors 00.

.4 Environmental Choice Program (ECP).
- .1 CCD-045-92, Sealants and Caulking Compounds.
- .2 CCD-046-92, Adhesives.

.5 National Fire Protection Association (NFPA).
- .1 NFPA 80-1999, Standard for Fire Doors and Fire Windows.
- .2 NFPA 252-1999, Standard Method of Fire Tests of Door Assemblies.

.6 Underwriters' Laboratories of Canada (ULC).
- .1 CAN-4S104M-80 (R1985), Fire Tests of Door Assemblies.
- .2 CAN4-S105M-85 (R1992), Fire Door Frames Meeting the Performance Required by CAN4-S104.

.7 LEED CI 1.0 2007 – Commercial Interiors

1.3 SUBMITTALS

.1 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC content:

.1 For caulking materials during application and curing.
.2 For door materials and adhesives.
.3 Submit FSC Chain of Custody Certificate.

2 Shop Drawings:
.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
.2 Indicate door types and cutouts for lights and louvres, sizes, core construction, transom panel construction and cutouts.

1.4 SAMPLES

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

.2 Submit one 300 x 300 mm corner sample of each type wood door.

.3 Show door construction, core, glazing detail and faces.

.4 Manufacturer's Instructions:
.1 Submit manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

.1 Regulatory Requirements:
.1 Wood fire rated doors: labelled and listed by an organization accredited by Standards Council of Canada.

.2 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.3 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Storage and Protection:
.1 Protect doors from dampness. Arrange for delivery after work causing abnormal humidity has been completed.
.2 Store doors in well ventilated room, off floor, in accordance with manufacturer's recommendations.
.3 Protect doors from scratches, handling marks and other damage. Wrap doors.
.4 Store doors away from direct sunlight.

1.7 WASTE MANAGEMENT AND DISPOSAL

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

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

.3 Unused or damaged glazing materials are not recyclable and must not be diverted to municipal recycling programs.

.4 Divert unused adhesive material from landfill to official hazardous material collections site approved by Departmental Representative.

.5 Do not dispose of unused paint materials into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

1.8 GUARANTEE

.1 This section shall furnish the Departmental Representative with a two (2) year M.M.A.B.C. (The BC Chapter of AWMAC) Guarantee Certificate or an equivalent maintenance bond, to the full value of the architectural woodwork sub-contract, certifying that the architectural woodwork supplied will be in accordance with the Standards incorporated in the AWMAC Quality Standards manual, latest edition.

.2 The Guarantee shall cover replacing and refinishing to make good any defects in architectural woodwork due to faulty workmanship or defective materials supplied by this Section, which appear during a two (2) year period following the substantial completion of the Project.

2.0 PRODUCTS

2.1 WOOD FLUSH DOORS

.1 Solid core: to CAN/CSA-0132.2.1.
- .1 Construction:
  - .1 Core: Agfiber particleboard to ANS1 A280.1 LD7
- .2 Face Panels as scheduled:
  - .1 HPVA Architectural “A” grade wood veneer (minimum thickness 1/50”) slip match, maple, or oak, to match existing.
  - .2 Paint grade MDO

.2 Adhesive: Type I (waterproof) no urea formaldehyde for all doors.

.3 Stiles:
- .1 CE Compatible with face veneer mill option AWS Type B veneered
- .2 Standard: AWMAC Custom Grade

.4 Environmental:
- .1 All wood in door FSC certified or FSC controlled
- .2 Manufactured with pre-consumer recycled material

2.3 GLAZING

.1 Glass: As per Glazing Section 08 80 50

2.4 FABRICATION

.1 Vertical edge strips to match face veneer.

.2 Prepare doors for louvres and glazing. Provide to match face veneer glazing stops with mitred corners.

.3 Bevel vertical edges of single acting doors 3 mm in 50 mm on lock side and 1.5 mm in 50 mm on hinge side.

.4 Radius vertical edges of double acting doors to 60 mm radius.

3.0 EXECUTION

3.1 MANUFACTURER’S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Unwrap and protect doors in accordance with CAN/CSA-O132.2 Series, Appendix A.

.2 Install labelled fire rated doors to NFPA 80.

.3 Install doors and hardware in accordance with manufacturer's printed instructions and CAN/CSA-0132.2 Series, Appendix A.

.4 Adjust hardware for correct function.

.5 Install glazing in accordance with Section 08 80 50 - Glazing.

.6 Install louvres and stops.

.7 Secure transom and side panels by means of stops concealed fasteners or countersunk screws concealed by means of wood plugs matching panel in grain and colour.

3.3 ADJUSTMENT

.1 Re-adjust doors and hardware just prior to completion of building to function freely and properly.

3.4 CLEANING

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

.2 Remove traces of primer, caulking; clean doors and frames.

.3 Clean glass and glazing materials with approved non-abrasive cleaner.

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

END OF SECTION 08 14 16

1.0 GENERAL

1.1 DOCUMENTS

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

1.2 SECTION INCLUDES

.1 Supply and install interior aluminum sliding mall front entrances, double glazed, and single glazed where noted, and all necessary flashings, sealants, gaskets, caulking and accessories to full extent shown on drawings and as specified here-in-included but not limited to specifically:

- .1 Interior aluminum sliding door.
- .2 Thresholds.
- .3 Related operating hardware.
- .4 Glass and glazing.
- .5 Related deflection header components.

1.3 RELATED SECTIONS

.1	Metal Fabrications	Section 05 50 00
.2	Rough Carpentry For Minor Works	Section 06 08 99
.3	Finish Carpentry	Section 06 20 00
.4	Joint Sealants	Section 07 92 00
.5	Door Hardware	Section 08 71 00
.6	Glazing	Section 08 80 50
.7	Gypsum Board Assemblies	Section 09 21 16
.8	Non Structural Metal Framing	Section 09 22 16
.9	Tile Carpeting	Section 09 68 13

1.4 REFERENCES

.1 ASTM B209 07, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.2 ASTM E283-84, "Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors."

.3 ASTM E331-00, "Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference".

.4 NRCC/DBR Building Practice Note #234.

.5 Canadian Building Digest #96, "Use of Sealants", by G.K. Garden.

.6 CAN2-12.1-M76 - Glass, Safety, Temper d or Laminated

.7 CAN2-12.1-M76 - Glass, Polished Plate or Float, Flat, Clear.

.8 CAN2-12.4-M76 - Glass, Heat Absorbing.

.9 CAN/CGSB-12.8 97, Insulating Glass Units.

.10 CAN/CGSB-12.20 M89, Structural Design of Glass for Buildings.

.11 CAN/CGSB-19.13 M87, Sealing Compound One-Component, Elastomeric, Chemical Curing.

.12 CAN/CSA-S157 2005, Strength Design in Aluminum.

.13 CAN**/**CSA W59.2 M1991 (R2003), Welded Aluminum Construction.

.14 CAN/CSA - A440 Windows, 2000.

.15 Insulating Glass Manufacturers of Canada, Guidelines.

.16 AAMA-906 2007, Voluntary Specification for Sliding Glass Door Roller Assemblies.

.17 AAMA CW-10 2004, Care and Handling of Architectural Aluminum From Shop to Site.

.18 Aluminum Association (AA) DAF 45 2003, Designation System For Aluminum Finishes.

1.5 DESIGN AND LABORATORY TESTING REQUIREMENTS

.1 The Contractor shall design, test, fabricate and install the complete integrated assembly to meet the following performance criteria. The drawings shall be held to indicate the general arrangement of the assemblies, spacing of members, profile and sizes of members, materials and interface with adjacent construction.

.2 As a min. the assembly shall be designed, fabricated and installed in accordance with the BCBC, 2012 including seismic design.

.3 Design assembly to support dead loads and accommodate structural deflection and long term creep movements and drift without stress on glass, buckling, failure of joint seals, undue stress on structural elements, damaging loads on fasteners, reduction of performance, or other detrimental effects caused by structural movement.

.4 Design exterior curtain wall and entrance framing systems to provide for such expansion and contraction of component materials as will be caused by a surface temperature ranging from 20^{o}C to 70^{o}C without causing buckling, stresses on glass, failure of joint seals, undue stress on structural elements, damaging loads on fasteners, reduction of performance, or other detrimental effects. Operating windows and doors shall function normally over this temperature range.

.5 Design assembly to restrict air infiltration to 0.0003 $m^3/s/m^2$ at 300 Pascals. Test assembly in accordance with ASTM E283.

.6 Storefront members to incorporate rigid PVC or polyurethane thermal break.

.7 Air infiltration for pair of 1830 x 2134 doors and frames shall not exceed 5.56 m^3/hm per linear foot of crack.

.8 Thermally, the grid members shall have a condensation resistance equal to or better than the area along the bottom of a 1" sealed glass on it with standard metal spacer edge construction.

1.6 SUBMITTALS

.1 Product Data: Submit product data including manufacturer's literature for sliding aluminum-framed glass door components and accessories, indicating compliance with specified requirements and material characteristics.

.1 Submit list on sliding aluminum-framed glass door manufacturer's letterhead of materials, components and accessories to be incorporated into Work.

.2 Include product names, types and series numbers.

.3 Include contact information for manufacturer and their representative for this Project.

.2 Shop Drawings:

.1 Submit shop drawings for review in accordance with Section 01 33 00.

.2 Shop drawings shall be prepared and sealed by a professional engineer registered in the Province of British Columbia to indicate that the assembly will withstand all design loads imposed upon it, and that connections to building structure will transfer all loads, reactions and forces to the structure, and that the assembly meets air infiltration and design and laboratory testing requirements. Said Engineer shall provide BCBC 2012, Schedule B and Schedule C-B signed and sealed.

.3 Shop drawings and sliding glass doors fabrication shall be prepared by the manufacturer.

.4 Sliding aluminum-framed glass door and component dimensions, framed opening requirements and tolerances, adjacent construction.

.5 Indicate frame material, core thickness, reinforcements, glazing stops, location and details of anchors and exposed fastenings, reinforcing and finishes.

.6 Indicate track profile, materials and dimensions, arrangement of hardware and required clearances.

.7 Indicate storage pocket/area dimensions and requirements.

.8 Show size and location of seismic restraints. Include seismic design calculations.

.3 Samples: Provide a sample and site mock-up of each of the following in actual approved material, colour range, finish minimum size noted:

.1 One [600 x 600] mm corner sample of frame including glazing stops.

.2 Submit duplicate 600 x 600 mm sample sections of insulating glass unit showing glazing materials and edge and corner details.

.3 Insulating glass 600 x 600 mm for each type of glass specified.

.4 Each type of clear glass 600 x 600 mm specified.

.4 Field Reports: Submit manufacturer's field reports within 3 days of manufacturer representatives site visit and inspection.

.5 Operation and Maintenance Data: Provide four (4) copies of maintenance data for each type of sliding aluminum-framed glass door for incorporation into Owner's operation and maintenance manuals in accordance with Section 01 78 00 – Closeout Submittals.

1.7 QUALITY ASSURANCE

.1 Sliding aluminum-framed glass door, glass, glazing and sealants shall be fabricated and installed

by companies and skilled workers having a minimum of five (5) years proven experience in the completion of this type of installation for a comparable project.

.2 The glazing and other related trades shall work cooperatively with each other to provide a complete installation in conformance with the documents and all applicable codes and standards.

.3 Co-ordinate work of this Section with work of other trades for proper time and sequence to avoid

construction delays.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

.1 Deliver, handle and store units in accordance with the manufacturer's directions.

.2 Store units at site on raised wood pallets protected from the elements and corrosive materials. Do not remove from crates or other protective covering until ready for installation.

.3 Store prefabricated frame assemblies blocked off the ground in an approved manner to prevent warping, twisting, undue strain on assembly or physical abuse and damage.

.4 Material Handling & Storage: To AAMA CW-10.

.5 Match mark all components for field assembly.

.6 Insulating glass units must be stored with a positive bottom support at right angles to the plane of the glass.

1.9 WARRANTY

.1 Provide written warranty issued in the name of the Departmental Representative and signed by the Installer stating that the storefront assembly is warranted to perform in accordance with design and performance requirements specified under clauses 1.5 for a period of not less than one (1) year from date of Substantial Performance.

.2 Finish: Against non-uniform fading during warranty period to extent that adjacent members have a colour range greater than originally accepted colour range samples approved by the Consultant; pitting or other type of corrosion resulting from natural elements in local atmosphere; discolouration, staining or streaking of the surface.

.3 Sealed Units: Against failure for ten (10) years.

2.0 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

.1 Components from each specified system shall be from one single manufacturer.

2.2 MATERIALS

.1 General: All materials used in this contract shall be of the highest quality as manufactured by nationally recognized manufacturers and of the type indicated on the drawings and in these specifications.

.2 Steel Shapes: To CAN3-G40.21-M81, Grade 300W.

.3 Aluminum Members: Extruded from 6063-T54 alloy free from defects impairing strength, appearance and durability.

.4 Fastenings: Stainless steel, aluminum or other corrosion resistant material.

.5 Reinforcement Steel: Steel as reinforcement to aluminum members and fixing support for aluminum frames to be medium structural steel conforming to CSA Standard G-40.21, Type 44W.

2.3 FRAMING SYSTEM

.1 Single Track Sliding Door:

.1 System to be side stacking sliding aluminum-framed single glazed door system with top guides and bottom rollers in extruded aluminum single track.

.2 Sill to be recess mounted and head to be surface mounted extruded aluminum single track profile to ASTM B221, 6063 alloy and as shown on drawings.

.3 End Stiles at receiving jambs to be surface mounted extruded aluminum track reinforced to take locking hardware to ASTM B221, 6063 T-54 alloy and temper.

.4 Rollers to be ball bearing wheels in stainless steel, rail or stile mount as required.

.5 Guides to be stainless steel, rail or stile mount as required.

.6 Include D-handle pulls to the door exterior and interior.

.7 Lock is not required.

.8 Provide glazing stops of interlocking snap-in type for dry glazing.

.9 Powder coated finish white color.

2.4 FASTENERS, SCREWS & BOLTS

.1 In accordance with AAMA Guide Specification Manual to suit base metals in which they occur. Where exposed, colour coded to match surface in which they occur.

.2 To meet sliding aluminum-framed glass door requirements and as recommended by manufacturer.

2.5 SEALANT

.1 In accordance with CBD #96.

.2 In accordance with Section 07 92 00.

.3 Colour as selected by the Consultant.

2.6 GLAZING MATERIALS

.1 Exterior and Interior Glazing Gaskets: Dense, EPDM Durometer 50 (Shore A) to ASTM C509, keyed into stops and frames.

.2 Glass Setting Blocks: Compatible with glass edge seals, with a durometer hardness of 80 of ASTM D2240.

2.7 GLASS AND GLAZING

.1 10mm tempered glass minimum. Refer to 08 06 10 Door Schedule and Section 08 80 00 Glazing.

2.8 FINISHES

.1 Finish to exposed aluminum components shall be given an anodic oxide treatment in accordance with Aluminum Association specification AA-M12C22A31, Architectural Class II, clear anodized.

2.9 FABRICATION

.1 Fabricate members to shapes, sizes and configurations as shown on the drawings in accordance with reviewed shop drawings.

.2 All materials to be used internally or externally shall be corrosion resistant, nonstaining, non-bleeding and compatible with adjoining material.

.3 Fabricate all parts and assemblies to AAMA standards for aluminum framing as a minimum and as further specified in this section to provide a weathertight and waterproof system.

.4 Fabricate units in shop in accordance with the manufacturer's assembly details and reviewed shop

drawings. Build square, true, accurate to size, free from defects detrimental to appearance and performance.

.5 Machine all joints, corners, mitres, accurately to hairline joints. Provide interior reinforcing at connections of hollow assemblies to structural supports. Mechanical fasteners shall be hidden in completed installation. Join corners with metal corners sleeves and/or mitre and weld continuously along entire length of contact. Ensure joints are flush and hairline.

.6 Fabricate units in largest practical size for handling, transport and installation. Trial assemble all large units in shop and match-mark for field assembly.

.7 Build in expansion joints and deflection channels.

.8 Reinforce vertical and horizontal sections as required to ensure adequate strength to meet performance requirements and support dead load of system.

.9 Provide, install all alignment bars, brackets, clips, tees, inserts, splice plates, fastenings, anchors, etc., for fabrication and assembly. Ship loose those items required for field installation.

.10 Provide all caps, closures, trim, flashings as required to complete field installations.

.11 Back paint all aluminum surfaces in contact with concrete, masonry, mortar, plaster or other dissimilar materials with approved bituminous protective paint.

.12 Provide shielded drainage and pressure equalization vents where required. All horizontal members shall be sealed to vertical members to provide individual compartments within the system in accordance with the rain screen principle.

.13 Install hardware.

3.0 EXECUTION

3.1 INSPECTION

.1 Inspect the work of other sections upon which the work of this section depends. Proceed only after deficiencies, if any, in the work of other sections have been corrected.

.2 Ensure that all anchor and setting or installing assemblies or components supplied by the trade for installation by others are properly located and correctly set in place.

3.2 PREPARATION

.1 Obtain all dimensions affecting the work of this section from the job site.

.2 Provide data, dimensions and components, anchors and assemblies to be installed by others in proper time for installation.

.3 Attend a pre-installation meeting with General Contractor, Manufacturer’s field representative and Departmental Representative.

3.3 ERECTION

.1 Erect and secure assemblies aligned plumb and square, free from warp, twist or superimposed loads, installed to achieve weathertight installation with air/thermal barrier seal to full system.

.2 Erect in strict accordance with the manufacturer's written instructions and reviewed shop drawings.

.3 All anchors and fitments shall be concealed. Exposed heads of fasteners not permitted unless specified otherwise. All joints in exposed work shall be flush hairline butt joints. Attachments to be concealed include but are not limited to, all windows at stair locations and public corridor locations.

.4 Use anchors that will permit sufficient adjustment for accurate alignment.

.5 Build-in and provide any supplementary reinforcing and bracing required for assembly loads and deflections.

.6 Build in anchors and other items provided by other trades for incorporation into window system.

.7 Secure work adequately to structure in a manner not restricting thermal and wind movement. Touch-up any damaged finish.

.8 Correctly locate and install flashings, deflectors and weep holes to ensure proper drainage of moisture to exterior.

.9 Isolate aluminum surfaces from adjacent dissimilar materials and metals with coating of bituminous paint.

.10 Coordinate installation of automatic window operators and window security sensors, security hardware and other electrical components with other contractors.

.11 Ensure that all stops, gaskets, splines, seals, etc., are perfectly aligned and ready to receive glazing as specified herein.

3.4 GLASS AND GLAZING

.1 All sealed units to be installed and handled in accordance with Insulating Glass Manufacturers association of Canada (IGMAC) guidelines

.2 Glazing Method:

.1 Dry Glazing:

.1 corners must be glued, vulcanized or welded.

.2 glazing pressure below 5 kp/cm.

3.5 SEALANTS

.1 Sealant space between sliding aluminum-framed glass door track and adjacent construction: 13mm maximum.

3.6 ADJUSTING AND CLEANING

.1 At completion of work of this section, and continuously as work proceeds, remove all surplus materials, debris and scrap.

.2 At completion of work, remove all protective surface covering film and wrappings. Clean all glass panels, frames using mild soap or other cleaning agent approved by the manufacturers.

.3 Remove all excess glazing or joint sealing materials from exposed surfaces. Clean and polish glass.

.4 Adjust all hardware for proper function.

3.7 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by sliding aluminum-framed glass door installation.

END OF SECTION 08 32 13.01

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1	Metal Fabrications	Section 05 50 00
.2	Sheet Metal Flashing and Trim	Section 07 62 00
.3	Sealants and Caulking	Section 07 92 00
.4	Glazing	Section 08 80 00

1.2 REFERENCES

.1 ASTM E331, "Test method for water penetration of Exterior Windows, Curtain Walls and Doors by uniform static air pressure differential".

.2 NRCC/DBR Building Practice Note #234.

.3 CAN2 – 12.1.M – Glass, Safety, Tempered or Laminated.

.4 CAN3 – S157 – 1983 – “Strength Design in Aluminum”.

.5 CAN/CGSB – 12.20 – M89 – “Structural Design of Glass in Buildings”.

.6 American National Standards Institute (ANSI): ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Material Used in Buildings.

1.3 DESIGN AND TESTING

.1 Structural performance shall be based on CSA Standard CAN3-S157 “Strength Design in Aluminum” and a maximum deflection in a single member of L/360 for wind and snow.

.2 Design wind, rain and snow pressure on skylight: Refer Structural drawings general notes.

.3 Thermal movement: Design skylight components to accommodate expansion and contraction caused by exterior metal surface temperatures without buckling or imposing damaging loads on glass, structural members, fasteners, joint seals or other detrimental effects.

1.4 SUBMITTALS

.1 Provide a sample of a section of skylight 300 mm long complete with glazing gaskets.

.2 Submit shop drawings for review in accordance with Section 01 33 00.

.3 Shop drawings shall be prepared and sealed by a Professional Engineer registered in the Province of British Columbia to indicate the assembly will withstand all design loads imposed upon it, and that connections to the building structure will transfer all loads, reactions and forces to the structure.

.4 Clearly detail profiles, construction, assembly, installation for all conditions, flashing, caulking, sealing, provisions for thermal movement, glazing, anchorage attachment to building structure and method of adjustment.

.5 Provide (4) copies of maintenance data for cleaning and maintenance of aluminum finishes for incorporation into the owner’s operation and maintenance manuals.

1.5 QUALITY ASSURANCE

.1 Skylights shall be installed, glazed and adjusted by experienced personnel in accordance with the manufacturer’s instructions and approved shop drawings.

.2 The Register Professional engineers who prepare the shop drawings shall submit Schedule B and Schedule C of BCBC 2012 or Model Schedule B and C.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

.1 Deliver, handle and store units in accordance with the manufacturer's directions.

.2 Store units at site on raised wood pallets protected from the elements and corrosive materials. Do not remove from crates or other protective covering until ready for installation.

.3 Store prefabricated frame assemblies blocked off the ground in an approved manner to prevent warping, twisting, undue strain on assembly or physical abuse and damage.

.4 Match mark all components for field assembly.

.5 Glass must be stored with a positive bottom support at right angles to the plane of the glass.

1.7 WARRANTY

.1 Provide a written warranty issued in the name of the contractor and installer stating that the assembly is warranted to perform in accordance with design and performance requirements for a period of not less than five (5) years from the date of substantial performance

2.0 PRODUCTS

2.1 MATERIALS

.1 Exterior aluminum glazed canopy (at Building Entrances),

.1 Extrusions shall be 6063 Alloy, T5 or T54 Temper, to be pressure plate Aluminum Section with beauty cap.

.2 Formed Aluminum Components which include cover strips, ridges, closure strips, closure end caps and flashing as required and detailed, shall be Sheet of Alloy and Temper suitable for their purpose and finish.

.3 Fasteners shall be 300 series Stainless Steel Cadmium Plated and of sufficient size and quality to perform their intended function.

.4 Glazing Gaskets shall be extruded, black, closed cell or dense elastomer of durometer appropriate to the function.

.5 Where Structural Silicone Glazing is used; Gaskets shall be compatible with the Structural Silicone Sealant.

.6 Glazing to be frosted laminated safety glass consisting of 2 panes of 6 mm tempered glass laminated to 0.76 mm thick polyvinyl butyral (PVB) interlayer. All glass products to meet the requirements of Section 08 80 00.

2.2 FABRICATION

.1 Fabricate framing from extrusions of size and shape shown on shop drawings.

.2 Build square, true, accurate to size, and free from defects affecting appearance and performance.

.3 Conceal fasteners whenever possible.

.4 Isolate aluminum from dissimilar metals, except small areas of stainless steel, zinc, or white bronze, using shins, barrier tapes, plastic films, or asphalt base paint.

2.3 FINISHES

.1 For Exterior aluminum glazed canopy:

.1 Aluminum skylight framing to be clear anodized finish.

.2 Finish flashings and trim to match aluminum skylight framing.

.3 All exposed surfaces to be free of visible defects and scratches.

.2 For glass canopy hardware: standard manufacturer finish (similar to No. 4 Satin).

3.0 EXECUTION

3.1 INSPECTION

.1 Inspect the work of other sections upon which the work of this section depends. Proceed only after deficiencies, if any, in the work of other sections have been corrected.

.2 Ensure that all anchor and setting or installing assemblies or components supplied by the trade for installation by others are properly located and correctly set in place.

3.2 INSTALLTION

.1 Erect and secure assemblies aligned plumb and square, free from warp, twist or superimposed loads, installed to achieve weathertight installation with air/thermal barrier seal to full system.

.2 Erect in strict accordance with the manufacturer's written instructions and reviewed shop drawings.

.3 All anchors and fitments shall be concealed. Exposed heads of fasteners not permitted unless specified otherwise. All joints in exposed work shall be flush hairline butt joints.

.4 Use anchors that will permit sufficient adjustment for accurate alignment.

.5 Build-in and provide any supplementary reinforcing and bracing required for assembly loads and deflections.

.6 Build in anchors and other items provided by other trades for incorporation into window system.

.7 Secure work adequately to structure in a manner not restricting thermal and wind movement. Touch-up any damaged finish.

.8 Correctly locate and install flashings, deflectors and weep holes to ensure proper drainage of moisture to exterior.

.9 Isolate aluminum surfaces from adjacent dissimilar materials and metals with coating of bituminous paint.

.10 Ensure that all stops, gaskets, splines, seals, etc., are perfectly aligned and ready to receive glazing as specified herein.

3.3 ADJUSTING AND CLEANING

.1 At completion of work of this section, and continuously as work proceeds, remove all surplus materials, debris and scrap.

.2 At completion of work, remove all protective surface covering film and wrappings. Clean all glass panels and frames using mild soap or other cleaning agent approved by the aluminum glazed canopy manufacturer.

.3 Remove all excess glazing or joint sealing materials from exposed surfaces. Clean and polish glass.

.4 Adjust all hardware for proper function.

END OF SECTION 08 44 29

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1 Blanket Insulation — Section 07 21 16

.2 Air Barriers Descriptive or Proprietary — Section 07 27 00.01

.3 Metal Wall Panels — Section 07 42 13

1.2 REFERENCES

.1 Aluminum Association (AA)
- .1 Designation System for Aluminum Finishes (2003).

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-1.40-97, Anticorrosive Structural Steel Alkyd Primer.
- .2 CAN/CGSB-79.1-M91, Insect Screens.

.3 CSA International
- .1 AAMA/WDMA/CSA 101/I.S.2/A440-11
- .2 Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440-08/

.4 North American Fenestration Standard
- .1 NAFS-North American Fenestration Standard/Specification for windows, doors and skylights; Includes Update No. 1 (2008), Update No. 3 (2009), CSA A440S1-09.

.5 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
- .1 SCAQMD Rule 1113-A2007, Architectural Coatings.
- .2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

.6 BC Energy Efficiency Act.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for windows and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia, Canada.
- .2 Indicate materials and details in full size scale for head, jamb and sill, profiles of components, interior and exterior trim junction between combination units elevations of unit, anchorage details,location of isolation coating, description of related components and exposed finishes fasteners, and caulking. Indicate location of manufacturer's nameplates.

.4 Samples:
- .1 AAMA/WDMA/CSA 101/I.S.2/A440.

.5 Test and Evaluation Reports:
- .1 Submit test reports from approved independent testing laboratories, certifying compliance

with AAMA/WDMA/CSA 101/I.S.2/A440 and NAFS 08.

.6 Construction Waste Management:
.1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

.7 Low-Emitting Materials:
.1 Submit listing of sealants used in building, comply with VOC and chemical component limits or restriction requirements.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for windows for incorporation into manual.

1.5 QUALITY ASSURANCE

.1 Certifications: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.2 Manufacturer qualifications: company specializing in manufacturing the products specified in this section with minimum 10 years documented experience.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect windows from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in 01 74 19 – Waste Management and Disposal.

2.0 PRODUCTS

2.1 MATERIALS

.1 General: All materials used in this contract shall be of the highest quality as manufactured by nationally recognized manufacturers and of the type indicated on the drawings and in these specifications.

.2 Steel Shapes: To CAN3-G40.21-M81, Grade 300W.

.3 Aluminum Members: Extruded from 6063-T54 alloy free from defects impairing strength, appearance and durability.

.4 Fastenings: Stainless steel, aluminum or other corrosion resistant material.

.5 Reinforcement Steel: Steel as reinforcement to aluminum members and fixing support for

aluminum frames to be medium structural steel conforming to CSA Standard G-40.21, Type 44W.

.6 Metal Cladding (Head, Mullion, Sill): Provide matching metal cladding to all locations as indicated on drawings and as required for complete installation. All fastenings concealed.

.7 Aluminum trim, closure plate, flashing and cladding at all minimum 20 guage sheet stock, clear anodized, at perimeter walls as per drawings.

2.2 WINDOW TYPE AND CLASSIFICATION

.1 Curtain Wall Framing: Kawneer 1602 as indicated in drawing; thermally broken. Acceptable equivalent from Alumicor, Columbia Aluminum and Metro Aluminum.
.1 Colour and Finish: Clear Anodized.

.2 Glazing stops: Square extruded interlocking snap-in type for dry glazing. Exterior stop minimum 31.8 mm depth.

.3 Sills: Minimum 1.6 mm metal thickness aluminum sheet, formed into continuous sill profiles, finish to match curtain wall and window system.

.4 Flashings, filler panels, closure panels: Minimum 0.7 mm metal thickness aluminum sheet, finish to match curtain wall and windows.

.5 All exposed fasteners to be stainless steel.

.6 Anti-rotation blocks to be rigid PVC (or acceptable alternative) noting that styrofoam will not be accepted.

.7 Classification rating: to CSA-A440/A440.1.
.1 Air tightness: A3.
.2 Water tightness: B7.
.3 Wind load resistance: C5.

2.3 FABRICATION

.1 Fabricate in accordance with CSA-A440/A440.1 supplemented as follows:

.2 Fabricate units square and true with maximum tolerance of plus or minus 1.5 mm for units with a diagonal measurement of 1800 mm or less and plus or minus 3 mm for units with a diagonal measurement over 1800 mm.

.3 Face dimensions detailed are maximum permissible sizes.

.4 Brace frames to maintain squareness and rigidity during shipment and installation.

.5 Finish steel clips and reinforcement with shop coat primer to CAN/CGSB-1.40 380 g/m² zinc coating to ASTM A 123/A 123M.

2.4 ALUMINUM FINISHES

.1 Finish exposed surfaces of aluminum components in accordance with Aluminum Association Designation System for Aluminum Finishes.
.1 Clear anodic finish: designation AA-MI2C22A1, class 1, minimum 14.

2.5 ISOLATION COATING

.1 Primers: in accordance with manufacturer's recommendations for surface conditions.

.1 Primer: VOC limit 100 g/L maximum.

.2 Isolate aluminum from following components, by means of isolation coating:
.1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.
.2 Concrete, mortar and masonry.
.3 Wood.

2.6 GLAZING
.1 Glaze windows in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.
.1 Refer to Section 08 80 50 for exterior insulated glass.

2.7 AIR BARRIER AND VAPOUR RETARDER
.1 Equip window frames with site installed air barrier and vapour retarder material for sealing to building air barrier and vapour retarder as follows:
.1 Material: identical to, or compatible with, building air barrier and vapour retarder materials to provide required air tightness and vapour diffusion control throughout exterior envelope assembly.
.2 Material width: adequate to provide required air tightness and vapour diffusion control to building air barrier and vapour retarder from interior.

3.0 EXECUTION

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

3.2 INSTALLATION
.1 Window installation:
.1 Install in accordance with CSA A440.4
.2 Arrange components to prevent abrupt variation in colour.

.2 Sill installation:
.1 Install metal sills with uniform wash to exterior, level in length, straight in alignment with plumb upstands and faces.
.2 Cut sills to fit window opening.
.3 Secure sills in place with anchoring devices located at ends joints of continuous sills and evenly spaced 600 mm on centre in between.
.4 Fasten expansion joint cover plates and drip deflectors with self-tapping stainless steel screws.
.5 Maintain 6 to 9 mm space between butt ends of continuous sills. For sills over 1200 mm in length, maintain 3 to 6 mm space at each end.

.3 Caulking:
.1 Seal joints between windows and window sills with sealant. Bed sill expansion joint cover plates and drip deflectors in bedding compound. Caulk between sill upstand and window-frame. Caulk butt joints in continuous sills.
.2 Apply sealant in accordance with Section 07 92 00 - Joint Sealants. Conceal sealant within

window units except where exposed use is permitted by Departmental Representative.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: 01 74 19 Waste Management and Disposal.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by window installation.

END OF SECTION 08 50 00

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1	Finish Carpentry	Section 06 20 00
.2	Metal Doors & Frames	Section 08 11 00
.3	Aluminum Doors & Frames	Section 08 11 16
.4	Flush Wood Doors	Section 08 14 16

1.2 REFERENCES

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

- .1 ANSI/BHMA A156.1- 2000 , American National Standard for Butts and Hinges.
- .2 ANSI/BHMA A156.2- 2003 , Bored and Preassembled Locks and Latches.
- .3 ANSI/BHMA A156.3- 2001 , Exit Devices.
- .4 ANSI/BHMA A156.4- 2000 , Door Controls - Closers.
- .5 ANSI/BHMA A156.5- 2001 , Auxiliary Locks and Associated Products.
- .6 ANSI/BHMA A156.6- 2005 , Architectural Door Trim.
- .7 ANSI/BHMA A156.8- 2005 , Door Controls - Overhead Stops and Holders.
- .8 ANSI/BHMA A156.12- 2005 , Interconnected Locks and Latches.
- .9 ANSI/BHMA A156.13- 2002 , Mortise Locks and Latches Series 1000.
- .10 ANSI/BHMA A156.16- 2002 , Auxiliary Hardware.
- .111 ANSI/BHMA A156.18- 2006 , Materials and Finishes.

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

- .1 CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames - 2009.

1.3 HARDWARE/SECURITY COORDINATION

.1 Prior to preparation and submittal of hardware list, door hardware supplier’s hardware consultant shall arrange a coordination meeting with the following attendees:

- .1 Hardware supplier’s hardware consultant.
- .2 Facility’s Building Maintenance Manager.
- .3 Departmental Representative.
- .4 General Contractor.

.2 The final door hardware lists shall reflect all decisions made at said coordination meeting.

1.4 ACTION & INFORMAL SUBMITTALS

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

.2 Product Data:

- .1 Submit manufacturer's instructions, printed product literature and data sheets for door hardware and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:

- .1 Submit for review and acceptance of each unit.
- .2 Samples will be returned for inclusion into work.
- .3 Identify each sample by label indicating applicable specification paragraph number, brand

name and number, finish and hardware package number.

.4 After approval samples will be returned for incorporation in Work.

.4 Hardware List:

.1 Submit contract hardware list.

.2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.

.5 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

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

.7 Sustainable Design Submittals:

.1 Construction Waste Management:

.1 Submit project Construction Waste Management Plan highlighting recycling and salvage requirements.

.2 Submit calculations on end-of-project recycling rates salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.

1.5 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for door hardware for incorporation into manual.

1.6 MAINTENANCE MATERIALS SUBMITTALS

.1 Extra Stock Materials:

.1 Supply maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Tools:

.1 Supply 2 sets of wrenches for door closers, locksets, and fire exit hardware.

1.7 QUALITY ASSURANCE

.1 Regulatory Requirements:

.1 Hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.8 DELIVERY, STORAGE & HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Package items of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.

.4 Storage and Handling Requirements:

.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect door hardware from nicks, scratches, and blemishes.
.3 Protect prefinished surfaces with wrapping strippable coating.
.4 Replace defective or damaged materials with new.

.5 Develop Construction Waste Management Plan related to Work of this Section.

.6 Packaging Waste Management: remove for reuse and return by manufacturer of packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.9 REDUNDENT LOCKSETS

.1 Where existing and other lock-bearing devices are to be removed and disposed of: turn-over to Departmental Representative and obtain receipt. In order to maintain building keying security, no existing locksets are to be removed from building.

1.10 MAINTENANCE

.1 Extra Materials:
.1 Provide maintenance materials in accordance with Section 01 78 30-Closeout Submittals.
.2 Supply two sets of wrenches for door closers.

2.0 PRODUCTS

2.1 HARDWARE ITEMS

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

2.2 DOOR HARDWARE

.1 Locks and latches:
.1 Mortise locks and latches: to ANSI/BHMA A156.13, series 1000 mortise lock, grade 1, designed for function and keyed as stated in Hardware Schedule.
.2 Lever handles: plain 64mm x 114mm x 51mm design.
.3 Roses: round
.4 Normal strikes: box type, lip projection not beyond jamb.
.5 Cylinders: key into keying system as noted as directed.
.6 Finished to 652, 626 & 630
.7 6 pin (or7) tumbler keying to Maintenance’s Master System.

.2 Butts and hinges:
.1 Butts and hinges: to ANSI/BHMA A156.1, designated by letter A and numeral identifiers, followed by size and finish, listed in Hardware Schedule.

.3 Exit devices: to ANSI/BHMA A156.3, type & function as listed, grade (1)
.1 Auxiliary items: door coordinator.

.4 Door Closers and Accessories:
.1 Door controls (closers): to ANSI/BHMA A156.4, listed in Hardware Schedule, multi-sized sized 1 to though 6 in accordance with ANSI/BHMA A156.4, table A1, finished to 689.
.2 Closer/holder release devices: to ANSI/BHMA listed in hardware schedule, finished to 689.

.5 Architectural door trim: to ANSI/BHMA A156.6, designated by letter J and numeral identifiers listed in Hardware Schedule as listed below, finished to 626 or 630.
.1 Architectural door trim: to ANSI/BHMA A156.6, listed in Hardware Schedule as listed below, finished to 626 or 630

.6 Door bottom seal: heavy duty, door seal of extruded aluminum frame and solid closed cell neoprene weather seal, recessed in door bottom surface mounted recessed in door face, closed ends, adjustable automatic retract mechanism when door is open, clear anodized finish.

.7 Thresholds: 127mm wide x full width of door opening, extruded aluminum mill finish, serrated surface, with lip and vinyl door seal insert.

.8 Weatherstripping:
- .1 Head and jamb seal:
  - .1 Adhesive backed neoprene vinyl covered foam material.
- .2 Door bottom seal:
  - .1 Extruded aluminum frame and [closed cell neoprene vinyl sweep, clear anodized finish.

.9 Electric Strikes
- .1 Weatherproof type includes all accessories, transformer and housing. Conduit by Division 26, connection by Division 28.

2.3 MISCELLANEOUS HARDWARE

.1 Indexed key control system: to ANSI/BHMA A156.5, designated by letter E and numeral identifiers, wall mounted, type 50% expandable colour enamel paint finish.

2.4 FASTENINGS

.1 Use only fasteners provided by manufacturer. Failure to comply may void warranties and applicable licensed labels.

.2 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.

.3 Exposed fastening devices to match finish of hardware.

.4 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.

.5 Use fasteners compatible with material through which they pass.

2.5 KEYING

.1 Doors, padlocks and cabinet locks to be keyed to grand master keyed as directed and as noted in Hardware Schedule. Prepare detailed keying schedule in conjunction with Departmental Representative.

.2 Supply keys in duplicate for every lock in this Contract.

.3 Supply (five) 5 master keys for each master key or grand master key group.

.4 Supply 5 keys for each lock.

.5 Stamp keying code numbers on keys and cylinders.

.6 Supply construction cores.

.7 Hand over permanent cores and keys to Departmental Representative.

.8 All core to be high security interchangeable core.

2.6 KEYS

.1 Use standard construction cylinders for locks for Contractor's 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 Departmental Representative will, in conjunction with the lock manager:
- .1 Prepare an operational keying schedule.
- .2 Accept the operational keys and cylinders directly from the lock manufacturer.
- .3 Arrange for removal and return of the construction cores and install the operational core in all locks.

2.7 ADDITIONAL DOOR HARDWARE SCHEDULED ELSEWHERE

.1 Refer to Division 28- Electronic Safety and Security, for additional door items including, but not limited to the following:
- .1 Access and intrusion control panels.
- .2 Card readers.
- .3 Door Contacts.
- .4 Intrusion detection.

.2 Refer to Division 26-Electrical for all wiring and conduit for above items.

3.0 EXECUTION

3.1 INSTALLATION

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

.2 Supply metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.

.3 Supply manufacturers' instructions for proper installation of each hardware component.

.4 Install hardware to standard hardware location dimensions in accordance with CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction.

.6 Use only manufacturer's supplied fasteners.
- .1 Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.

3.2 ADJUSTING

.1 Adjust door hardware, operators, closures and controls for optimum, smooth operating condition, safety and for weather tight closure.

.2 Lubricate hardware, operating equipment and other moving parts.

.3 Adjust door hardware to ensure tight fit at contact points with frames.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

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

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

.3 Remove protective material from hardware items where present.

.4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal Requirements.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 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 fire exit hardware.

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

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by door hardware installation.

3.6 FINISH HARDWARE SCHEDULE

.1 HARDWARE SET NO. 001 - EXISTING ALUMINUM DOOR
FOR USE ON MARK/DOOR #(S): NC 102A

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	PANIC HARDWARE	CD-35A-EO	626	VON
1	EA	MORTISE CYLINDER	26-091-ICX XQ11-948	626	SCH
1	EA	PERMANENT CORE	BY OTHERS		UNK
1	EA	ELECTRIC STRIKE	6300 FSE	630	VON
1	EA	90 DEG OFFSET PULL	8190HD 255MM O	630	IVE
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4050 EDA	689	LCN
1	EA	CUSH SHOE SUPPORT	4050-30	689	LCN
1	EA	BLADE STOP SPACER	4050-61	689	LCN
1	EA	WEATHER SEALS	REUSE EXISTING		UNK
1	EA	DOOR SWEEP	W-24S X DR WIDTH	628	KNC
1	EA	THRESHOLD	REUSE EXISTING		
1	EA	DOOR CONTACT	7766	628	SCE
1	EA	POWER SUPPLY	PS902	LGR	SCE
1	EA	CARD READER	BY OTHERS		UNK

NOTE: CONFIRM EXISTING HARDWARE PREP TO ACCEPT SPECIFIED HARDWARE PRIOR TO ORDERING HARDWARE.
NOTE: CONTRACTOR TO CONFIRM EXISTING KEY SYSTEM PRIOR TO ORDERING PERMANENT CORES.

.2 HARDWARE SET NO. 002
FOR USE ON MARK/DOOR #(S): NC 102B, NC 117A, NC 202, NC 203, NC 205A

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1			RE-USE EXISTING HARDWARE		

.3 HARDWARE SET NO. 003
FOR USE ON MARK/DOOR #(S): NC 102C

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	3CB1HW 114 X 102	652	IVE
1	EA	STOREROOM LOCK	L9080T M52A	626	SCH
1	EA	PERMANENT CORE	BY OTHERS		UNK
1	EA	ELECTRIC STRIKE	6211 FSE DS CON	630	VON
1	EA	SURFACE CLOSER	4050 EDA	689	LCN
1	EA	KICK PLATE	8400 203MM X 40MM LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	WIRE HARNESS	CON-6W		VON
1	EA	DOOR CONTACT	7766	628	SCE
1	EA	POWER SUPPLY	PS902	LGR	SCE
1	EA	CARD READER	BY OTHERS		UNK

.4 HARDWARE SET NO. 004
FOR USE ON MARK/DOOR #(S): NC 103

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	3CB1 114 X 102	652	IVE
1	EA	CLASSROOM LOCK	L9070T M52A	626	SCH
1	EA	PERMANENT CORE	BY OTHERS		UNK
1	EA	SURFACE CLOSER	4050 DEL REG	689	LCN
1	EA	KICK PLATE	8400 305MM X 40MM LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	SET	SMOKE SEAL	W-21 (1X DR WIDTH, 2 X DR HEIGHT)	BLK	KNC

.5 HARDWARE SET NO. 005
FOR USE ON MARK/DOOR #(S): NC 117B

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	3CB1 114 X 102 NRP	652	IVE
1	EA	CLASSROOM LOCK	L9070T M52A	626	SCH
1	EA	PERMANENT CORE	BY OTHERS		UNK
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4050 EDA	689	LCN

1	EA	KICK PLATE	8400 203MM X 40MM LDW B-CS	630	IVE
1	SET	SMOKE SEAL	W-21 (1X DR WIDTH, 2 X DR HEIGHT)	BLK	KNC

.6 HARDWARE SET NO. 006
FOR USE ON MARK/DOOR #(S): NC 201

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	3CB1HW 114 X 102 NRP	652	IVE
1	EA	STOREROOM LOCK	L9080T M52A	626	SCH
1	EA	PERMANENT CORE	BY OTHERS		UNK
1	EA	ELECTRIC STRIKE	6211 FSE DS CON	630	VON
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4050 EDA	689	LCN
1	EA	KICK PLATE	8400 203MM X 40MM LDW B-CS	630	IVE
1	EA	WIRE HARNESS	CON-6W		VON
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS902	LGR	SCE
1	EA	CARD READER	BY OTHERS		UNK

.7 HARDWARE SET NO. 007
FOR USE ON MARK/DOOR #(S): NC 204

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	3CB1HW 114 X 102 NRP	652	IVE
1	EA	STOREROOM LOCK	L9080T M52A	626	SCH
1	EA	PERMANENT CORE	BY OTHERS		UNK
1	EA	ELECTRIC STRIKE	6211 FSE DS CON	630	VON
1	EA	SURFACE CLOSER	4050 EDA	689	LCN
1	EA	KICK PLATE	8400 203MM X 40MM LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	WIRE HARNESS	CON-6W		VON
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS902	LGR	SCE
1	EA	CARD READER	BY OTHERS		UNK

.8 HARDWARE SET NO. 008
FOR USE ON MARK/DOOR #(S): NC 205B

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	3CB1 114 X 102	652	IVE
1	EA	STOREROOM LOCK	L9080T M52A	626	SCH
1	EA	PERMANENT CORE	BY OTHERS		UNK
1	EA	SURFACE CLOSER	4050 REG	689	LCN
1	EA	KICK PLATE	8400 203MM X 40MM LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	SET	SMOKE SEAL	W-21 (1X DR WIDTH, 2 X DR HEIGHT)	BLK	KNC

.9 HARDWARE SET NO. 009
FOR USE ON MARK/DOOR #(S): NC 206, NC 209

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	3CB1 114 X 102	652	IVE
1	EA	PUSH PLATE	8200 100MM X 405MM	630	IVE
1	EA	PULL PLATE	8303 255MM 100MM X 405MM	630	IVE
1	EA	SURFACE CLOSER	4050 DEL REG	689	LCN
1	EA	KICK PLATE	8400 203MM X 40MM LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE

.10 HARDWARE SET NO. 010
FOR USE ON MARK/DOOR #(S): NC 207, NC 208

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	3CB1 114 X 102	652	IVE
1	EA	CORRIDOR LOCK	L9456P M52A L583-363 L283-722	626	SCH
1	EA	SURFACE CLOSER	4050 DEL REG	689	LCN
1	EA	KICK PLATE	8400 305MM X 40MM LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE

.11 HARDWARE SET NO. 011
FOR USE ON MARK/DOOR #(S): NC 210

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	3CB1 114 X 102	652	IVE
1	EA	CLASSROOM LOCK	L9070T M52A	626	SCH
1	EA	PERMANENT CORE	BY OTHERS		UNK
1	EA	KICK PLATE	8400 203MM X 40MM LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE

.12 HARDWARE SET NO. 012
FOR USE ON MARK/DOOR #(S): NC 211

PROVIDE EACH SL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	HARDWARE	BY DOOR & FRAME MANUFACTURE		UNK

.13 HARDWARE SET NO. 013

FOR USE ON MARK/DOOR #(S): NC 212

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	3CB1 114 X 102	652	IVE
1	EA	STOREROOM LOCK	L9080T M52A	626	SCH
1	EA	PERMANENT CORE	BY OTHERS		UNK
1	EA	SURFACE CLOSER	4050 REG	689	LCN
1	EA	KICK PLATE	8400 203MM X 40MM LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE

.14 HARDWARE SET NO. 014
FOR USE ON MARK/DOOR #(S): NC 214

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	3CB1HW 114 X 102 NRP	652	IVE
1	EA	FIRE EXIT HARDWARE	98-L-F-M52	626	VON
1	EA	RIM CYLINDER	20-057-ICX	626	SCH
1	EA	PERMANENT CORE	BY OTHERS		UNK
1	EA	SURFACE CLOSER	4050 REG	689	LCN
1	EA	KICK PLATE	8400 203MM X 40MM LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	SET	SMOKE SEAL	W-21 (1X DR WIDTH, 2 X DR HEIGHT)	BLK	KNC

.15 HARDWARE SET NO. 015
FOR USE ON MARK/DOOR #(S): NC 217, NC 218, NC 219

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	3CB1 114 X 102	652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050T M52A	626	SCH
1	EA	PERMANENT CORE	BY OTHERS		UNK
1	EA	WALL STOP	WS406/407CVX	630	IVE

END OF SECTION 08 71 00

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1	Metal doors and frames	Section 08 11 00
.2	Glass Canopies	Section 08 44 29
.3	Windows	Section 08 50 00

1.2 REFERENCES

.1 ASTM International
- .1 ASTM C 542-05, Standard Specification for Lock-Strip Gaskets.
- .2 ASTM D 790-07e1, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- .3 ASTM D 1003-07e1, Standard Test Method for Haze and Luminous Transmittance of Plastics.
- .4 ASTM D 1929-96 (R2001) e1, Standard Test Method for Determining Ignition Temperature of Plastics.
- .5 ASTM D 2240-05, Standard Test Method for Rubber Property - Durometer Hardness.
- .6 ASTM E 84-10, Standard Test Method for Surface Burning Characteristics of Building Materials.
- .7 ASTM E 330-02, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- .8 ASTM F 1233-08, Standard Test Method for Security Glazing Materials and Systems.

.2 Canada Green Building Council (CaGBC)
- .1 LEED Canada-CI Version 1.0 2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System and Reference Package For Commercial Interiors.

.3 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.
- .2 CAN/CGSB-12.2-M91, Flat, Clear Sheet Glass.
- .3 CAN/CGSB-12.3-M91, Flat, Clear Float Glass.
- .4 CAN/CGSB-12.4-M91, Heat Absorbing Glass.
- .5 CAN/CGSB-12.6-M91, Transparent (One-Way) Mirrors.
- .6 CAN/CGSB-12.8-97, Insulating Glass Units.
- .7 CAN/CGSB-12.8-97, (Amendment), Insulating Glass Units.
- .8 CAN/CGSB-12.9-M91, Spandrel Glass.
- .9 CAN/CGSB-12.10-M76, Glass, Light and Heat Reflecting.
- .10 CAN/CGSB-12.11-M90, Wired Safety Glass.
- .11 CAN/CGSB-12.12-M90, Plastic Safety Glazing Sheets.
- .12 CAN/CGSB-12.13-M91, Patterned Glass.

.4 Environmental Choice Program (ECP)
- .1 CCD-045-95(R2005), Sealants and Caulking Compounds.

.5 Glass Association of North American (GANA)
- .1 GANA Glazing Manual - 2008.
- .2 GANA Laminated Glazing Reference Manual - 2009.

.6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards

.1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

1.3 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for glass, sealants, and glazing accessories and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Sustainable Design Submittals:

.1 Construction Waste Management:

.1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

.2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 50% of construction wastes were recycled or salvaged.

.2 Low-Emitting Materials:

.1 Submit listing of adhesives and sealants used in building, showing compliance with VOC and chemical component limits or restrictions requirements.

.4 Samples: Provide 2 glazed units samples in accordance with Section 01 33 00- Submittal Procedures.

.5 Shop Drawings:

.1 Provide shop drawings in accordance with Section 01 33 00- Submittal Procedures:

.1 Provide drawings stamped and signed by professional engineer registered or licensed in the Province of British Columbia, Canada. Submit Schedule B and C-B per BCBC 2012 or Model Schedule B and C.

.2 Shop drawing consist of steel framing installation details. Indicate sizes, spacing, location and quantities.

1.5 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for glazing for incorporation into manual.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect glazing and frames from nicks, scratches, and blemishes.

.3 Protect prefinished aluminum surfaces with wrapping.

.4 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal

1.7 AMBIENT CONDITIONS

.1 Ambient Requirements:

.1 Install glazing when ambient temperature is 10 degrees C minimum. Maintain ventilated environment for 24 hours after application.

.2 Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.8 WARRANTY

.1 Provide manufacturer's warranty in writing for insulating glass units against failure of seal of enclosed air space and deposits on inner faces of glass detrimental to vision for a period of 2 years from date of Substantial Performance of Work.

2.0 PRODUCTS

2.1 MATERIALS

.1 Design Criteria:

.1 Ensure continuity of building enclosure vapour and air barrier using glass and glazing materials as follow:

.1 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.

.2 Size glass to withstand wind loads, dead loads and positive and negative live loads to British Columbia Building Code.

.3 Limit glass deflection to 1/200 with full recovery of glazing materials.

.2 Glass thicknesses: Indicated or to industry standards for size of opening, local wind loading and use, but shall not be less than 6 mm thick.

.3 Float glass: Clear glass to CAN/CGSB-12.3, glazing quality.

.4 Safety glasses: To CAN/CGSB-12.1.

.1 Tempered: Free of tong marks in final position.

.2 Laminated: 2 layers of minimum 6mm thk tempered glass laminated to 0.76 mm thick frosted polyvinyl butyral (PVB) interlayer, or 2 layers of 8mm thick tempered glass for larger spam as determined by manufacturer to meet design criteria.

.5 Wired glass: To CAN/CGSB-12.11, 6 mm thick, Georgian wire mesh style.

.6 Insulated glass unit, performance requirements for insulated glass units with 13 mm air space and two 6 mm lites, interior lite clear, shall be as follows:

.1 Transmittance: UV-18%, Visible-70%, Solar-32%.

.2 Outdoor reflectance: Visible-11%, Total Solar Energy-29%.

.3 U-Value BTU/Hr./Ft./°F: Winter 0.29 Summer 0.28

.4 Solar heat gain coefficient: 0.38

.5 Shading coefficient: 0.43

.7 Mirror glass: To CAN/CGSB-12.5, float glass, 6 mm thick unless indicated otherwise, edges ground and polished.

.8 Insulating glass units: To CAN/CGSB-12.8, with 13 mm thick air space enclosed by interior/exterior lites (glass) as scheduled.

.9 Sealant: in accordance with Section 07 92 00-Joint Sealants.
.1 VOC limit 250 g/L maximum to SCAQMD Rule 1168

2.2 ACCESSORIES

.1 Setting blocks: neoprene Shore A durometer hardness to ASTM D 2240, minimum 100 mm x width of glazing rabbet space minus 1.5 mm x height.

.2 Spacer shims: neoprene Shore A durometer hardness to ASTM D 2240, 75 mm long x one half height of glazing stop x thickness to suit application. Self-adhesive on one face.

.3 Glazing tape:
.1 Preformed butyl compound Shore A durometer hardness to ASTM D 2240; coiled on release paper; black colour. Width x thickness recommended by manufacturer to suit installation.

.4 Glazing splines: resilient neoprene, extruded shape to suit glazing channel retaining slot, black colour as selected.

.5 Glazing clips: manufacturer's standard type.

.6 Lock-strip gaskets: to ASTM C 542.

3.0 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for glazing installation in accordance with manufacturer's written instructions.
.1 Verify that openings for glazing are correctly sized and within tolerance.
.2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.
.3 Visually inspect substrate in presence of Departmental Representative.
.4 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.5 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

.1 Clean contact surfaces with solvent and wipe dry.

.2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.

.3 Prime surfaces scheduled to receive sealant.

3.3 INSTALLATION

.1 All glass shall be cushioned and rattle free. Draw marks shall be installed horizontally unless prohibited by the size of the sheet.

.2 Install all glass on glazing blocks with spacer blocks, of sizes required to ensure shim spaces as recommended by the glass manufacturer with adequate space for glazing compounds and sealants.

.3 Fill gap between glass and applied stop with sealant to depth equal to bite of frame on glass but not more than 10 mm below sightline.

.4 Apply sealant to uniform and level line, flush with sightline and tooled or wiped with solvent to smooth appearance.

3.4 GLAZING SCHEDULE

.1 Hollow Metal Door and Frame
- .1 Interior door refer to Door Schedule
- .2 All glass to be tempered
- .3 All glass for Fire rated door to be wired glass

.2 Aluminum Windows
- .1 Exterior Lite: tempered
- .2 Interior Lite: tempered

.3 Glass Canopy
- .1 Laminated tempered

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .1 Leave Work area clean at end of each day.
  - .1 Remove traces of primer, caulking.
  - .2 Remove glazing materials from finish surfaces.
  - .3 Remove labels.
  - .4 Clean glass and mirrors using approved non-abrasive cleaner in accordance with manufacturer's instructions.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.2 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 After installation, mark each light with an "X" by using removable plastic tape or paste.
- .1 Do not mark heat absorbing or reflective glass units.

.3 Repair damage to adjacent materials caused by glazing installation.

END OF SECTION 08 80 50

				WALLS					
NO.	ROOM NAME	FLOORS	BASE	WEST WALL	NORTH WALL	EAST WALL	SOUTH WALL	CEILING	REMARKS
NC 102	EX. Stair	CONC,	EX	PTD	PTD	PTD	PTD	EXP	#3
NC 103	New Wheel Chair Lift Lobby	SF	RB	PTD	PTD	PTD	PTD	ACT	#2
NC 111	EX. PFSK	CONC.	RB	PTD	-	PTD	PTD	EXP	
NC 112	EX. Search	EX	EX	PTD	PTD	PTD	PTD	GWB	
NC 113	EX. Doc. Room	EX	EX	EX	EX	EX	EX	EX/ACT	#4
NC 114	New PSPC	CPT	RB	PTD	PTD	PTD	PTD	EX/ACT	#4
NC 115	EX. Hall	EX	RB	PTD	EX	PTD	PTD	EX	#6
NC 117	EX. Stair	EX	EX	PTD	PTD	PTD	PTD	EX	#1
NC 201	Waiting Area	CPT	RB	PTD	PTD	PTD	PTD	EXP	
NC 202	EX. Stair	CONC.	EX	PTD	PTD	PTD	PTD	EXP	#3, #5
NC 203	EX. IT Office	EX	RB	PTD	PTD	PTD	PTD	EXP	
NC 204	Hallway	CPT	RB	PTD	PTD	PTD	PTD	EXP	
NC 205	EX. Mechanical	EX	RB	EX	PTD	PTD	EX	EX	#6
NC 206	Locker	SF	RB	PTD	PTD	PTD	PTD	EXP	
NC 207	Washroom	PRT	PRT	PTD	PTD	PTD	PTD	ACT	
NC 208	Accessible Washroom	PRT	PRT	PTD	PTD	PTD	PTD	ACT	
NC 209	Kitchenette	SF	RB	PTD	PTD	PTD	PTD/CT	ACT/EXP	
NC 210	Medium Meeting Room	CPT	RB	PTD	PTD	PTD	PTD	ACT/EXP	
NC 211	Quiet Room	CPT	RB	PTD	PTD	PTD	PTD	GWB	
NC 212	Archival Storage	SF	RB	PTD	PTD	PTD	PTD	EXP	
NC 213	Service Space	CONC.	RB	PTD	PTD	PTD	PTD	EXP	
NC 214	Stair	SC/RT	RB	PTD	PTD	PTD	PTD	GWB	#7, #8
NC 215	Shared Equipment Area	CPT	RB	PTD	PTD	PTD	PTD	ACT/EXP	
NC 216	General Office	CPT	RB	PTD	PTD	PTD	PTD	ACT/EXP	
NC 217	Office 1	CPT	RB	PTD	PTD	PTD	PTD	ACT	
NC 218	Office 2	CPT	RB	PTD	PTD	PTD	PTD	ACT	#8
NC 219	Office 3	CPT	RB	PTD	PTD	PTD	PTD	ACT/EXP	

LEGENDS

FLOOR		BASE		WALLS		CEILINGS	
CONC.	Sealed Concrete	EX	Existing	CT	Ceramic Tile	ACT	Suspended T-Bar w/ Acoustic Ceiling Tiles
CPT	Carpet	RB	Rubber Base	EX	Existing Re-Painted	EX	Existing
CT	Ceramic Tile			PTD	Painted	EXP	Exposed Ceiling (Painted)
PRT	Porcelain Tile					GWB	GWB Ceiling Paint Finish
RT	Tactile Warning Rubber Tile						
SF	Sheet Flooring						

GENERAL NOTES

1. All wall finishes and wall base to be continuous behind any wall fixtures.
2. Vertical bulkheads/down drops to be finished same as horizontal.
3. Return wall finishes into window frames at jambs and head.
4. Wall finishes to extend down to floor with applied base over.
5. All exposed services to be painted.
6. Refer separate schedule for paint color.
7. All flooring in hallways must extend to the room side of the door frame.
8. Refer to drawing for floor pattern, interior elevation, ceiling design and details.
9. All finishes as shown in schedule are new U.N.O.
10. All existing walls to be made good and prepared to paintable conditions to receive new paint.
11. Prep all existing walls to receive new wall finishes.
12. Refer to floor pattern and finish plan for flooring and paint color.

REMARKS

1. Apply new concrete sealer to existing concrete stair and landing. Re-paint nosing contrasting colour.
2. New T-Bar ceiling to match existing.
3. Apply new sealer to existing concrete stair, paint nosing contrasting colour.
4. Refer to drawing A-09 for extent of new ceiling.
5. Re-paint existing ceiling.
6. Apply RB to new wall only.
7. Paint nosing contrasting colour.
8. Paint top of sloped GWB ceiling.

END OF SECTION 09 06 00

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1	Joint Sealants	Section 07 92 00
.2	Non-Structural Metal Framing	Section 09 22 16
.3	Ceramic Tiling	Section 09 30 13
.4	Painting	Section 09 91 23

1.2 REFERENCES

.1 ASTM International
- .1 ASTM C 475-02 (2007), Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- .2 ASTM C 514-04 (2009e1), Standard Specification for Nails for the Application of Gypsum Board.
- .3 ASTM C 840-08, Standard Specification for Application and Finishing of Gypsum Board.
- .4 ASTM C 954-07, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
- .5 ASTM C 1002-07, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- .6 ASTM C 1047-09, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
- .7 ASTM C 1396/C 1396M-09a, Standard Specification for Gypsum Wallboard.

.3 Association of the Wall and Ceilings Industries International (AWCI)
- .1 AWCI Levels of Gypsum Board Finish-97.

.4 Canada Green Building Council (CaGBC)
- .1 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System and Reference Package For Commercial Interiors.

.5 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-51.34-M86 (R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .2 CAN/CGSB-71.25-M88, Adhesive, for Bonding Drywall to Wood Framing and Metal Studs.

.6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
- .1 SCAQMD Rule 1113-A2007, Architectural Coatings.
- .2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

.7 Underwriters' Laboratories of Canada (ULC)
- .1 CAN/ULC-S102-07, Standard Method of Test of Surface Burning Characteristics of Building Materials and Assemblies.

1.3 SUBMITTALS

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

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for gypsum board assemblies and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Sustainable Design Submittals.
.1 Construction Waste Management:
.1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
.2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 50 of construction wastes were recycled or salvaged.
.2 Recycled Content:
.1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.
.3 Low-Emitting Materials:
.1 Submit listing of adhesives and sealants and used in building, showing compliance with VOC and chemical component limits or restriction requirements.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store gypsum board assemblies materials level off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect gypsum board assemblies from nicks, scratches, and blemishes.
.3 Protect from weather, elements and damage from construction operations.
.4 Handle gypsum boards to prevent damage to edges, ends or surfaces.
.5 Protect prefinished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.
.6 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section.

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

1.5 AMBIENT CONDITIONS

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

.2 Apply board and joint treatment to dry, frost free surfaces.

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

2.0 PRODUCTS

2.1 MATERIALS

.1 Standard board: to ASTM C 1396/C 1396M regular, 12.7mm and 15.9 mm thick Type X, 12.7 mm and 15.9 mm thick, 1200 mm wide x maximum practical length, ends square cut, edges tapered.

.2 Water-resistant board: to ASTM C 1396/C 1396M regular, 12.7mm and 15.9 mm thick and Type X, 12.7mm and 15.9mm thick, 1220 mm wide x maximum practical length.

.3 Glass mat water-resistant gypsum backing board: to ASTM C 1178/C 1178M, 12.7 and 15.9 mm thick, 1200 mm wide x maximum practical length.

.4 Glass mat gypsum substrate sheathing: to ASTM C 1177/C 1177M, 15.9 mm thick, 1200 mm wide x maximum practical length.

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

.6 Resilient clips and drywall furring: 0.5 mm base steel thickness galvanized steel for resilient attachment of gypsum board.

.7 Nails: to ASTM C 514.

.8 Steel drill screws: to ASTM C 1002.

.9 Laminating compound: as recommended by manufacturer, asbestos-free.

.10 Casing beads, corner beads, control joints and edge trim: to ASTM C 1047, metal, zinc-coated by hot-dip process, 0.5 mm base thickness, perforated flanges, one piece length per location.

.11 Sealants: in accordance with Section 07 92 00 - Joint Sealants.
- .1 VOC limit 250 g/L maximum to SCAQMD Rule 1168.
- .2 Acoustic sealant: in accordance with Section 07 92 00 - Joint Sealants.

.12 Joint compound: to ASTM C 475, asbestos-free.

3.0 EXECUTION

3.1 EXAMINATION

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

3.2 ERECTION

.1 Do application and finishing of gypsum board to ASTM C 840 except where specified otherwise.

.2 Do application of gypsum sheathing to ASTM C 1280.

.3 Erect hangers and runner channels for suspended gypsum board ceilings to ASTM C 840 except where specified otherwise.

.4 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.

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

.6 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles.

.7 Install 19 x 64 mm furring channels parallel to, and at exact locations of steel stud partition header track.

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

.10 Install wall furring for gypsum board wall finishes to ASTM C 840, except where specified otherwise.

.11 Furr openings and around built-in equipment, cabinets, access panels on four sides. Extend furring into reveals. Check clearances with equipment suppliers.

.12 Furr duct shafts, beams, columns, pipes and exposed services where indicated.

3.3 APPLICATION

.1 Apply gypsum board after bucks, anchors, blocking, sound attenuation, electrical and mechanical work have been approved.

.2 Apply single or double layer gypsum board to wood furring or framing using screw fasteners for first layer, screw fasteners for second layer. Maximum spacing of screws 300 mm on centre.

- .1 Single-Layer Application:
  - .1 Apply gypsum board on ceilings prior to application of walls to ASTM C 840.
  - .2 Apply gypsum board vertically or horizontally, providing sheet lengths that will minimize end joints.
- .2 Double-Layer Application:
  - .1 Install gypsum board for base layer and exposed gypsum board for face layer.
  - .2 Apply base layer to ceilings prior to base layer application on walls; apply face layers in same sequence. Offset joints between layers at least 250 mm.
  - .3 Apply base layers at right angles to supports unless otherwise indicated.
  - .4 Apply base layer on walls and face layers vertically with joints of base layer over supports and face layer joints offset at least 250 mm with base layer joints.

.3 Apply water-resistant gypsum board where wall tiles to be applied and adjacent to sinks. Apply water-resistant sealant to edges, ends, cut-outs which expose gypsum core and to fastener heads. Do not apply joint treatment on areas to receive tile finish.

.4 Apply 12 mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, and ducts, in partitions where perimeter sealed with acoustic sealant.

.5 Install gypsum board on walls vertically to avoid end-butt joints. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs, except where local codes or fire-

rated assemblies require vertical application.

.6 Install gypsum board with face side out.

.7 Do not install damaged or damp boards.

.8 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

3.4 INSTALLATION

.1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm on centre.

.2 Install casing beads around perimeter of suspended ceilings.

.3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.

.4 Install insulating strips continuously at edges of gypsum board and casing beads abutting metal window and exterior door frames, to provide thermal break.

.5 Construct control joints of preformed units set in gypsum board facing and supported independently on both sides of joint.

.6 Provide continuous polyethylene dust barrier behind and across control joints.

.7 Locate control joints at changes in substrate construction at approximate 10 m spacing on long corridor runs at approximate 15 m spacing on ceilings.

.8 Install control joints straight and true.

.9 Construct expansion joints as detailed, at building expansion and construction joints. Provide continuous dust barrier.

.10 Install expansion joint straight and true.

.11 Install cornice cap where gypsum board partitions do not extend to ceiling.

.12 Fit cornice cap over partition, secure to partition track with two rows of sheet metal screws staggered at 300 mm on centre.

.13 Splice corners and intersections together and secure to each member with 3 screws.

.14 Install access doors to electrical and mechanical fixtures specified in respective sections.
.1 Rigidly secure frames to furring or framing systems.

.15 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.

.16 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with AWCI Levels of Gypsum Board Finish:

.1 Levels of finish:

.1 At water resistant backing at ceramic tile locations. Level 2: embed tape for joints and interior angles in joint compound and apply one separate coat of joint compound over joints, angles, fastener heads and accessories; surfaces free of excess joint compound; tool marks and ridges are acceptable.

.2 At typical wall and ceiling locations. Level 4: embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and edges.

.17 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.

.18 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.

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

.20 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment n accordance with Section 01 74 11 - Cleaning.

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

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by gypsum board assemblies installation.

END OF SECTION 09 21 16

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1 Rough Carpentry for Minor Works Section 06 08 99

.2 Blanket Insulation Section 07 21 16

.3 Gypsum Board Assemblies Section 09 21 16

1.2 REFERENCES

.1 ASTM International
- .1 ASTM C 645- 00, Specification for Nonstructural Steel Framing Members.
- .2 ASTM C 754- 00 , Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products

.2 Green Seal Environmental Standards (GS)
- .1 GS-11-2008, 2nd Edition, Paints and Coatings.

.3 Environmental Choice Program (ECP).
- .1 CCD-047a - 98, Paints - Surface Coatings.
- .2 CCD-048- 98, Surface Coatings - Recycled Water-borne.

.4 Association of Wall and Ceiling Contractors of BC (AWCC)
- .1 Specification Standards Manual

1.3 SUBMITTALS

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

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for gypsum board assemblies and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia, Canada. Submit BCBC 2012 Schedule B and C-B or Model Schedule B and C.
- .2 Indicate system dimensions, framed opening requirements and tolerances, adjacent construction, anchor details anticipated deflection under load, affected related Work, weep drainage network, expansion and contraction joint location and details, and field welding required.

.4 Sustainable Design Submittals.
- .1 Construction Waste Management:
  - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
- .2 Low-Emitting Materials:
  - .1 Submit listing of adhesives and sealants and used in building, showing compliance with VOC and chemical component limits or restriction requirements.

1.4 QUALITY ASSURANCE

.1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1. 4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Waste Management And Disposal.

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

2.0 PRODUCTS

2.1 MATERIALS

.1 Steel Studs & Steel Stud Furring:

.1 Conform to CAN/CGSB-7.1-M86, non-loadbearing; C-shape, hot dipped galvanized steel studs with Z180 (G60) zinc coating to ASTM A525-86, roll formed from ASTM A446/A446M-85, Grade A steel.
Studs to have knurled face and pre-punched pass-through holes for horizontal runs of wiring and piping. Length to suit, no splicing allowed.

.2 Flange: Depth not less than 32mm , edges bent back 90 deg. and edges hemmed 5mm minimum.

.3 Widths: As scheduled and indicated.

.4 Gauges: Interior steel stud to be a minimum of 0.88mm (20 gauge). Interior door jamb studs: 0.88 mm (20 gauge), two (2) studs each side of opening. Increase gauge of steel studs at over-height locations to suit stud manufacturer's design tables, in order to maintain overall partition dimension as detailed in wall schedule and in accordance with the BC Building Code. Exterior steel stud to be minimum1.23 mm (18 gauge).

.5 Colour code steel studs for gauge in accordance with AWCC colour code chart.

.2 Stud Tracks:

.1 Top and bottom runner tracks fabricated from same materials as studs; leg design min. 32mm high, slightly bent in to hold studs; widths to equal stud width.

.2 Use extended leg top track to partitions as required for deflection.

.3 Stud Fasteners: Manufacturer's standard, suitable for intended application.

.3 Furring Channels: Hat section; roll formed from 0.53mm hot dipped galvanized steel having a Z180 (G60) coating to ASTM A525-86, dimensions 68.2 mm or 66.7mm overall width, face width 35 mm by 22.2mm deep, face knurled.

.4 "Z-bar" Furring: Roll formed from 0.46mm (26 ga.) hot dipped galvanized steel having a Z180 (G60) coating to ASTM A525-86, 32mm face dimension x depth to suit rigid insulation thickness, see drawings and wall schedule.

.5 Metal Backing Plates: Flat sheet from 0.91mm (20ga.) thick galvanized steel of same type as are the studs as blocking to support work of other sections.

Gypsum Board Thickness	Maximum Furring Spacing
Single 12.7mm board	400 mm
Single 15.9mm board	600 mm
Double layer	400 mm

3.0 EXECUTION

3.1 ERECTION

.1 Fire Resistance Rated Walls: Comply with requirements of testing agency approved by the Consultant for wall systems detailed on Drawings.

.2 Align partition tracks at floor and ceiling and secure at 600 mm on centre maximum.

.3 Place studs vertically at on centre as detailed and not more than 50 mm from abutting walls, and at each side of openings and corners. Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.

.4 Erect metal studding to tolerance of 1:1000.

.5 Attach studs to bottom and ceiling track using screws crimp method pop rivets.

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

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

.8 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified. Secure studs together, 50 mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.

.9 Install heavy gauge single jamb studs at openings.

.10 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs. Secure track to studs at each end, in accordance with manufacturer's instructions. Install intermediate studs above and below openings in same manner and spacing as wall studs.

.11 Frame openings and around built-in equipment, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.

.12 Provide 40 mm stud or furring channel secured between studs for attachment of fixtures behind lavatory basins, toilet and bathroom accessories, and other fixtures including grab bars and towel rails, attached to steel stud partitions.

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

.14 Extend partitions to ceiling height except where noted otherwise on drawings.

.15 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs. Use 50 mm leg ceiling tracks.

.16 Install continuous insulating strips to isolate studs from uninsulated surfaces.

.17 Install two continuous beads of acoustical sealant insulating strip under studs and tracks around perimeter of sound control partitions.

.18 Provide clearances and isolation felt to ensure no contact between steel stud system and adjacent metal components to eliminate electrolytic action.

3.2 CHASE WALLS

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

3.2 CLEANING

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

END OF SECTION 09 22 16

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1 Gypsum Board Assemblies Section 09 21 16

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/Ceramic Tile Institute (CTI)
- .1 ANSI A108.1-99, Specification for the Installation of Ceramic Tile (Includes ANSI A108.1A-C, 108.4-.13, A118.1-.10, ANSI A136.1).
- .2 CTI A118.3-92, Specification for Chemical Resistant, Water Cleanable Tile Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive (included in ANSI A108.1).
- .3 CTI A118.4-92, Specification for Latex Cement Mortar (included in ANSI A108.1).
- .4 CTI A118.5-92, Specification for Chemical Resistant Furan Resin Mortars and Grouts for Tile Installation (included in ANSI A108.1).
- .5 CTI A118.6-92, Specification for Ceramic Tile Grouts (included in ANSI A108.1).

.2 Canadian General Standards Board (CGSB)
- .1 CGSB 71-GP-22M-78 (AMEND.), /Adhesive, Organic, for Installation of Ceramic Wall Tile.
- .2 CAN/CGSB-75.1-M88, Tile, Ceramic.
- .3 CAN/CGSB-25.20-95, Surface Sealer for Floors.

.3 South Coast Air Quality Management District (SCAQMD), California State
- .1 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.

.4 Terrazzo Tile and Marble Association of Canada (TTMAC)
- .1 Tile Specification Guide 09 30 00 2009/2010, Tile Installation Manual.
- .2 Tile Maintenance Guide 2000.

1.3 SUBMITTALS

.1 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.
- .1 Include manufacturer's information on:
  - .1 Ceramic tile, marked to show each type, size, and shape required.
  - .2 Chemical resistant mortar and grout (Epoxy and Furan).
  - .3 Cementitious backer unit.
  - .4 Dry-set cement mortar and grout.
  - .5 Divider strip.
  - .6 Elastomeric membrane and bond coat.
  - .7 Reinforcing tape.
  - .8 Levelling compound.
  - .9 Latex cement mortar and grout.
  - .10 Commercial cement grout.
  - .11 Organic adhesive.
  - .12 Slip resistant tile.
  - .13 Fasteners.

.2 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.
- .1 Base tile: submit duplicate, full size sample of each colour, texture, size, and pattern of tile.
- .2 Floor tile: submit duplicate, full size sample of each colour, texture, size, and pattern of tile.
- .3 Trim shapes, bullnose cap and cove including bullnose cap and base pieces at internal and external corners of vertical surfaces, each type, colour, and size.

.4 Adhere tile samples to 11 mm thick plywood and grout joints to represent project installation.

1.4 QUALITY ASSURANCE

.1 Quality Assurance Submittals:

.1 Manufacturer's Instructions: manufacturer's installation instructions.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:

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

.2 Waste Management and Disposal:

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

1.6 AMBIENT CONDITIONS

.1 Maintain air temperature and structural base temperature at ceramic tile installation area above 12 degrees C for 48 hours before, during, and 48 hours after, installation.

.2 Do not install tiles at temperatures less than 12 degrees C or above 38 degrees C.

.3 Do not apply epoxy mortar and grouts at temperatures below 15 degrees C or above 25 degrees C.

1.7 MAINTENANCE

.1 Extra Materials:

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Provide minimum 2% of each type and colour of tile required for project for maintenance use. Store where directed.

.3 Maintenance material same production run as installed material.

2.0 PRODUCTS

2.1 INTERIOR FINISH MATERIAL AND COLOUR SCHEDULE

.1 This schedule will be issued as a separate document and may list specific manufacturers related to patterns and colours upon which the colour scheme for the project is based.

.2 The following material specifications, which are prescriptive in nature, are presented in order to establish a quality of product upon which a price can be tendered.

.3 The Departmental Representative will consider substitute Products which meet or exceed the properties of the specified Product and are similar in material, construction, thickness, colour, texture, and overall quality, provided that proposals are submitted to the Departmental Representative complete with samples and whatever other data the Departmental Representative may require in order to evaluate the proposed substitute Product. If the Departmental Representative approves the proposed substitute Product, the Contractor will have the option of providing Product listed in the Finish schedule or an approved alternative.

2.2 FLOOR TILE

.1 Porcelain tile: to CAN/CGSB-75.1, Type 4, Class MR1 (02 -3.0%), V2 or less variation. PRT-1

.1 Size: 300mm x 600mm x 10mm

.2 Water Absorption: Conform to ISO 10545-3, ≤0.5%.
.3 Deep Abrasion Resistance: Conform to ISO 10545-6, ≤ 175N/mm^3
.4 Chemical Resistance: ISO 10545-13, ≥ UB
.5 Frost Resistance: ISO 10545-12, no damage/100 cycles.
.6 Colour & Pattern: Refer to Interior Finish Material and Colour Schedule.

2.3 WALL TILE

.1 Ceramic tile: to CAN/CGSB-75.1, Type 5, Class MR 4, V2 or less variation.
.1 CT-1
.1 Size 53 mm x 218 mm x 8mm
.2 PEI: 3
.3 Colour & Pattern: refer to Interior Finish Material and Colour Schedule.

2.4 MORTAR AND ADHESIVE MATERIALS

.1 Cement: to CSA-A5, type 10.

.2 Sand: to ASTM C 144, passing 16 mesh.

.3 Hydrated lime: to ASTM C 207, in accordance with TTMAC Installation Manual.

.4 Latex additive: formulated for use in cement mortar and thin set bond coat.

.5 Water: potable and free of minerals and chemicals which are detrimental to mortar and grout mixes.

.6 Adhesives:
.1 Maximum VOC limit 65 g/L to SCAQMD Rule 1168.

2.5 BOND COAT

.1 In accordance with TTMAC Installation Manual.

2.6 GROUT

.1 Colouring Pigments:
.1 Pure mineral pigments, lime-proof and non-fading, complying with ASTM C 979.
.2 Colouring pigments to be added to grout by manufacturer.
.3 Job coloured grout are not acceptable.
.4 All grouts: Colour as selected by Departmental Representative (premium grades).

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

.3 All grout: Colour as selected by Departmental Representative (premium grade).

2.7 ACCESSORIES

.1 Reinforcing mesh: 50 x 50 x 1.6 x 1.6 mm galvanized steel wire mesh, welded fabric design, in flat sheets.

.2 Divider strips: between tile and carpet flooring: 5mm thick stainless steel, depth to suit.

.3 Transition Strips: purpose made metal extrusion; zinc type.

.4 Reducer Strips: purpose made metal extrusion; zinc type; maximum slope of 1:2.

.5 Prefabricated Movement Joints: purpose made, having a Shore A Hardness not less than 60 and elasticity of plus or minus 40 percent when used in accordance to TTMAC Detail 301EJ.

.6 Sealant: in accordance with Section 07 92 00 - Joint Sealants.
- .1 Sealants: maximum VOC limit 250 g/L to SCAQMD Rule 1168.

.7 Floor sealer and protective coating: to tile and grout manufacturers' recommendations.

.8 Edge Protection: For all exterior corners and edges of tile surfaces. L-shaped profile with 3.2 mm wide top section and vertical section forming visible surface, integrated. Trapezoid-perforated anchoring leg and an 87° sloped vertical wall protection, material to be aluminum, in anodized or color-coated finish. Allow for 4 colours from manufacturers standard options width to suit thickness.

2.8 MIXES

.1 Cement:
- .1 Scratch coat: 1 part cement, 1/5 to 1/2 parts hydrated lime to suit job conditions, 4 parts sand, 1 part water, and latex additive where required. Adjust water volume depending on water content of sand.
- .2 Slurry bond coat: cement and water mixed to creamy paste. Latex additive may be included.
- .3 Mortar bed for floors: 1 part cement, 4 parts sand, 1 part water. Adjust water volume depending on water content of sand. Latex additive may be included.
- .4 Mortar bed for walls and ceilings: 1 part cement, 1/5 to 1/2 parts hydrated lime to suit job conditions, 4 parts sand and 1 part water. Adjust water volume depending on water content of sand.
- .5 Levelling coat: 1 part cement, 4 parts sand, minimum 1/10 part latex additive, 1 part water including latex additive.
- .6 Bond or setting coat: 1 part cement, 1/3 part hydrated lime, 1 part water.
- .7 Measure mortar ingredients by volume.

.2 Dry set mortar: mix to manufacturer's instructions.

.3 Organic adhesive: pre-mixed.
- .1 Adhesives: maximum VOC limit to SCAQMD Rule 1168.

.4 Mix bond and levelling coats, and grout to manufacturer's instructions.

.5 Adjust water volumes to suit water content of sand.

2.9 PATCHING AND LEVELLING COMPOUND

.1 Cement base, acrylic polymer compound, manufactured specifically for resurfacing and leveling concrete floors. Products containing gypsum are not acceptable.

.2 Have not less than the following physical properties:
- .1 Compressive strength - 25 MPa.
- .2 Tensile strength - 7 MPa.
- .3 Flexural strength - 7 MPa.
- .4 Density - 1.9.

.3 Capable of being applied in layers up to 50 mm thick, being brought to feather edge, and being trowelled to smooth finish.

.4 Ready for use in 48 hours after application.

2.10 CLEANING COMPOUNDS

.1 Specifically designed for cleaning masonry and concrete and which will not prevent bond of subsequent tile setting materials including patching and leveling compounds and elastomeric waterproofing membrane and coat.

.2 Materials containing acid or caustic material are not acceptable.

3.0 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 WORKMANSHIP

.1 Do tile work in accordance with TTMAC Tile Installation Manual 2009/2010, "Ceramic Tile", except where specified otherwise.

.2 Apply tile or backing coats to clean and sound surfaces.

.3 Fit tile around corners, fitments, fixtures, drains and other built-in objects. Maintain uniform joint appearance. Cut edges smooth and even. Do not split tiles.

.4 Maximum surface tolerance 1:800.

.5 Make joints between tile uniform and approximately 1.5 mm wide, plumb, straight, true, even and flush with adjacent tile. Ensure sheet layout not visible after installation. Align patterns.

.6 Lay out tiles so perimeter tiles are minimum 1/2 size.

.7 Sound tiles after setting and replace hollow-sounding units to obtain full bond.

.8 Make internal angles square, external angles rounded.

.9 Use round edged tiles at termination of wall tile panels, except where panel abuts projecting surface or differing plane.

.10 Install divider strips at junction of tile flooring and dissimilar materials.

.11 Allow minimum 24 hours after installation of tiles, before grouting.

.12 Clean installed tile surfaces after installation and grouting cured.

3.3 WALL TILE

.1 Install in accordance with TTMAC detail, for suitable substrates and applicable conditions.

3.4 FLOOR TILE

.1 Install in accordance with TTMAC details for suitable substrates and applicable conditions.

3.5 BASE TILE

.1 Install in accordance with TTMAC detail for suitable substrates and applicable conditions.

3.6 FLOOR SEALER AND PROTECTIVE COATING

.1 Apply in accordance with manufacturer's instructions.

3.7 FIELD QUALTIY CONTROL

.1 Manufacturer's Field Services:

.1 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.

3.8 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

END OF SECTION 09 30 13

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1 Gypsum Board Assemblies Section 09 21 16.

1.2 REFERENCES

.1 ASTM International

.1 ASTM C 635/C 635M- 07, Standard Specifications for the Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.

.2 ASTM C 636/C 636M- 08, Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.

.3 ASTM E 1477- 98a (2008), Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.

.2 Canada Green Building Council (CaGBC)

.1 LEED Canada-CI 1.0 -2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System and Reference Package For Commercial Interiors.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-92.1- M89, Sound Absorptive Prefabricated Acoustical Units.

.4 Green Seal Environmental Standards (GS)

.1 GS-11- 2008, 2nd Edition, Paints and Coatings.

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

.1 Material Safety Data Sheets (MSDS).

.6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards

.1 SCAQMD Rule 1113- A2007, Architectural Coatings.

.7 Underwriter's Laboratories of Canada (ULC)

.1 CAN/ULC-S102- 2007, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.3 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for ceiling panels and ceiling suspension system and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 33- Health and Safety Requirements

3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia, Canada. The Engineer shall submit Letters of Assurance of along with sealed shop drawings and BCBC 2012 Schedule B and C-B on completion of the work.

.2 Submit reflected ceiling plans for special grid patterns as indicated.

.3 Indicate lay-out, insert and hanger spacing and fastening details, splicing method for

main and cross runners, change in level details, and acoustical unit support at ceiling fixture lateral bracing and accessories .

.4 Samples:
.1 Submit for review and acceptance of each unit.
.2 Samples will be returned for inclusion into work.
.3 Submit duplicate full size samples of each type of acoustical units.

.5 Sustainable Design Submittals:
.1 Construction Waste Management:
.1 Submit calculations on end-of-project recycling rates salvage rates, and landfill rates per Construction Waste Management Plan.

.2 Low-Emitting Materials:
.1 Submit listing of touch-up paints used in building, comply with VOC and chemical component limits or restriction requirements.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Provide acoustical units amounting to 2% of gross ceiling area for each pattern and type required for project.

.3 Extra materials to be from same production run as installed materials.

.4 Clearly identify each type of acoustic unit, including colour and texture.

.5 Deliver to Departmental Representative, upon completion of the work of this section.

.6 Store where directed by Departmental Representative.

.7 Operation and Maintenance Data: submit operation and maintenance data for ceiling materials installed in the work for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store materials inside, level, under cover. Protect from weather, damage from construction operations and other causes, in accordance with manufacturer's printed instructions.
.3 Handle materials to prevent damage to edges or surfaces. Protect metal accessories and trim from being bent or damaged.
.4 Store and protect acoustic ceiling materials from nicks, scratches, and blemishes.
.5 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

2.0 PRODUCTS

2.1 INTERIOR FINISH MATERIAL & COLOUR SCHEDULE

.1 This schedule will be issued as a separate document and may list specific manufacturer's related to patterns and colours upon which the colour scheme for the project is based.

.2 The following material specifications, which are prescriptive in nature, are presented in order to establish a quality of product upon which a price can be tendered.

.3 The Departmental Representative will consider substitute Products which meet or exceed the properties of the specified Product and are similar in material, construction, thickness, colour , texture, and overall quality, provided that proposals are submitted to the Departmental Representative complete with samples and whatever other data the Departmental Representative may require in order to evaluate the proposed substitute Product. If the Departmental Representative approves the proposed substitute Product, the Contractor will have the option of providing Product listed in the Finish schedule or an approved alternative.

2.2 COMPONENTS

.1 Acoustic units for suspended ceiling system: to CAN/CGSB-92.1.
- .1 ASTM E1264 Classification: Type III, Form 1.
- .2 Pattern CE, Fire Class A.
- .3 Flame spread rating of 25 or less in accordance with CAN/ULC-S102.
- .4 Smoke development Classification 50 or less in accordance with CAN/ULC-S102.
- .5 Noise Reduction Coefficient (NRC) designation of 0.75 to ASTM C423.
- .6 Light Reflectance (LR) range of 0.85 to ASTM E 1477.
- .7 CAC Rating: 35.
- .8 Edge type: Angled, tegular, 23.8 mm (15/16")
- .9 Colour: White.
- .10 Size: 610 mm x 1220 mm x 22 mm
- .11 Shape: flat.
- .12 VOC Formaldehyde: No Added.
- .13 Warranty: Minimum 30 year performance guarantee.
- .14 Refer to Interior Finish Material and Colour Schedule.

.2 Acoustical Suspension:
- .1 Intermediate duty system to ASTM C 635.
- .2 Basic materials for suspension system: commercial quality cold rolled steel, zinc coated.
- .3 Suspension system: non fire rated, two directional exposed tee bar grid.
- .4 Exposed tee bar grid components: shop painted satin sheen, white colour. 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, 3.6 mm diameter for access tile ceilings.
- .6 Hanger inserts: purpose made.
- .7 Carrying channels: of size, thickness and weight to carry spans; painted galvanized steel. Where spans exceed 1200mm use channels of adequate strength.
- .8 Accessories: splices, clips, wire ties, retainers and wall moulding flush reveal, to complement suspension system components, as recommended by system manufacturer.

.9 ULC-approved hold-down clips where noted and required.

.3 Performance/Design Criteria:
.1 Maximum deflection: 1/360th of span to ASTM C 635 deflection test.

2.3 ACCESSORIES
.1 Touch-up paint : in accordance with manufacturer's recommendations for surface conditions:
.1 Paint: VOC limit 250 g/L maximum to and GS-11 and SCAQMD Rule 1113.

3.0 EXECUTION

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

3.2 INSTALLATION
.1 Installation: in accordance with ASTM C 636 except where specified otherwise.

.2 Suspension System:
.1 Erect ceiling suspension system after work above ceiling has been inspected by Departmental Representative
.2 Secure hangers to overhead structure using attachment methods as indicated acceptable to Departmental Representative.
.3 Install hangers spaced at maximum 1200 mm centres and within 150 mm from ends of main tees.
.4 Lay out system according to reflected ceiling plan. Where not indicated, layout centerline of ceiling both ways, to provide balanced borders at room perimeter with border units not less than 50% of standard unit width
.5 Install wall moulding to provide correct ceiling height.
.6 Completed suspension system to support super-imposed loads, such as lighting fixtures diffusers grilles and speakers.
.7 Support at light fixtures diffusers with additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
.8 Interlock cross member to main runner to provide rigid assembly.
.9 Ensure finished ceiling system is square with adjoining walls and level within 1:1000.

.3 Acoustic Panels:
.1 Install acoustical panels and tiles in ceiling suspension system.
.2 Co-ordinate ceiling work with work of other sections such as interior lighting, fire protection communication, and intrusion and detection systems.

3.3 CLEANING
.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

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

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by acoustical ceiling installation.

END OF SECTION 09 51 99

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1 Gypsum Board Assemblies Section 09 21 16

.2 Tile Carpeting Section 09 68 13

1.2 REFERENCES

.1 ASTM International

..1 ASTM D 2047-04, Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.

.3 ASTM F F2195-13 Standard Specification for Linoleum Floor Tile

.6 ASTM F 1861, Standard Specification for Resilient Wall Base.

.2 Canada Green Building Council (CaGBC)

.1 LEED Canada-CI 1.0 -2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System and Reference Package For Commercial Interiors.

.3 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards

.1 SCAQMD Rule 1113-A2007, Architectural Coatings.

.2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

.4 National Floor Covering Association (NFCA) Specification Manual.

1.3 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for flooring, adhesive, primer, sealer, and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 33- Health and Safety Requirements,

.3 Samples:

.1 Submit for review and acceptance of each unit.

.2 Samples will be returned for inclusion into work.

.3 Submit duplicate 300 x 300 mm sample pieces of sheet material.

.4 Submit duplicate full size samples of each type of tile.

.5 Submit 300 mm long base and edge strips.

.4 Sustainable Design Submittals:

.1 Construction Waste Management:

.1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

.2 Low-Emitting Materials:

.1 Submit listing of adhesives primers used in building, showing compliance with VOC and chemical component limits or restriction requirements.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for resilient flooring for incorporation into manual.

.3 Extra Materials.

.1 Provide 10% extra materials of each colour, pattern, and type flooring materials required for project maintenance use.

.2 Extra material to be in the same container and from same production run as installed materials.

.3 Clearly identify each container of tile flooring and each container of adhesive.

.4 Deliver to Departmental Representative upon completion of the work of this Section.

.5 Store where directed by Departmental Representative.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect resilient flooring from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section.

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

1.6 SITE CONDITIONS

.1 Ensure high ventilation rate, with maximum outside air, during installation.

.1 Vent directly to outside.

.2 Do not let contaminated air recirculate through a district or whole building air distribution system.

2.0 PRODUCTS

2.1 INTERIOR FINISH MATERIAL AND COLOUR SCHEDULE

.1 This schedule will be issued as a separate document and may list specific manufacturers related to patterns and colours upon which the colour scheme for the project is based.

.2 The following material specifications, which are prescriptive in nature, are presented in order to establish a quality of product upon which a price can be tendered.

.3 The Departmental Representative will consider substitute Products which meet or exceed the properties of the specified Product and are similar in material, construction, thickness, colour, texture, and overall quality, provided that proposals are submitted to the Departmental

Representative complete with samples and whatever other data the Departmental Representative may require in order to evaluate the proposed substitute Product. If the Departmental Representative approves the proposed substitute Product, the Contractor will have the option of providing Product listed in the Finish schedule or an approved alternative.

2.2 RESILIENT TILE FLOORING MATERIALS

.1 Linoleum

.1 SF

.1 Modular Linoleum Flooring to ASTM F2034 for commercial application

.2	Width:	50 mm
.3	Length:	50 mm
.4	Gauge:	2.5 mm
.5	Backing:	Polyester
.6	Static Load Limit:	450 pounds/sq inch ASTM F-970
.7	Colour:	Refer to Interior Finish Material and Colour Schedule

.2 Tactile Warning Rubber Tile:

.1 Raised round solid colour rubber tile 3.175 mm thick.

.2 Accessories: Rubber reducer strips tapered from rubber tile to concrete floor. Color to be same as rubber tile.

2.3 ACCESSORIES

.1 Resilient base (RB):

.1	Resilient Base:	To ASTM F1861, rubber, continuous length top set, bullnose top, cove toe in resilient floor areas only and toeless in carpet areas.
.2	Height:	100 mm
.3	Thickness:	3 mm
.4	Exterior Corners:	Cut backside and fold
.5	Interior Corners:	Mitre on site
.6	Exposed Ends:	Round off corners on site. Provide in longest lengths possible. Joints to be at corners only where possible.
.7	Colour:	Refer to Interior Finish Material and Colour Schedule.

.2 Primers and adhesives: of types recommended by resilient flooring manufacturer for specific material on applicable substrate, above, on or below grade.

.1 Adhesives: VOC limit 50 g/L maximum to SCAQMD Rule 1168.

.2 Primer: in accordance with manufacturer's recommendations for surface conditions:

.1 VOC limit: 100 g/L maximum to SCAQMD Rule 1113

.3 Sub-floor filler and leveller: white premix latex requiring water only to produce cementitious paste as recommended by flooring manufacturer for use with their product.

.4 Metal edge strips: extruded aluminum, smooth, mill finish, stainless steel with lip to extend under floor finish, shoulder flush with top of adjacent floor finish.

.5 Sealer and wax: type recommended by resilient flooring material manufacturer for material type and location.

.1 Coating: VOC limit 50 g/L maximum to SCAQMD Rule 1113.

3.0 EXECUTION

3.1 EXAMINATION

.1 Examine conditions, substrates and work to receive work of this Section, co-ordinate with Section 01 71 00 - Examination and Preparation.

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

.3 Ensure concrete floors are clean and dry by using test methods recommended by flooring manufacturer.

3.2 PREPARATION

.1 Prepare for installation in accordance with manufacturer's written recommendations.

.2 Remove sub-floor ridges and bumps and fill low spots, cracks, joints, holes and other defects with sub-floor filler.

.3 Clean floor and apply filler; trowel and float to leave smooth, flat hard surface.
- .1 Prohibit traffic until filler is completely cured and dry.

.4 Seal concrete slab as recommended by resilient flooring manufacturer's written instructions.

.5 For existing Terrazzo flooring, properly cleanse substrate using degreasing solution. Grind any highly polished or irregular surfaces. Fill any low spots, holes, chips and seams that my telegraph through the new flooring. Test for porosity and use the appropriate adhesive application method. Perform bond tests prior to all installations.

3.3 BOND TEST

.1 Using the flooring and adhesive suitable for the subfloor, install a 610 x 610mm (2’ x2’) section following the recommended installation procedures select areas next to walls, columns, or other light traffic areas. Tape the perimeter with duct tape to prevent edge drying of the adhesive. After 48 hours, the adhesive should be dry and the flooring should be difficult to remove.

3.4 APPLICATION - FLOORING

.1 Apply adhesive uniformly using recommended trowel. Do not spread more adhesive that can be covered by flooring before initial set takes place.

.2 Resilient tile flooring:
- .1 Lay flooring with joints parallel to building lines to produce symmetrical tile pattern.
- .2 Border tiles: half tile width minimum.
- .3 Install flooring to square grid pattern with joints aligned.

.3 As installation progresses, and after installation roll flooring with 45 kg minimum roller to ensure full adhesion.

.4 Cut flooring neatly around fixed objects.

.5 Continue flooring over areas which will be under built-in furniture.

.6 Continue flooring through areas to receive movable type partitions without interrupting floor pattern.

.7 Terminate resilient flooring at centreline of door in openings where adjacent floor finish or colour is dissimilar.

.8 Install metal edge strips at unprotected or exposed edges where flooring terminates.

3.5 APPLICATION - BASE

.1 Lay out base to keep number of joints at minimum.

.2 Clean substrate and prime with one coat of adhesive.

.3 Apply adhesive to back of base.

.4 Set base against wall and floor surfaces tightly by using 3 kg hand roller.

.5 Install straight and level to variation of 1:1000.

.6 Scribe and fit to door frames and other obstructions. Use pre-moulded end pieces at flush door frames.

.7 Cope internal corners using pre-moulded corner units for right angle external corners and formed straight base material for external corners of other angles.

.8 Use toeless type base where floor finish will be carpet, coved type elsewhere.

.9 Install toeless type base before installation of carpet on floors.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
  .1 Remove excess adhesive from floor, base and wall surfaces without damage.
  .2 Clean, seal and wax floor and base surface to flooring manufacturer's printed instructions.

.3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
  .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Protect new floors in accordance with manufacturer's printed instructions.

.3 Repair damage to adjacent materials caused by resilient flooring installation.

END OF SECTION 09 65 99

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1 Ceramic Tiling Section 09 30 13

.2 Resilient Flooring for Minor Works Section 09 65 99

1.2 REFERENCES

.1 American Association of Textile Chemists and Colorists (AATCC)
- .1 AATCC Test Method 16- 2004, Colorfastness to Light.
- .2 AATCC Test Method 23- 2005, Colorfastness to Burn Gas Fumes.
- .3 AATCC Test Method 129- 2005, Colourfastness to Ozone in the Atmosphere Under High Humidities.
- .4 AATCC Test Method 134- 2006, Electrostatic Propensity of Carpets.
- .5 AATCC Test Method 171- 2005, Carpets: Cleaning of; Hot Water Extraction Method.
- .6 AATCC Test Method 175- 2008, Stain Resistance: Pile Floor Coverings.
- .7 AATCC Test Method 189- 2007, Fluorine Content of Carpet Fibers.

.2 ASTM International
- .1 ASTM D 297- 93 (2006), Standard Test Methods for Rubber Products-Chemical Analysis.
- .2 ASTM D 1335- 05, Standard Test Method for Tuft Bind of Pile Yarn Floor Coverings.
- .3 ASTM D 2661- 08, Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings.
- .4 ASTM D 1667- 05, Standard Specification for Flexible Cellular Materials-Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam).
- .5 ASTM D 3574- 08, Standard Test Methods for Flexible Cellular Materials - Slab, Bonded, and Molded Urethane Foams.
- .6 ASTM D 3936- 05, Standard Test Method for Resistance to Delamination of the Secondary Backing of Pile Yarn Floor Covering.

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.3 Canada Green Building Council (CaGBC)
- .1 LEED Canada-CI Version 1.0- 2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.

.4 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-4.2 No. 22- 2004, Textile Test Methods - Colourfastness to Rubbing (Crocking).
- .2 CAN/CGSB-4.2 No.27.6M- 2004, Textile Test Methods - Flame Resistance - Methemine Tablet Test for Textile Floor Coverings.
- .3 CAN/CGSB-4.2 No. 76- 94 /ISO 2551: 1981 , Textile Test Methods - Machine-Made Textile Floor Coverings - Determination of Dimensional Changes Due to the Effects of Varied Water and Heat Conditions.
- .4 CAN/CGSB-4.2 No.77.1- 94 /ISO 4919: 2000, Textile Test Methods - Carpets - Determination of Tuft Withdrawal Force.
- .5 CAN/CGSB-4.129- 93 (R1997), Carpets for Commercial Use.

.5 Carpet and Rug Institute (CRI)
- .1 CRI Carpet Installation Standard 2009.
- .2 CRI Green Label Indoor Air Quality Testing Program.
- .3 CRI Green Label Plus Indoor Air Quality Testing Program.

.6 Environmental Choice Program (ECP)
- .1 CCD-152- 2009, Flooring Products, Commercial Non-modular Textile Flooring.

.7 Health Canada
.1 C.R.C., c.923- 10, Hazardous Products Act - Carpet Regulations, Part II of Schedule 1.

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

.9 National Floor Covering Association (NFCA)
.1 National Floor Covering Specification Manual 2007.

.10 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
.1 SCAQMD Rule 1113- A2007, Architectural Coatings.
.2 SCAQMD Rule 1168- A2005, Adhesives and Sealants Applications.

.11 Underwriters' Laboratories of Canada (ULC)
.1 CAN/ULC-S102- 07, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
.2 CAN/ULC-S102.2- 07, Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings and Miscellaneous Materials and Assemblies.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Installation Meetings:
.1 Convene pre-installation meeting 1 week prior to beginning work of this Section and on-site installation, with Contractor's Representative and Departmental Representative in accordance with Section 01 31 19 - Project Meetings to:
.1 Verify project requirements.
.2 Review installation and substrate conditions.
.3 Co-ordination with other construction sub-trades.
.4 Review manufacturer’s written installation instructions and warranty requirements.

.2 Sequencing: Comply with manufacturer's written recommendations for sequencing construction operations.

.3 Scheduling: schedule with other work in accordance with Section 01 32 16.07.

1.4 SUBMITTALS

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

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for each carpet tile, under-cushion, adhesive, carpet protection, subfloor patching compound and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 33 - Health and Safety Requirements

.3 Shop Drawings:
.1 Information on shop drawings to indicate:
.1 Nap: direction, open edges, special patterns.
.2 Cutouts: show locations where cutouts are required.
.3 Edgings: show location of edge moldings and edge bindings.

.4 Samples:
.1 Submit for review and acceptance of each unit.
.2 Samples will be returned for inclusion into work.

.3 Submit duplicate samples, size 610 mm X 610 mm, of each type of carpet tile specified and duplicate tiles for each colour selected, 150 mm length binder bars, and divider strips.

.5 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.6 Test and Evaluation Reports:
.1 Certified test reports showing compliance with specified performance characteristics and physical properties.

.7 Manufacturer's Instructions: submit manufacturer's installation and storage instructions.

.8 Manufacturers Reports:
.1 Manufacturer's Field Reports: submit manufacturer's written reports within 3 days of review, verifying compliance with specifications.

.10 Qualification Statements:
.1 Compliance: to CAN/ULC-S102 and CAN/ULC-S102.2.
.2 Testing: passes testing requirements of:
.1 Green Label Plus Indoor Air Quality Testing Program.
.3 Tuft bind: meets requirements of CAN/CGSB-4.129 when tested to CAN/CGSB-4.2 No.77.1.

1.5 CLOSEOUT SUBMITTALS
.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for installed products for incorporation into manual.

.3 Warranty Documentation: submit warranty documents specified in Section 1.10.

1.6 MAINTENANCE MATERIAL SUBMITTALS
.1 Extra stock materials in accordance with Section 01 78 00 Closeout Submittals: deliver to Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels.
.1 Quantity: provide minimum 5 % of each colour, pattern and type of carpeting and adhesives required for the carpeting materials.
.2 Delivery, storage and protection: comply with Owner's requirements for delivery and storage of extra materials.

1.7 QUALITY ASSURANCE
.1 Regulatory Requirements:
.1 Prequalification: compliance with Health Canada regulations under "Hazardous Products Act", Part II of Schedule 1, to CAN/CGSB-4.2 No. 27.6.

.2 Qualifications:
.1 Manufacturer: capable of providing field service representation during construction and approving application method.

.2 Flooring Installer:
.1 Experienced in performing work of this Section who has specialized in installation of work similar to that required for this project.

.2 Certified by carpet manufacturer prior to tender submission.
.3 Must not sub-contract labour without written approval of Departmental Representative.
.4 Responsible for proper product installation, including floor testing and preparation as specified and in accordance with carpet manufacturer's written instructions.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
.3 Store and protect carpet tile and adhesive in original containers or wrapping with manufacturer's seals and labels intact.
.4 Store and protect carpet tile and accessories in location as directed by Departmental Representative.
.5 Store carpet and adhesive at minimum temperature of 18 degrees C and relative humidity of maximum 65% for minimum of 48 hours before installation.
.6 Prevent damage to materials during handling and storage. Keep materials under cover and free from dampness.
.7 Safety: comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.
.8 Replace defective or damaged materials with new.

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

1.9 SITE CONDITIONS

.1 Ambient Conditions:
.1 Moisture: ensure substrate is within moisture limits and alkalinity limits recommended by manufacturer. Prepare moisture testing and provide report to Departmental Representative.
.2 Temperature: maintain ambient temperature of not less than 18 degrees C from 48 hours before installation to at least 48 hours after completion of work.
.3 Relative humidity: maintain between 10% and 65% for 48 hours before, during and 48 hours after installation.
.4 Ventilation:
.1 Departmental Representative will co-ordinate operation of ventilation system during installation of carpet. Ventilate area of work as directed by Departmental Representative by use of approved portable supply and exhaust fans.
.2 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities. Provide fans with HEPA filters.

.3 Provide continuous ventilation during and after carpet application. Run ventilation system 24 hours per day during installation; provide continuous ventilation for 7 days after completion of carpet installation.

.5 Install carpet after space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete.

1.10 WARRANTY

.1 Manufacturer's warranty: submit, for Departmental Representative's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to and does not limit other rights Owner may have under Contract Documents.

.2 Warranty period: 10 years commencing on date of substantial performance of work.

.1 Work of this Section is guaranteed against deterioration and failure of materials and workmanship detrimental to appearance and performance under normal traffic conditions,

.2 Warranty covers labour and repair or replacement of defective components.

2.0 PRODUCTS

2.1 INTERIOR FINISH MATERIAL AND COLOUR SCHEDULE

.1 This schedule will be issued as a separate document and may list specific manufacturers related to patterns and colours upon which the colour scheme for the project is based.

.2 The following material specifications, which are prescriptive in nature, are presented in order to establish a quality of product upon which a price can be tendered.

.3 The Departmental Representative will consider substitute Products which meet or exceed the properties of the specified Product and are similar in material, construction, thickness, color, texture, and overall quality, provided that proposals are submitted to the Departmental Representative complete with samples and whatever other data the Departmental Representative may require in order to evaluate the proposed substitute Product. If the Departmental Representative approves the proposed substitute Product, the Contractor will have the option of providing Product listed in the Finish schedule or an approved alternative.

2.2 MATERIALS

.1 Manufacturers:

.1 Ensure manufacturer has minimum 5 years' experience in manufacturing components similar to or exceeding requirements of project.

.2 Description:

.1 Sustainability Characteristics:

.1 Adhesives: VOC limit 50 150 g/L maximum to SCAQMD Rule 1168 GS-36.

.2 Primer Sealer : in accordance with manufacturer's recommendations for surface conditions:

.1 VOC limit:100 g/L maximum to SCAQMD Rule 1113

2.3 PERFORMANCE

.1	Flooring Radiant Panel:	(ASTM E-648) Class 1
.2	Smoke Density:	(ASTM E-662) ≤ 450
.3	Flammability Passes Methenamine Pill Test:	(DOC-FF1-70)
.4	Lightfastness:	(AATCC 16 – E) ≥ 4.0 @ 60 AFU's
.5	Static:	(AATCC 134 – E) < 3.0 KV

.6	Dimensional Stability:	AACHEN Din 54318 < 10%
.7	Traffic Classification:	Heavy
.8	Fiber Modification Ratio:	1.7 to 1.9
.9	Preservative Efficacy:	(AATCC 174 Parts 2& 3) 99% Reduction/ No mold 7 days (ASTM E- 2471) Complete Inhibition

2.4 FABRICATION

.1 Carpet Tile (CPT)

.1	Product Construction:	Tufted Textured Loop
.2	Yarn System:	Post-Consumer Content Type 6,6 Nylon
.3	Yarn Manufacturer:	Universal or equivalent
.4	Dye Method:	100% Solution Dyed
.5	Soil/Stain Protection:	Protekt^2 or equivalent
.6.	Preservative Protection:	Intersept or equivalent
.7	Tufted Yarn Weight:	475 g/m^2 (14 oz/yd^2)
.8	Machine Gauge:	47.2 ends/10cm (1/12 in)
.9	Pile Height:	3.3 mm (0.13 in)
.10	Pile Thickness:	1.7 mm (0.068 in)
.11	Stitches:	30.7 ends/10cm(7.8/in)
.12	Pile Density:	274,835.3 g/m^3 (7,412 oz/yd^3)
.13	Size:	25 cm x 1 m (9.845 in x 39.38 in)
.14	Colour & Pattern:	Refer to Interior Finish Material and Color Schedule

.2 Environmental:

.1	Total Recycled Content:	73%
.2	Recycled Content (Post Industrial):	71%
.3	Recycled Content (Post Consumer):	2%
.4	Indoor Air Quality Green Label Plus:	#GLP0820
.5	Ingredients and Life Cycle Impacts:	Environmental Product Declaration
.6	Other Environmental Claims:	3rd Party Verified Carbon Neutral NSF/ANSI-140 Gold – Sustainability Assessment
.7	End of Life:	Carpet to Carpet Recycling

.3 Technical:

.1	Installation:	Non-directional
.2	Reclamation:	Recyclable through manufacturer's program
.3	Warranty:	15 Year Standard, Non-Prorated Warranty
.4	Standard Backing:	GlasBac or equivalent
.5	Manufacturing Location:	ISO 9001 & 14001 Certified facilities

2.5 TILE CUSHION BACKING

.1 Density: urethane 224 kg/m^3; EVA and PVC 240 kg/m^3 to ASTM D 3574.

.2 Compression force deflection, minimum: urethane 34.5 kN/m^2 to ASTM D 3574.

.3 Compression deflection, minimum: EVA and PVC 48.3 kN/m^2 to ASTM D 1667.

.4 Compression set at 50%, maximum: urethane 15% to ASTM D 3574.

.5 Compression set at 25%, maximum: EVA and PVC 10% to ASTM D 3574.

.6 Ash content, maximum: urethane 50%; EVA and PVC 50% to ASTM D 297.

.7 Anti-microbial Resistance: to AATCC 174, 2 mm minimum halo of inhibition for gram positive bacteria.
- .1 1 mm minimum halo of inhibition for gram negative bacteria.
- .2 Ensure no fungal growth.

2.6 ACCESSORIES

.1 Edge Strips:
- .1 Metal:
  - .1 Hammered surface aluminum installed.
  - .2 Floor flange minimum 38 mm wide, face minimum 16 mm wide.
  - .3 Finish: clear anodic coating.

.2 Adhesive:
- .1 Multi-purpose Adhesive Type: recommended by carpet tile manufacturer for direct glue down installation.
- .2 Pressure Sensitive Type: recommended by carpet tile manufacturer for direct glue down installation of specialty backed carpet tiles.
- .3 Mill-applied Adhesive Type: fully cured. Combination of pre-applied adhesive and tile to meet carpet only VOC emissions criteria of Carpet and Rug Institute Green Label Plus Indoor Air Quality Certification Program.
- .4 Pre-applied Adhesive: non-transferable.
- .5 On site application VOC limit: 50 150 g/L maximum to SCAQMD Rule 1168.
- .6 Adhesive in compliance with CCD-152.

.3 Transition Mouldings:
- .1 Carpet edge / reducer strip: Stainless steel, to suit.

.4 Carpet protection: non-staining heavy duty kraft paper.

.5 Concrete floor sealer/primer :
- .1 VOC limit: 100 g/L maximum to SCAQMD Rule 1113.

.6 Subfloor patching compound: Portland cement base filler mix with latex and water to form cementitious paste.

3.0 EXECUTION

3.1 INSTALLERS

.1 Use experienced and qualified technicians to carry out assembly and installation of tile carpet.

3.2 EXAMINATION

.1 Examine conditions, substrates and work to receive work of this Section, co-ordinate with Section 01 71 00 - Examination and Preparation.

.2 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for carpet tile installation in accordance with manufacturer's written instructions.
- .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative

3.3 PREPARATION

.1 Subfloor Preparation:

.1 Where powdery or porous concrete surface is encountered, apply primer compatible with adhesive to provide a suitable surface for glue-down installation.

.2 Fill and level cracks 3 mm wide or protrusions over 0.8 mm with appropriate and compatible latex polymer fortified patching compound.

.3 Comply with manufacturer's written recommendations for maximum patch thickness.

.4 Prime large patch areas with compatible primer.

.5 Ensure concrete substrates are cured, clean and dry.

.6 Ensure concrete substrates are free of paint, dirt, grease, oil, curing or parting agents, and other contaminates, including sealers, that interfere with the bonding of adhesive.

.2 Surface Preparation: prepare surface in accordance with manufacturer's written recommendations and co-ordinate with Section 01 71 00 - Examination and Preparation.

.1 Prepare floor surfaces in accordance with CRI Carpet Installation Standard.

.3 Tile Carpeting Preparation:

.1 Pre-condition carpeting: following manufacturer's written instructions.

3.4 INSTALLATION

.1 Install carpet tiles in accordance with manufacturer's written instructions, and CRI Carpet Installation Standard and co-ordinate with Section 01 73 00 - Execution .

.2 Co-ordinate tile carpeting work with work of other trades, for proper time and sequence to avoid construction delays.

.3 Install carpet tile after finishing work is completed but before demountable office partitions and telephone and electrical pedestal outlets are installed.

.4 Install carpet tile as per manufacturer's recommendation. This can include quarter-turn 90 degree format, monolithic, random, quarter turn ashlar, horizontal, herringbone or vertical ashlar.

.5 Snugly join carpet tiles in completed installation.

.1 Measure distance covered by 11 carpet tiles (10 joints) and ensure distance is in compliance with manufacturer specifications.

.2 Do not trap yarn between carpet tiles.

.6 Apply thin film of pressure-sensitive adhesive according to manufacturer's recommendations.

.7 Ensure finished installation presents smooth wearing surface free from conspicuous seams, burring and other faults.

.8 Use material from same dye lot.

.1 Ensure colour, pattern and texture match within visual areas.

.2 Maintain constant pile direction.

.9 Fit around architectural, mechanical, electrical and telephone outlets, and furniture fitments, around perimeter of rooms into recesses, and around projections.

.10 Extend carpet tiles into toe spaces, door reveals,open-bottomed obstructions, removable flanges,

alcoves, and similar openings.

.11 Install carpet tiles smooth and free from bubbles, puckers, and other defects.

.12 Protect exposed carpet tile edges at transition to other flooring materials with suitable transition strips.

3.5 SITE QUALITY CONTROL

.1 Site Tests and Inspections:
- .1 Co-ordinate site test with Section 01 45 00 - Quality Control.

.2 Manufacturer's Field Services:
- .1 Co-ordinate manufacturer's services with Section 01 45 00 - Quality Control. Have manufacturer review work involved in handling, installation / application, protection and cleaning of its product s, and submit written reports, in acceptable format, to verify compliance of work with Contract.
- .2 Manufacturer's field services: provide manufacturer's field services, consisting of product use recommendations and periodic site visits for inspection of product installation, in accordance with manufacturer's instructions.
- .3 Schedule site visits:
  - .1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.
  - .2 Twice during progress of Work at 25% and 60% complete.
  - .3 Upon completion of Work, after cleaning is carried out.
- .4 Obtain reports within 3 days of review and submit immediately to Departmental Representative.

3.6 CLEANING

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

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal
- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Prohibit traffic on carpet for period of 24 hours minimum after installation and until adhesive is cured.

.3 Install carpet protection to satisfaction of Departmental Representative.

.4 Repair damage to adjacent materials caused by tile carpeting installation.

END OF SECTION 09 68 13

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1	Metal Fabrications	Section 05 50 00
.2	Finish Carpentry	Section 06 20 00
.3	Architectural Woodwork	Section 06 40 00
.4	Metal Doors & Frames	Section 08 11 00
.5	Flush Wood Doors	Section 08 14 16
.6	Room Finish Schedule	Section 09 06 00

1.2 REFERENCES

.1 Department of Justice Canada (Jus)
- .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33

.2 Environmental Protection Agency (EPA)
- .1 EPA Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 - 1995, (for Surface Coatings).

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

.4 Master Painters Institute (MPI)
- .1 MPI Architectural Painting Specifications Manual, latest edition.

.5 National Fire Code of Canada - 1995

.6 Society for Protective Coatings (SSPC)
- .1 SSPC Painting Manual, Volume Two, 8th Edition, Systems and Specifications Manual.

.7 Transport Canada (TC)
- .1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

1.3 QUALITY ASSURANCE

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

.2 Conform to the standards contained in the Master Painters Institute Architectural Painting Specification Manual, latest edition (hereafter referred to as MPI Painting Specification Manual) for all painting products including preparation and application of materials. MPI Painting Specification Manual as issued by the local MPI Accredited Quality Assurance Association having jurisdiction.

.3 All paint manufacturers and products used shall be as listed under the “Approved Products” section of the MPI Painting Specification manual.

.4 Other paint materials shall be the highest quality product of an approved manufacturer listed in MPI Painting Specification Manual and shall be compatible with other coating materials as required.

.5 Single-Source Responsibility: provide primers and undercoat paint produced by the same manufacturer as the finish coat.

.6 All painting and decorating work shall be inspected by Paint Inspection Agency (inspector) acceptable to the specifying authority and the local MPI Accredited Quality Assurance Association. The painting contractor shall notify the Paint Inspection Agency a minimum of one week prior to commencement of work and provide a copy of the project painting specification, plans and elevation drawings (including pertinent details) as well as a Finish Schedule.

.7 All surfaces requiring painting or repainting shall be inspected by the inspection agency who shall advise on all aspects of painting work including preparation, notifying the Consultant, the Contractor and the Trade Contractor of any defects or problems prior to commencing painting work or after the prime coat shows defects in the substrate, and as the work progresses.

.8 Standard of Acceptance:
- .1 Wall: No defects visible from a distance of 1000mm at 90° to surface.
- .2 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

.9 Mock-Ups:
- 1 Construct mock-ups in accordance with Section 01 45 00 - Quality Control.
  - .1 Prepare and paint designated surface, area, room or item (in each colour scheme) to specified requirements, with specified paint or coating showing selected colours, gloss/sheen, textures.
  - .2 Mock-up will be used:
    - .1 To judge workmanship, substrate preparation, operation of equipment and material application and workmanship to MPI Architectural Painting Specification Manual standards.
  - .3 Locate where directed.
  - .4 Allow 24 hours for inspection of mock-up before proceeding with work.
  - .5 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.

.10 Pre-Installation Meeting:
- .1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart
  - .1 Verify project requirements.
  - .2 Review installation and substrate conditions.
  - .3 Coordination with other building subtrades.
  - .4 Review manufacturer's installation instructions and warranty requirements.

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

1.4 PERFORMANCE REQUIREMENTS
.1 Environmental Performance Requirements:
.1 Provide paint products meeting MPI "Environmentally Friendly" E1, E2, E3 ratings based on VOC (EPA Method 24) content levels.
.2 Green Performance in accordance with MPI Standard GPS-

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

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

.3 Schedule painting operations to prevent disruption of occupants.

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

.2 Product Data:
.1 Submit product data and instructions for each paint and coating product to be used.
.2 Submit product data for the use and application of paint thinner.
.3 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOCs during application.

.3 Samples:
.1 Submit triplicates 200 x 300 mm sample panels of each paint, stain, or clear coating with specified paint or coating in colours, gloss/sheen and textures required to MPI Architectural Painting Specification Manual standards submitted on following substrate materials:
.1 3 mm plate steel for finishes over metal surfaces.
.2 10 mm hardboard plywood for finishes over wood surfaces.
.3 13 mm gypsum board for finishes over gypsum board and other smooth surfaces.
.2 Retain reviewed samples on-site to demonstrate acceptable standard of quality for appropriate on-site surface.
.3 Test reports: submit certified test reports for paint from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
.1 Lead, cadmium and chromium: presence of and amounts.
.2 Mercury: presence of and amounts.
.3 Organochlorines and PCBs: presence of and amounts.
.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
.5 Manufacturer's Instructions:
.1 Submit manufacturer's installation instructions.

.6 Closeout Submittals: submit maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals include following:
.1 Product name, type and use.
.2 Manufacturer's product number.
.3 Colour numbers.
.4 MPI Environmentally Friendly classification system rating.

1.7 MAINTENANCE

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

1.8 DELIVERY, STORAGE AND HANDLING

.1 Packing, Shipping, Handling and Unloading:
.1 Pack, ship, handle and unload materials in accordance with Section 01 61 00 - Common Product Requirements and manufacturer's written instructions.

.2 Acceptance at Site:
.1 Identify products and materials with labels indicating:
.1 Manufacturer's name and address.
.2 Type of paint or coating.
.3 Compliance with applicable standard.
.4 Colour number in accordance with established colour schedule.

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

.4 Storage and Protection:
.1 Provide and maintain dry, temperature controlled, secure storage.
.2 Store materials and supplies away from heat generating devices.
.3 Store materials and equipment in well-ventilated area with temperature range 7 degrees C to 30 degrees C.

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

.6 Keep areas used for storage, cleaning and preparation clean and orderly. After completion of operations, return areas to clean condition.

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

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

.9 Waste Management and Disposal:
- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene corrugated cardboard and packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan (WMP).
- .4 Separate for recycling and place in designated containers Steel, Metal, Plastic waste in accordance with Waste Management Plan (WMP).
- .5 Place materials defined as hazardous or toxic in designated containers.
- .6 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal, regulations.
- .7 Ensure emptied containers are sealed and stored safely.
- .8 Unused paint, coating materials must be disposed of at official hazardous material collections site as approved by Departmental Representative.
- .9 Paint, stain and wood preservative finishes and related materials (thinners and solvents) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.
- .10 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
- .11 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
- .12 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into ground follow these procedures:
  - .1 Retain cleaning water for water-based materials to allow sediments to be filtered out.
  - .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
  - .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
  - .4 Dispose of contaminants in approved legal manner in accordance with hazardous waste regulations.
  - .5 Empty paint cans are to be dry prior to disposal or recycling (where available).
- .13 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.
- .14 Set aside and protect surplus and uncontaminated finish materials. Deliver to or arrange collection by organizations for verifiable re-use or re-manufacturing.

1.9 SITE CONDITIONS

.1 Heating, Ventilation and Lighting:
- .1 Provide heating facilities to maintain ambient air and substrate temperatures above 10 degrees C for 24 hours before, during and after paint application until paint has cured sufficiently.

.2 Provide continuous ventilation for seven days after completion of application of paint.
- .3 Coordinate use of existing ventilation system with Departmental Representative and ensure its operation during and after application of paint as required.
- .4 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.
- .5 Provide minimum lighting level of 323 Lux on surfaces to be painted.

.3 Temperature, Humidity and Substrate Moisture Content Levels:

.1 Unless pre-approved written approval by Paint Inspection Agency Authority and product manufacturer, perform no painting when:

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

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

.3 Substrate and ambient air temperatures are not expected to fall within MPI or paint manufacturer's prescribed limits.

.4 The relative humidity is under 85% or when the dew point is more than 3 degrees C variance between the air/surface temperature. Paint should not be applied if the dew point is less than 3 degrees C below the ambient or surface temperature. Use sling psychrometer to establish the relative humidity before beginning paint work.

.5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.

.6 Ensure that conditions are within specified limits during drying or curing process, until newly applied coating can itself withstand 'normal' adverse environmental factors.

.2 Perform painting work when maximum moisture content of the substrate is below:

.1 Allow new concrete and masonry to cure minimum of 28 days.

.2 15% for wood.

.3 12% for plaster and gypsum board.

.3 Test for moisture using calibrated electronic Moisture Meter. Test concrete floors for moisture using "cover patch test".

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

.4 Surface and Environmental Conditions:

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

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

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

.5 Additional interior application requirements:

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

.2 Apply paint in occupied facilities during silent hours only. Schedule operations to approval of Departmental Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.

1.10 GUARANTEE

.1 Furnish a 100% two (2) year Maintenance Bond.

.2 Painting and decorating Subcontractors providing a Maintenance Bond shall provide a maintenance bond consent from a reputable surety company licensed to do business in Canada. Cash or certified cheque are not acceptable in lieu of surety consent.

2.0 PRODUCTS

2.1 MATERIALS

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

.2 Provide paint materials for paint systems from single manufacturer.

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

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

.5 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) in accordance with MPI Architectural Painting Specification Manual "Approved Product" listing.

.6 Linseed oil, shellac, and turpentine: highest quality product from approved manufacturer listed in MPI Architectural Painting Specification Manual, compatible with other coating materials as required.

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

.8 Use MPI listed materials having minimum E2 rating where indoor air quality (odour) requirements exist.

.9 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids:
- .1 Water-based.
- .2 Non-flammable.
- .3 Manufactured without compounds which contribute to ozone depletion in the upper atmosphere.
- .4 Manufactured without compounds which contribute to smog in the lower atmosphere.
- .5 Do not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.

.10 Formulate and manufacture water-borne surface coatings with no aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.

.11 Flash point: 61.0 degrees C or greater for water-borne surface coatings and recycled water-borne surface coatings.

.12 Ensure manufacture and process of both water-borne surface coatings and recycled water-borne surface coatings does not release:
- .1 Matter in undiluted production plant effluent generating 'Biochemical Oxygen Demand' (BOD) in excess of 15 mg/L to natural watercourse or sewage treatment facility lacking secondary treatment.
- .2 Total Suspended Solids (TSS) in undiluted production plant effluent in excess of 15 mg/L to natural watercourse or a sewage treatment facility lacking secondary treatment.

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

.14 Recycled water-borne surface coatings must not contain:
- .1 Lead in excess of 600.0 ppm weight/weight total solids.
- .2 Mercury in excess of 50.0ppm weight/weight total product.
- .3 Cadmium in excess of 1.0ppm weight/weight total product.
- .4 Hexavelant chromium in excess of 3.0 ppm weight/weight total product.
- .5 Organochlorines or polychlorinated biphenyls (PCBS) in excess of 1.0 ppm weight/weight total product.

2.2 COLOURS

.1 Refer to Interior Finish Material and Colour Schedule, Section 09 06 00 Finish Schedule and drawings for identification and location of colours.

.2 Interior Finish Material and Colour Schedule:
- .1 This schedule will be issued as a separate document and may list specific manufacturers related to patterns and colours upon which the colour scheme for the project is based.
- .2 The following material specifications, which are prescriptive in nature, are presented in order to establish a quality of product upon which a price can be tendered.
- .3 The Departmental Representative will consider substitute Products which meet or exceed the properties of the specified Product and are similar in material, construction, thickness, colour, texture, and overall quality, provided that proposals are submitted to the Departmental Representative complete with samples and whatever other data the Departmental Representative may require in order to evaluate the proposed substitute Product. If the Departmental Representative approves the proposed substitute Product, the Contractor will have the option

.3 Second coat in 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. Obtain written approval from Departmental Representative for tinting of painting materials.

.2 Mix paste, powder or catalyzed paint mixes in accordance with manufacturer's written instructions.

.3 Use and add thinner in accordance with paint manufacturer's recommendations. Do not use kerosene or similar organic solvents to thin water-based paints.

.4 Thin paint for spraying in accordance with paint manufacturer's instructions.

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

2.4 GLOSS/SHEEN RATINGS

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

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

.2 Gloss level ratings of painted surfaces as indicated.

2.5 PAINTING SYSTEMS –NEW CONSTRUCTION

.1 Metal Fabrications: steel
 .1 INT 5.1B – Waterborne light industrial gloss level 3 coating.

.2 Steel – high heat: (boilers, furnaces, heat exchangers, breeching, pipes, flues ,stacks, etc.' with temperature range as noted):
 .1 INT 5.2C – Inorganic zinc rich coating, maximum 400 degrees C.

.3 Galvanized metal: doors frames, railings, misc., steel, pipes, and ducts.
 .1 INT 5.3K – Waterborne light industrial gloss level 4 coating (over waterborne primer).

.4 Dresser lumber: doors, casings, mouldings:
 .1 INT 6.3A – High performance architectural latex gloss level 3 finish.

.5 Plaster and gypsum board: gypsum wallboard, drywall, "sheet rock type material", and textured finishes:
 .1 INT 9.2A – Latex gloss level 3 finish (over latex sealer) for wall typical, gloss level 3 for ceiling.

.6 Asphalt Surfaces – Traffic marking.
 .1 EXT 2.1A Latex zone/Traffic marking finish.

2.6 INTERIOR REPAINTING SYSTEM – EXISTING CONSTRUCTION

.1 Structural Steel and Metal Fabrications:
 .1 RIN 5.1B Waterbourne light industrial gloss level 3 coating.

.2 Galvanized Metal: doors, frames, railings, misc. steel, pipes, overhead decking, ducts, etc.
 .1 RIN 5.3B Waterbourne light industrial gloss level 4 coating.

.3 Plaster and Gypsum Board Surfaces: gypsum wallboard, drywall, "sheet rock type material":, etc.
 .1 RIN 9.2A Latex, gloss level 3 finish for wall typical, gloss level 1 finish for ceiling typical.

.4 Asphalt Surfaces – Traffic marking.
 .1 REX 2.1A Latex zone/Traffic marking finish.

2.7 SOURCE QUALITY CONTROL

.1 Perform following tests on each batch of consolidated post-consumer material before surface coating is reformulated and canned. Testing by laboratory or facility which has been accredited by Standards Council of Canada.

.1 Lead, cadmium and chromium are to be determined using ICP-AES (Inductively Coupled Plasma - Atomic Emission Spectroscopy) technique no. 6010 as defined in EPA SW-846.

.2 Mercury is to be determined by Cold Vapour Atomic Absorption Spectroscopy using Technique no. 7471 as defined in EPA SW-846.

.3 Organochlorines and PCBs are to be determined by Gas Chromatography using Technique no. 8081 as defined in EPA SW-846.

3.0 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 GENERAL

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

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

3.3 EXAMINATION

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

.2 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "cover patch test". Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

.3 Maximum moisture content as follows:

.1 Stucco, plaster and gypsum board: 12%.

.2 Wood: 15%.

3.4 PREPARATION

.1 Protection:

.1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Departmental Representative.

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

.3 Protect factory finished products and equipment.

.4 Protect passing pedestrians, building occupants and general public in and about the building.

.2 Surface Preparation:

.1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.

.2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.

.3 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Departmental Representative.

.3 Clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
- .1 Remove dust, dirt, and other surface debris by wiping with dry, clean cloths or compressed air.
- .2 Wash surfaces with a biodegradable detergent and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.
- .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
- .4 Allow surfaces to drain completely and allow to dry thoroughly.
- .5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.
- .6 Use trigger operated spray nozzles for water hoses.
- .7 Many water-based paints cannot be removed with water once dried. Minimize use of mineral spirits or organic solvents to clean up water-based paints.

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

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

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

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

.8 Touch up of shop primers with primer as specified.

.9 Do not apply paint until prepared surfaces have been accepted by Departmental Representative.

3.5 APPLICATION

.1 Method of application to be as approved by Departmental Representative. Apply paint by brush, roller, air or airless sprayer. Conform to manufacturer's application instructions unless specified otherwise.

.2 Brush and Roller Application:
- .1 Apply paint in uniform layer using brush and/or roller type suitable for application.
- .2 Work paint into cracks, crevices and corners.
- .3 Paint surfaces and corners not accessible to brush using spray daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
- .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces free of roller tracking and heavy stipple.

.5 Remove runs, sags and brush marks from finished work and repaint.

.3 Spray application:
- .1 Provide and maintain equipment that is suitable for intended purpose, capable of atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
- .2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
- .3 Apply paint in uniform layer, with overlapping at edges of spray pattern. Back roll first coat application.
- .4 Brush out immediately all runs and sags.
- .5 Use brushes and rollers to work paint into cracks, crevices and places which are not adequately painted by spray.

.4 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access.

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

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

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

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

.9 Finish closets and alcoves as specified for adjoining rooms.

.10 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

3.6 MECHANICAL/ELECTRICAL EQUIPMENT

.1 Paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as indicated.

.2 Boiler room, mechanical and electrical rooms: paint exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment.

.3 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.

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

.5 Do not paint over nameplates.

.6 Keep sprinkler heads free of paint.

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

.8 Paint fire protection piping red.

.9 Paint disconnect switches for fire alarm system and exit light systems in red enamel.

.10 Paint natural gas piping yellow.

.11 Paint both sides and edges of backboards for telephone and electrical equipment before installation. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

.12 Do not paint interior transformers and substation equipment.

3.7 SITE TOLERANCES

.1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.

.2 Ceilings: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.

.3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

3.8 FIELD QUALITY CONTROL

.1 Interior painting and decorating work shall be inspected by a Paint Inspection Agency (inspector) acceptable to the specifying authority and local Painting Contractor's Association. Painting contractor shall notify Paint Inspection Agency a minimum of one week prior to commencement of work and provide a copy of project painting specification, plans and elevation drawings (including pertinent details) as well as a Finish Schedule.

.2 Interior surfaces requiring painting shall be inspected by Paint Inspection Agency who shall notify Departmental Representative and General Contractor in writing of defects or problems, prior to commencing painting work, or after prime coat shows defects in substrate.

.3 Where "special" painting, coating or decorating system applications (i.e. elastomeric coatings) or

non-MPI listed products or systems are to be used, paint or coating manufacturer shall provide as part of this work, certification of surfaces and conditions for specific paint or coating system application as well as on site supervision, inspection and approval of their paint or coating system application as required at no additional cost to Departmental Representative.

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

.5 Field inspection of painting operations to be carried out be independent inspection firm as designated by Departmental Representative.

.6 Advise Departmental Representative when surfaces and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.

.7 Cooperate with inspection firm and provide access to areas of work.

.8 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Departmental Representative.

3.9 RESTORATION

.1 Clean and re-install hardware items removed before undertaken painting operations.

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

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

.4 Protect freshly completed surfaces from paint droppings and dust to approval of Departmental Representative. Avoid scuffing newly applied paint.

.5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Departmental Representative.

3.10 PAINT COLOUR SCHEDULE

.1 Refer to Interior Finishes Material and Color Schedule.

END OF SECTION 09 91 23

1.0 GENERAL

1.1 RELATED SECTIONS

.1	Rough Carpentry	Section 06 10 11
.2	Finish Carpentry	Section 06 20 00
.3	Architectural Woodwork	Section 06 40 00
.4	Gypsum Board Assemblies	Section 09 21 16

1.2 SUBMITTALS

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

.2 Clearly indicate component size and configuration, attachment details, accessories, colour and finish.

.3 Manufacturer's written product data indicating compliance with specified materials required.

.4 Manufacturer's written installation instructions.

.5 Samples:
- .1 300mm x 300mm samples of each tackboard materials required.
- .2 300mm in length samples of trim, tray, and end caps as required.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

.1 Take delivery, uncrate and store in safe and dry space until ready for installation.

.2 Store on edge, in warm, dry and protected area.

.3 Store dry-erase wallcovering within original package to prevent damage to roll(s).

1.4 WARRANTY

.1 Warrant in writing panels against delamination for period of five (5) Years from date of Substantial Performance.

.2 Submit manufacturer's limited five-year written warranty against manufacturing defects for tackboard, whiteboard and dry-erase wallcovering.

1.5 QUALITY ASSURANCE

.1 Applicator:
Installation by skilled commercial wallcovering applicators with no less than three years of documented experience installing dry erase wallcovering of the types and extent required.

.2 Fire Hazard Classification:
Provide materials that comply with NFPA Class A fire rating when tested in accordance with ASTM E 84 using GRC Board as substrate. Magnetism & magnetism grid: Class A and magnetism in-line: Class B Identify components with markings from testing and inspection organization.

.3 Field Samples: Prepare field samples for Architect's review and establish requirements for seaming and finish trim.
- .1 Install sample panel of each type presentation wallcovering specified in area designated by Architect.
- .2 Maintain corrected and approved samples to serve as a standard of performance for the project.

2.0 PRODUCTS

2.1 INTERIOR FINISH MATERIAL AND COLOUR SCHEDULE

.1 This schedule is attached in the appendix and may list specific manufacturers related to patterns and colours upon which the colour scheme for the project is based.

.2 The following material specifications, which are prescriptive in nature, are presented in order to establish a quality of product upon which a price can be tendered.

.3 The Departmental Representative will consider substitute Products which meet or exceed the properties of the specified Product and are similar in material, construction, thickness, colour, texture, and overall quality, provided that proposals are submitted to the Departmental Representative complete with samples and whatever other data the Departmental Representative may require in order to evaluate the proposed substitute Product. If the Departmental Representative approves the proposed substitute Product, the Contractor will have the option of providing Product listed in the Finish schedule or an approved alternative.

2.2 MATERIALS

.1 Tackboards (BB)

.1 Material: Linoleum resilient homogeneous tackable surface with self-healing ability.

.2 Construction: Linoleum resilient homogeneous tackable surface material shall be of natural materials consisting of linseed oil, granulated cork, rosin binders and dry pigments, mixed and calendered onto a natural burlap (jute) backing. Uni-color shall extend throughout thickness of material. Contains no harmful by-products or carcinogens.

.3 Size: 1220 mm Wide x 28 Lineal M

.4 Thickness: 6 mm

.5 Backing: Jute

.6 Flexibility: Will not crack or break when bent around a 70 mm / 2 3/4” diameter cylinder.

.7 Fire Resistance: ASTM E 84, Class B: NFPA 255, Class II

.8 Electrical Insulation: DIN 51953-1010 Ohm VDE 0100 24-106 Ohm Anti-static characteristics to ISOTR6356-minimal charges, even at 23°C and 25% relative humidity. Under normal conditions, Bulletin Board is not susceptible to build-up of electrostatic charges.

.9 Thermal Conductivity: The coefficient of thermal conductivity is 0.10 W/m.K.

.10 Chemical Resistance:

** *Diluted Acids:*
Acetic Acid (5%) . . . . . No effect
Citric Acid(5%) . . . . . No effect
Lactic Acid(5%) . . . . . No effect
** *Solvents:*
White Spirits . . . . . No effect
Turpentine . . . . . No effect
Ether . . . . . No effect
Acetone . . . . . No effect
** *Miscellaneous:*
Hydrogen Peroxide (3%) . . . No effect
Alcohol . . . . . No effect
Mineral Oil . . . . . No effect
Vegetable Oil . . . . . No effect
Formalin (2%) . . . . . No effect
**Tested to EN-ISO 26987.

.11 Self-Healing: Material will self-heal from punctures caused by thumbtacks and pins. Repeated use of pins does not harm the material. Material will not dry out, crack, peel or crumble. Tested to LH000420.

.12 Force On Pins: Thumbtacks and pins can be inserted easily an are gripped firmly. When objects are pinned to the board, the combination can carry a force of 25 N, when hanging from the pins, the combination can carry a force of 10 N. Tested to LH000421.
.13 Bacteriostatic Properties: To EN-ISO 22196, yes.
.14 Natural Materials (.e.g. cork, linseed oil, jute): 91%
.15 Recycled Content: 43%
.16 PVC, PET, plasticizers content: 0%
.17 Finish: Matte, washable.
.18 Colour: Refer to Interior Finish Material and Colour Schedule.

.2 Accessories:
.1 Perimeter Trim or frame: aluminum extrusion channel to fit over and enclose all exposed edges of tackboard. Trim to be 20-25 mm exposed width, with hairline mitred corners and concealed fasteners.
.2 Aluminum extrusions to be Alloy 6063-T5, clear anodized, satin finish.

3.0 EXECUTION

3.1 PROJECT CONDITION

.1 Provide not less than 80 foot-candles per square foot lighting level measured mid-height at substrate surfaces.

3.2 EXAMINATION

.1 Notify the contractor and architect in writing of any conditions detrimental to the proper and timely completion of the installation.

.2 Beginning of installation means acceptance of surface conditions.

3.3 INSTALLATION

.1 All work shall be performed according to manufacturer’s written instructions.

.2 Stop installation of material that is questionable in appearance and notify the manufacturer’s representative for an inspection.

.3 Installation shall be performed by skilled mechanics experienced in this line of work.

.4 Install work square, plumb, straight, true and accurately fitted with hairline joints.

.5 Install work centred on wall and at locations as confirmed by Consultant.

.6 Include all anchors, dowels and fastenings necessary to anchor work together and/or to work of other trades. Anchor in accordance with manufacturer's printed instructions.

.7 Verify locations, mounting heights and dimensions of all units before installation.

.8 Refer to drawings for sizes, locations and quantities of units.

.9 Install panels using approved manufacturers adhesive and according to manufacturer’s written installation instruction.

.10 Finish exposed surfaces of aluminum components in accordance with Aluminum Association Designation System for Aluminum Finishes, clear anodized, Class 2.

.11 Fabricate and install bulletin boards for continuous lengths minimizing seam joints that will allow reasonable handling and installation. Submit as required under 1.4 as listed above.

.12 Make finished bulletin boards flat and rigid.

3.4 CLEANING

.1 Upon completion of installation, remove all exposed adhesive immediately using a soft cloth and a warm, mild soap solution and rinse thoroughly with water and dry with clean towel prior to using.

.2 Upon completion of the work, remove surplus materials, rubbish, and debris resulting from the installation. Leave areas in neat, clean and orderly condition.

.3 Clean & maintain finished work according to manufacturer's written instructions.

END OF SECTION 10 11 00

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1 Rough Carpentry for Minor Works — Section 06 08 99

.2 Finish Carpentry — Section 06 20 00

1.2 REFERENCES

.1 ASTM International
- .1 ASTM A 167-99(2009), Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- .2 ASTM B 456-03, Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
- .3 ASTM A 653/A 653M-09, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .4 ASTM A 924/A 924M-09, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

.2 Canada Green Building Council (CaGBC)
- .1 LEED Canada-CI Version 1.0- 2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For Commercial Interiors.

.3 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-1.81-M90, Air Drying and Baking Alkyd Primer for Vehicles and Equipment.
- .2 CAN/CGSB-1.88-92, Gloss Alkyd Enamel, Air Drying and Baking.
- .3 CGSB 31-GP-107MA-90, Non-inhibited Phosphoric Acid Base Metal Conditioner and Rust Remover.

.4 CSA International
- .1 CAN/CSA-B651-04, Accessible Design for the Built Environment.
- .2 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

1.3 SUBMITTALS

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

.2 Product Data:
- .1 Provide manufacturer's printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Indicate size and description of components, base material, surface finish inside and out, hardware and locks, attachment devices, description of rough-in-frame, building-in details of anchors for grab bars.

.5 Sustainable Standards Certification:
- .1 Low-Emitting Materials: submit listing of laminate adhesives used in building, verifying that they contain no urea-formaldehyde.

1.4 CLOSEOUT SUBMITTALS

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

1.5 MAINTENANCE MATERIAL SUBMITTALS

.1 Tools:

.1 Provide special tools required for assembly, disassembly or removal for toilet and bath accessories in accordance with requirements specified in Section 01 78 00 - Closeout Submittals.

.2 Deliver special tools to Departmental Representative.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect toilet and bathroom accessories from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse of pallets, crates, padding, and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

2.0 PRODUCTS

2.1 MATERIALS

.1 Sheet steel: to ASTM A 653/A 653M with ZF001 designation zinc coating.

.2 Stainless steel sheet metal: to ASTM A 167, Type 304, with satin finish.

.3 Sustainability Characteristics:

.1 Laminate Adhesives.

.1 Urea Formaldehyde Free.

.4 Stainless steel tubing: Type 304, commercial grade, seamless welded 1.2 mm wall thickness.

.5 Fasteners: concealed screws and bolts hot dip galvanized, exposed fasteners to match face of unit. Expansion shields fibre, lead or rubber as recommended by accessory manufacturer for component and its intended use.

2.2 INTERIOR FINISH MATERIAL AND COLOUR SCHEDULE

.1 This schedule will be issued as a separate document and my list specific manufacturers related to style and quality upon which the scheme for the project is based.

.2 The following component specifications, which are prescriptive in nature, are presented in order to establish a quality of product upon which a price can be tendered.

.3 The Departmental Representative will consider substitute Products which meet or exceed the properties of the specified Product and are similar in material, construction, thickness, colour, texture, and overall quality, provided that proposals are submitted to the Departmental Representative complete with samples and whatever other data the Departmental Representative

may require in order to evaluate the proposed substitute Product. If the Departmental Representative approves the proposed substitute Product, the Contractor will have the option of providing Product listed in the Finish schedule or an approved alternative.

2.3 COMPONENTS

.1 Toilet tissue dispenser: (TTD) side by side double roll type, surface mounted, brushed stainless steel frame, capacity of 3000 double ply sheets, transfer paddle, locking dispenser for coreless roll use.

.2 Paper towel Dispenser & Disposal (PTDD): Hands-free type for jumbo roll towels max 200mm diameter . Stainless steel type 304 #4 brushed finish. Safety guarded stainless steel saw tooth cutting bar. Full length SS piano hinges for door c/w two tumbler keyed locks. Include removable galvanized steel liner (26 ga). Operates with plug in AC adaptor.

.1 Semi-recessed, extra-large capacity (47 litre).

.3 Soap Dispenser (SD): Stainless steel vertical, wall mount, 1185ml, 40 oz size 127 x 127 x 203 high.

.4 Grab Bars (GB): 30/32 mm dia x 1.6 mm wall tubing of stainless steel, 38 mm diameter wall flanges, concealed screw attachment, flanges welded to tubular bar, provided steel back plates and all accessories. Knurl bar at area of hand grips. Grab bar material and anchorage to withstand downward pull of 2.2kN. Configurations and sizes as indicated.

.1 GB1 (Toilet Side Wall Grab Bar): 915mm L.

.5 Sanitary Napkin Disposal (ND): Stainless Steel Type 304 recessed Type with coverall door, removable leak proof plastic waste bin. Self-closing counter balanced door secured to recessed body. Recessed body to be corrosion resistant galvanized steel.

.6 Mirror (MR)

.1 Frame: 18-8, heavy gauge stainless steel, ¾" x ¾" (19 x 19 mm) angle with satin finish. One-piece, roll-formed construction forms continuous integral stiffener on all sides. Bevel design on front of angle holds frame tightly against mirror, Corners of mirror frame are heliarc welded, ground and polish smooth. Galvanized steel back is fastened to frame with concealed screws and equipped with integral horizontal hanging brackets near the top and bottom of the mirror for hanging the mirror and to prevent the mirror from pulling away from the wall. Locking devices secure mirror to concealed wall hanger.

.2 Mirror: No.1 quality, ¼" (6 mm) select float glass (standard glass): selected for silvering, electrolytically copper-plated by the galvanic process, and guaranteed for 15 years against silver spoilage. All edges protected by plastic filler strips; back is protected by full-size, shock-absorbing, water-resistant, nonabrasive, 3/16" (5 mm) thick polyethylene padding.

.3 Concealed Wall Hanger: Galvanized steel construction. Incorporates upper and lower support members, which engage lower backplate louvers to keep bottom of mirror against wall.

.7 Shelf (SH): 11 gauge, Type 304, 18-10 stainless steel with surface treatment to minimize finger marks. Size to be 120 mm x 600 mm, complete with mounting hardware.

.8 Toilet Seat Cover (TSC): Recessed toilet-seat-cover dispenser shall be type-304 stainless steel with all-welded construction; exposed surfaces shall have stain finish. Door shall be 18 gauge (1.2 mm); have 9/16" (14 mm) 90° return edges; be secured to cabinet with a concealed, full-length stainless steel piano-hinge; and equipped with a tumbler lock keyed like other washroom accessories. Dispenser shall have a minimum capacity of 500 paper toilet seat covers.

.9 Benches: Free standing lacquered 1-1/4" thick solid maple top that resists water, warping and solvents. Pre-drilled mounting, includes bench top, two 14W tubular stainless steel pedestals

completed with floor anchor plate and installation hardware. Size to be 96” long x 9” wide x 17” high. 4 benches total as shown on drawing.

2.4 FABRICATION

.1 Weld and grind joints of fabricated components flush and smooth. Use mechanical fasteners only where approved.

.2 Wherever possible form exposed surfaces from one sheet of stock, free of joints.

.3 Brake form sheet metal work with 1.5 mm radius bends.

.4 Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.

.5 Back paint components where contact is made with building fini;;shes to prevent electrolysis.

.6 Hot dip galvanize concealed ferrous metal anchors and fastening devices to CAN/CSA-G164.

.7 Shop assemble components and package complete with anchors and fittings.

.8 Deliver inserts and rough-in frames to job site at appropriate time for building-in. Provide templates, details and instructions for building in anchors and inserts.

.9 Provide steel anchor plates and components for installation on studding and building framing.

2.5 FINISHES

.1 Chrome and nickel plating: to ASTM B 456, satin finish, U.O.N.

.2 Manufacturer's or brand names on face of units not acceptable.

3.0 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrates and surfaces to receive toilet and bathroom accessories previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's instructions prior to toilet and bathroom accessories installation.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval from Departmental Representative.

3.2 INSTALLATION

.1 Install and secure accessories rigidly in place as follows:

.1 Stud walls: install steel back-plate to stud prior to plaster or drywall finish. Provide plate with threaded studs or plugs.

.2 Hollow masonry units, existing plaster or drywall: use toggle bolts drilled into cell or wall cavity.

.3 Solid masonry, marble, stone or concrete: use bolt with lead expansion sleeve set into drilled hole.

.4 Toilet and shower compartments: use male to female through bolts.

.2 Install grab bars on built-in anchors provided by bar manufacturer.

.3 Use tamper proof screws/bolts for fasteners.

.4 Fill units with necessary supplies shortly before final acceptance of building.

.5 Install mirrors in accordance with Section 08 80 50 - Glazing.

3.3 ADJUSTING

.1 Adjust toilet and bathroom accessories components and systems for correct function and operation in accordance with manufacturer's written instructions.

.2 Lubricate moving parts to operate smoothly and fit accurately.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

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

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by toilet and bathroom accessories installation.

3.6 SCHEDULE

.1 Locate accessories where indicated on drawings. Exact locations to be confirmed by Departmental Representative.

END OF SECTION 10 28 10

1.0 GENERAL

1.1 DOCUMENTS

.1 This section forms an integral part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 RELATED WORK

.1 Rough Carpentry.

1.3 REFERENCES

.1 CGSB 44 - GP - 40 (71), Lockers, Clothing Steel.

1.4 SAMPLES

.1 Submit samples in accordance with Section 01 30 00 – Administrative Procedures.

1.5 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 30 00 – Administrative Procedures.

.2 Indicate thickness of metal, fabricating methods, assembled bank of lockers, bases, trim, numbering, filler panels, end and back panels.

1.6 QUALITY ASSURANCE

.1 Installers: Factory-trained personnel having a minimum of five (5) years proven experience in the installation of lockers for projects of similar size and complexity.

.2 Regulatory Requirements: Design and installation in accordance with BCBC 2012 seismic restraints.

2.0 PRODUCTS

2.1 MATERIALS

.1 Fabrication

.1 Lockers: to CGSB 44 - GP - 40, single tier (ST), banks of lockers as indicated on drawings, 305 mm wide x 460mm deep x 1830 high in locker room NC 206, free standing, with doors of double wall construction; proud from frame chrome plated steel inset flush with door face, number plates inset with finger pull, 4” high metal base, back and side to be provided with continuous lock forming, running the complete height of the locker in baked enamel finish. 24 gauge body - 16-gauge frame with shelf notched into frame for extra support. One shelf and two coat hooks per locker. Slope Top. Contractor to provide blocking.

.2 Locking System: Magnetic latch; prepare doors to accept combination padlocks complete with heavy duty 11 ga. padlock hasp.

.3 Colour to be selected by Consultant from Manufacturer’s standard colours.

.4 Corner closure and end wall panels. Provide matching corner, closure, and end wall panels to suit room and wall locations. Confirm fit on site.

3.0 EXECUTION

3.1 INSTALLATION

.1 Assemble and install lockers in accordance with manufacturer’s written instructions.

.2 Securely fasten lockers to grounds and nailing strips

.3 Install finished end, panels to exposed ends of locker banks.

END OF SECTION 10 51 13

1.0 GENERAL

1.1 RELATED REQUIREMENTS

. 1 Windows Section 08 50 00

1.2 SUBMITTALS

.1 Submit shop drawings in accordance with General Requirements.

.2 Indicate dimensions in relation to window jambs, operator details, head and sill anchorage details, hardware and accessories details.

.3 Submit one representative working sample of roller shades in accordance with Section 01 33 00.

.4 Submit duplicate samples of the specified colors for approval by Consultant.

.5 Submit duplicate copies of operating and maintenance instructions including, name and telephone number of local service company.

1.3 INSPECTION / PREPARATION

.1 Take field measurements to verify or supplement dimensions indicated. Be responsible for accurate fit of work.

.2 Notify Consultant in writing of any deficiencies in the work of other trades that would affect the window treatment system.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

.1 Do not deliver to site until areas to receive shades are completely finished, all walls and ceilings completed and painted.

.2 Deliver materials in original protective wrappings or containers, with manufacturers labels and sealed intact.

.3 Handle and store materials according to manufacturers recommendations protecting materials and finishes from damages, marring of finishes or soiling.

1.5 GUARANTEE

.1 A written one (1) year guarantee will be required guaranteeing all products to be free of any defects of materials or any deficiencies in workmanship and on-site installation from the date of Substantial Performance.

2.0 PRODUCTS

2.1 SHADES

.1 Acceptable Product: snap-in spring loaded. Clear anodized aluminium parts with fabric to provide view 10% open, color to be determined by Departamental Rrepresentative from manufacturer’s standard colours.

.2 Fascia Color: Clear anodized.

.3 Shade System shall be free of sharp edges, butts or other defects, which might be harmful.

2.2 FABRICATION

.1 Prior to fabrication, verify actual opening dimensions by on-site measurement. Calculate blind dimensions to fit within specified tolerances.

.2 Fabricate blinds to fill openings from head to sill and jamb to jamb. Measure in several places. The clearance blind-to-blind shall be 1/8 inch minimum. Locate blind divisions at mullions.

3.0 EXECUTION

3.1 INSPECTION

.1 Verify that the work in which the blinds will be installed is free of conditions that interfere with blinds installations and operations. Begin blind installation only when unsatisfactory conditions have been corrected.

3.2 INSTALLATION

.1 Install work by manufacturer's skilled tradesmen and in strict accordance with manufacturer's installation procedures except as otherwise specified herein.

.2 Install blinds with adequate clearance to permit smooth operation of blinds and any sash operators. Hold blinds 1/8 inch clear from each side of window opening on inside mount unless other clearance is indicated.

.3 All items installed, plumbed, squared, rigidly coupled and adequately anchored, maintaining uniformed clearances, accurate alignment levels, and parallel with the window plane. Fabric shall not travel more than 3 mm (0.125") in either direction within channels after installation.

.4 The solar screen shall be pre-measured and manufactured off-site.

.5 Demonstrate blinds to be in smooth, working order.

3.3 ADJUSTING AND CLEANING

.1 Adjust shades and operating components as required to ensure smooth and trouble free operation without binding.

.2 Adjust shade and shade-cloth to hang flat without buckling or distortion.

.3 Clean shades and exposed components. Wipe or sponge using a mild detergent and warm water solution. Do not immense in water or dry-clean.

.4 Replace work, which cannot be satisfactorily repaired, adjusted, or cleaned.

3.4 SCHEDULE OF BLINDS

.1 All new windows on 2/F project area, AW1 to AW4.

END OF SECTION 12 50 05

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1 Electrical Division 26

1.2 REFERENCES

.1 American National Standards Institute (ANSI) B-29.2 – Chain Standards for Inverted Tooth (Silent) Chains and Sprockets.

.2 American Society of Mechanical Engineers (ASME) A17.1 – Safety Code for Elevators and Escalators.

.3 American Society of Mechanical Engineers (ASME) A18.1 – Safety Standard for Platform and Stairway Chair Lifts.

.4 U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA). Accessibility Guidelines for Buildings and Facilities (ADAAG)".

.5 BC Building Code.

1.3 REQUIREMENTS OF REGULATORY AGENCIES

.1 Fabrication and installation work in compliance with applicable jurisdictional authorities.

.2 File shop drawings and submissions with local authorities as the information is made available. Company pre-inspection and jurisdictional authority inspections and permits are to be made on timely basis as required.

1.4 SUBMITTALS

.1 Submit under provisions of Section 01 33 00.

.2 Product Data: Manufacturer's data sheets on each product to be used, including:
- .1 Preparation instructions and recommendations.
- .2 Storage and handling requirements and recommendations.
- .3 Installation methods.

.3 Shop Drawings: Provide a complete layout of lift equipment detailing dimensions and clearances as required.

.4 Selection Samples: For each finish product specified requiring selection of color or finish, two complete sets of color charts representing manufacturer's full range of available colors and patterns.

1.5 QUALITY ASSURANCE

.1 Manufacturer Qualifications:

.2 Installer Qualifications:
- .1 Execute work of this section only by a company that has adequate product liability insurance.
- .2 Skilled tradesman shall be employees of the installing contractor approved by the manufacturer, with demonstrated ability to perform the work on a timely basis.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Store products in manufacturer's unopened packaging until ready for installation.

.2 Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 PROJECT CONDITIONS

.1 Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer

1.8 WARRANTY

.1 Coverage – this warranty applies to the repair or replacement, at Manufacturer's option, of parts that fail due to defective material or workmanship. Manufacturer may, at its option, provide factory reconditioned parts. This warranty is provided to the Authorized Dealer on behalf of the final purchaser of the product and is not transferable. The Manufacturer's warranty does not cover labor charges for the removal, repair or replacement of warranty parts but such costs may be covered for a period of time by Authorized Dealer's warranty, which is provided to purchaser separately.

.1 The manufacturer shall offer a 36-month warranty on parts from date of substantial completion.

2.0 PRODUCTS

2.1 HYDRAULIC VERTICAL PLATFORM LIFT

.1 Work described in this section consist of a hydraulic tower with a lifting platform for indoor, commercial application and includes providing equipment, incidental material and labor required for complete, operable hydraulic platform lift installation. Lifts shall be erected, installed, adjusted, tested and placed in operation by lift system manufacturer, or manufacturer's authorized installer.

.1 Lifts shall be in accordance with the ASME A18.1 and ADA compliant including local codes and regulations except where specified otherwise.

.2 The following preparatory work to receive the lifts specified in this section is part of the work of other sections:

.1 Permanent 120 VAC, 20 amp single phase power to operate lift to be provided from a lockable fused/cartridge type disconnect switch with auxiliary contacts for battery operation. Refer to drawings for permanent power specifications and location of disconnects. Temporary power may be provided to expedite installation of lift.

.2 Provide a plumb and square hoistway with smooth interior surfaces, including fascias or furring of the hoistway interior.

.3 Provide rough openings per lift contractor's shop drawings.

.4 Provide substantial, level pit floor slab as indicated on the lift contractor's shop drawings.

.4 Characteristics:

.1 Rated Load: 750 lb (340 kg).

.2 Rated Speed: 25 fpm (0.13 m/s).

.3 Usable Car Dimensions: 36 inches by 48 inches (914 mm by 1219 mm)

.4 Levels Serviced: 2

.5 Number of Openings: 2.

.6 Car Access: Enter/Exit , refer to drawings

.7 Max. Travel: Refer to drawings.

.8 Operations: Constant pressure.

.9 Power Supply: 110 volt, 15 amp, 1 phase, 60 Hz.

.10 Drive System: 2:1 Roller chain hydraulic.

.11 Paint: Aluminum Anodized.

.12 Emergency Power: Battery operation in down direction.

.13 Controller: Electronic-free relay logic.
.14 Motor/Pump: 110VAC, 1.5 HP.
.15 Manual Lowering: Outside the hoistway at desired landing.
.16 Color: Aluminum Anodized.

.5 Car Enclosure:
.1 Side guards of platform shall have a steel frame with a powder coat finish and steel panel inserts to a minimum of 42 inches (1067 mm) above the upper landing.
.2 No platform gate required, to allow for ease of operation.
.3 Upper gate shall be 80 inches high by 36 inches wide (2032 mm by 914 mm), with minimum 6mm thk tempered glass inserts and shall be equipped with interlock, spring hinges and kick plate. Lower door inserts shall be 80 inches high by 36 inches wide (2032 mm by 914 mm), with 6mm thk tempered glass inserts and shall be equipped with interlock, hydraulic closer and kick plate on both sides. The inside kick plate shall be made of steel.
.4 Upper door shall be 36 inches wide by 80 inches high (914 mm by 2032 mm) top landing door instead of the top landing gate.
.5 Lower and upper door and door frame with 1 hour ULC Fire rating, heavy duty hinges, Door vision panel, flush mounting of door inside the hoistway and adjustable hydraulic door closer on door frame.
.6 Doors shall be flush mounted inside the hoistway as to avoid pinch points and shear hazards.
.7 Handrail: A single handrail, with 1-1/2 inches (38 mm) diameter rail and with both ends returned to the side guard, shall be located on the control wall of the carriage.

.6 Car Operation:
.1 Car Operating Panel shall consist of constant pressure buttons or rocker switches, emergency stop/alarm button, on/off key switch and emergency light mounted on a removable stainless steel panel (Type 304 #4 Stainless Steel Finish).
.2 Emergency Operation: The car shall be equipped with a battery operated light fixture, emergency battery lowering device and alarm in case of normal building supply failure. The battery shall be the rechargeable type with an automatic recharging system. A manual lowering device shall be located outside the hoistway in a lockable box positioned at a designated landing.

.7 Pumping Unit and Control:
.1 The pumping unit and control shall be enclosed in the tower. The controller and pump unit shall be pre-wired and tested prior to shipment. The controller is to be electronic-free with relay logic operation for ease of maintenance and service. Pump unit shall incorporate the following features:
.2 Smooth stops at each landing.
.3 Adjustable pressure relief valve.
.4 Manually operable down valve to lift in the event of an emergency. This valve shall be activated from outside of the hoistway through a keyed box.
.5 Pressure gauge isolating valve, manually operable.
.6 Gate valve to isolate cylinder from pump unit.
.7 Electrical solenoid for down direction control.
.8 Emergency lowering by battery power, from the car control.

.8 Cylinder and Plunger:
.1 The cylinder shall be constructed of steel pipe of sufficient thickness and suitable safety margin. The top of the cylinder shall be equipped with a cylinder head with an internal guide ring and self-adjusting packing.
.2 The plunger shall be constructed of a steel shaft of proper diameter machined true and smooth. The plunger shall be provided with a stop electrically welded to the bottom to prevent the plunger from leaving the cylinder.

.9 Roller Chains: Two No.50 roller chains with 5/8 inch (16 mm) pitch. Minimum breaking strength 6100 lb (2773 kg) each.

.10 Leveling Device:
.1 The lift shall be provided with an anti-creep device which will maintain the carriage level within ½ inch (12 mm) of the top landing.
.2 All limit switch and leveling device switches shall be located in a position to be inaccessible to unauthorized persons. They shall be located behind the mast wall and be accessible through removable panels.

.11 Guide Yoke: The 2:1 guide yoke/sprocket assembly shall be supplied with two sprockets, roller guide shoes, bearings and guards.

.12 Call Stations: Provide key-controlled call stations for upper level and lower level on a stainless steel plate (Type 304 #4 stainless steel finish).

.13 Terminal Stopping Devices: Normal terminal stopping devices shall be provided at top and bottom of runway to stop the car positively and automatically. Micro switches shall not be used.

.14 Guide Rails and Brackets: Steel ‘C’ guide rails and brackets shall be used to guide the platform and sling. Guide rails shall form part of the structural integrity of the unit and be integral to the mast enclosure, ensuring stability and minimum platform deflection when loaded.

3.0 EXECUTION

3.1 EXAMINATION

.1 Do not begin installation until hoistway and machine room has been properly prepared.

.2 Site dimensions shall be taken to verify that tolerances and clearances have been maintained and meet local regulations.

.3 If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

.1 Clean surfaces thoroughly prior to installation.

.2 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 LIFT INSTALLATION

.1 Install all the components of the lift system that are specified in this section to be provided, and that are required by jurisdictional authorities to license the lift.

.2 Trained employees of the lift contractor shall perform all installation work of this section.

.3 Adjust lift for proper operation and clean unit thoroughly.

.4 Instruct users in operation procedures and Owner's maintenance person in trouble-shooting and maintenance procedures.

3.4 PROTECTION

.1 Protect installed products until completion of project.

.2 Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 14 42 16

1. GENERAL

1.1 Work Included

.1 Refer to Division 23 05 00 Common Works Results for HVAC

1. GENERAL

1.1 Work Included

.1 Fire protection system piping and accessories.

.2 Sprinkler heads.

.3 Valves.

.4 Hydraulic calculations and shop drawings.

.5 Fire extinguishers and cabinets.

1.2 Quality Assurance

.1 All work shall be installed in accordance with the current edition of NFPA No. 13, Standard for Installation of Sprinkler Systems.

.2 All workers engaged in the construction or modification of the fire protection system shall be journeymen who have Trades Qualifications as Sprinkler Fitters under Province of British Columbia legislation, or are indentured apprentices working under a journeyman who is on the site. Trades Qualification certificates must be submitted prior to commencing work and must be on site for inspection.

.3 All material, equipment, valves and devices installed and/or furnished under this section shall be listed and/or approved for use in fire protection installation by the following agencies or codes.

.1 Factory Mutual Engineering Association.

.2 Underwriters' Laboratories of Canada.

.3 Underwriters' Laboratories Incorporated.

.4 National Fire Protection Association.

.5 Local Fire Department.

.4 Fire extinguishers must conform to any one of the following National Standards: ULC-S504, CAN4-503, ULC-S512, CAN4-S507.

.5 External fire pumper connections shall comply with the sizing standards of the local fire department.

1.3 Design Criteria

.1 Design density requirements are as prescribed in the current edition of NFPA Standard 13.

.2 Light hazard occupancies include the following: classrooms, administration offices, staff lounge, gymnasiums, lobbies, corridors, lunchrooms, washrooms, libraries (with low book stacks), music and drama, rooms, gymnasia.

.3 Ordinary Hazard Group 1 occupancies include the following: mechanical rooms, janitor rooms, storage rooms, equipment rooms, business classrooms, computer classrooms, home economics classrooms, stage, stage wings, elevator shaft, crawl spaces.

.4 Ordinary Hazard Group 2 occupancies include the following: science laboratories, metal workshops, auto shops, woodworking shops.

1.4 Submittals - Prior to Construction

.1 Submission details and requirements shall be as prescribed in the current edition of NFPA Standard 13.

.2 Equipment Shop Drawings: Submit technical and maintenance detail for the following equipment:

.1 Each type of sprinkler head

.2 Sprinkler head guards

.3 Accessory valves

.4 Extinguishers, including rating and capacity

.5 Extinguisher cabinets

.6 Pressure gauges

.3 System Shop Drawings and Hydraulic Calculations

.1 Hydraulic calculations and shop drawings must be sealed by a qualified Professional Specialty Engineer.

.2 Shop drawings must be submitted in Computer Aided Drafting (CAD) format. The sheet size of the shop drawings must match the tender drawing size.

.3 Before commencing the fabrication of installation of the fire protection system, the contractor shall submit one reproducible copy of shop drawings and hydraulic calculations to the Specialty Engineer for review.

.4 Submit final Specialty Engineer approved shop drawings and hydraulic calculations to:

.1 Local authority having jurisdiction.

.2 Local Fire Department.

.5 Submit Schedule SB letter of assurance sealed by a fire protection Specialty Engineer licenced to practice in the province were the work is taking place.

1.5 Submittals – Prior to Substantial Performance

.1 Include final Specialty Engineer approved working plans and hydraulic calculations as well as approval letter from Insurance Company in each of the Maintenance Manuals.

.2 Submit completed above ground and below ground Materials and Testing Certificate at completion.

.3 Signed statement from the local fire department that the thread size on the fire department pumper connection is correct.

.4 Signed statement from the local fire department that the thread size on the hydrant is correct.

.5 Submit Schedule SC letter of assurance sealed by a fire protection Specialty Engineer licenced to practice in the province were the work is taking place.

1.6 Hydraulic Calculations

.1 Hydraulic calculations for the systems shall be performed by the fire protection contractor. Drawings indicate the general layout, configuration and pipe routing required, based on wet grid and loop systems, or dry feeders and branch systems, and shall be followed unless the contractors disclose conflicts which may make any of the installation impractical.

.2 After tendering, the successful contractor will be responsible to submit hydraulic calculations and shop drawings with the necessary related test data to the Specialty Engineer for review prior to commencing work.

.3 The contract drawings for this project have been prepared using an AutoCAD computerized drafting system. Include for the cost of updating the original computer software to include all changes recorded on the record white prints.

.4 If requested, copies of the software drawing file will be made available by the Department Representative on floppy discs prepared with AutoCAD 2002. The drafting system used to produce the shop drawings and final record drawings must be compatible with this system.

.5 Perform or obtain certified correct tests from the Fire Department or Water Utility for water supply characteristics.

.6 To expedite the examination of hydraulically calculated sprinkler systems, the following information is to be submitted with the drawings and calculations for acceptance:

.1 The direction of flow and the quantity flowing in each pipe leading to or in the design area chosen.

.2 The type of pipe and the C factor used for piping in the system and in the underground supply to the system in addition a "K" factor is required.

.3 A node diagram with indication of the discharge quantities from each sprinkler and the pressures applying at each node point.

.4 A supply and a demand curve at a common reference point (to be stated) on semi-log graph paper to show the relationship between the sprinkler and hose demand against the actual supply. Design for the water supply to be capable of supplying 20% more in volume than the total sprinkler demand and 10% more pressure at the base of the riser. When water supply information is obtained from a third party, a copy of the written confirmation indicating the amount available, the pressure available, the reference point, the time and date of test and the person or persons who made the test.

.5 Show dimensions between sprinkler heads and branch lines.

.6 Indicate capacity of sprinkler system when flooded in U.S. gallons.

1.7 Record Drawings

.1 Refer to Section 23 01 00, Documentation, Manuals and Record Drawings.

1.8 Acceptable Contractors

.1 Construction companies, whether tendering as sub-contractors or prime contractors, that are approved in principle, but subject to requirements of drawings and specifications are:

.1 Integrated Fire Protection Ltd., Kelowna, BC

.2 Total Mechanical Systems Inc., Kelowna, BC

.3 Okanagan Fire Protection Services Ltd, Kelowna, BC

.4 Chapman Fire Protection, Vernon, BC

.5 Troy Sprinkler Limited, Chilliwack, BC

.6 BTR Fire Protection Ltd, Kelowna, BC

1.9 Acceptable Manufacturers

.1 Manufacturers of fire extinguishers and cabinets whose products are approved in principle, but subject to requirements of drawings and specifications are:

.1 CEB, National Fire Equipment, Flag, Wilson and Cousins, Silverline, Chubb.

.2 Manufacturers of automatic sprinkler valves whose products are approved in principle, but subject to requirements of drawings and specifications are:

.1 Globe, Grinnell, Vipond, Astra, Viking, Central, Gem, Star.

.3 Manufacturers of sprinkler heads and equipment whose products are approved in principle, but subject to requirements of drawings and specifications are:

.1 Automatic, Grinnell, Vipond, Viking, Astra, Globe, Central, Gem, Star, Reliable, Victaulic.

.4 Manufacturers of sprinkler pipe fittings identified in Section 23 05 05.

1.10 Special Conditions

.1 Provide 48 hours' notice to the Departmental Representative prior to disruption of systems. Obtain approval prior to proceeding with systems shutdown or disruption.

.2 Systems are to be provided with temporary work as required to maintain systems in operation at all times. Short periods of discontinuous service may be approved for reconnection, modification or renovation of services or systems.

.3 Systems outside the work area are not to be left in inoperable conditions overnight.

.4 The Departmental Representative may instruct the Contractor to activate systems in the area of work even if the remainder of the construction and installation of building components is not complete. The Contractor must schedule his work to allow minimal periods of inoperable system operation in the area of work.

2. PRODUCTS

2.1 Sprinkler Heads and Escutcheon Plates

.1 Sprinkler heads installed shall be upright sidewall or pendant, as conditions and density require, and shall be of the proper type and finish for the building and/or areas designated.

.2 Sprinkler heads in attic or ceiling spaces, crawl spaces and on unfinished exposed piping, except where noted, shall be brass finish upright type.

.3 Heads for finished ceilings shall be recessed pendent type, with chrome plated finish and escutcheon plates. The escutcheon plates shall cover all of the pendent piping, up to the sprinkler head.

.4 Heads in light hazard occupancies shall be quick response type, if required.

2.2 Sprinkler Head Guards

.1 Head guards shall be approved by the sprinkler head manufacturer for use on the sprinkler head approved.

2.3 Nameplates - Hydraulic Data Plates

.1 Comply with current edition of NFPA Standard No. 13, Mounted on riser above each sprinkler alarm valve.

2.4 Test Pipes and Test Modules

.1 Flow Test Modules: ULC, FM approved ductile iron body, separate bronze fitted valves for drain and test operation, acrylic sight glass, internal replaceable orifice with four sized, EPDM gaskets, threaded connection. Equal to Viking Testmaster Style 718.

.2 Test Valve: Single ball valve, threaded test pipe and cap, 25 mm diameter.

.3 Provide engraved plastic label on each unit, identifying zone of service.

2.5 Sprinkler Isolation Valves

.1 All valves for the sprinkler systems shall be designated to withstand a working pressure of 1,200 kPa (175 psig). Valves 50 mm or smaller to be bronze construction with screwed connections.

.2 Valves isolating automatic valves shall be gear operated butterfly valves complete with integral tamper switches.

.3 Refer to Section 23 05 23.

2.6 Piping

.1 Refer to Division 23 05 05

2.7 Fittings

.1 Sprinkler System Less than 64 mm diameter: Threaded, Malleable Steel. Welded, same thickness as pipe.

.2 Branch Mains and Tees 64 mm and up: Welded, Flanged, Victaulic. Threaded, Malleable Steel. Welded, same thickness as pipe. Weld-o-lets, full depth. Victaulic, approved clamp, Malleable steel.

.3 Pressure Ratings: Not less than 1,200 kPa (175 psig) or 350 kPa (50 psig) above maximum static pressure.

2.8 Hangers

.1 Conform to current NFPA requirements.

.2 All hangers and components of hangers are to be UL listed for use in sprinkler systems.

.3 Adjustable, cast or forged ring, or strap type clevis hanger.

2.9 Fire Extinguisher - Type FA

.1 UL listed for class A, B and C fires, dry chemical ammonium phosphate powder, red finish, complete with semi recessed cabinet (Type 1).

.2 Strike First (Diamond) 4.5 kg (10 lb), Model ABC-100WWD, ULC Fire rating 6-A/80-BC 135 mm diameter, 520 mm high.

2.10 Fire Extinguisher Cabinets

.1 Type 1: National Fire Equipment Ltd Fire Extinguisher Cabinet CE-950-3-2-FR to accommodate 10 lb Dry Chemical Extinguisher, full glass door, 2 hour fire rated assembly, grey baked enamel finish to be painted to match existing Cabinets on main floor.

2.11 Pressure Gauges

.1 Steel case, 90 mm diameter minimum, phosphor bronze bourdon tube brass movement, extruded brass socket.

.2 Provide brass needle shutoff valve.

.3 All gauges shall be calibrated in S.I. (Metric) Units and Imperial Units.

3. EXECUTION

3.1 General

.1 Sprinkler piping will be concealed throughout the project, except where specifically noted.

.2 Sufficient heat will be maintained by the building operator, in areas which are theoretically warm spaces, to prevent piping freezing.

.3 Wall, ceiling and floor penetration – distribution piping greater 65 mm and over: Cast metal floor and ceiling plates with set screws.

.4 Wall, ceiling and floor penetration – sprinkler head piping less than 65 mm: Chrome finished split rings, complete with fastening screws.

.5 Provide sleeves whenever pipes pass through concrete or concrete block walls. Maintain a 12 mm annular clearance between sleeves and pipe. Pack sleeves with flexible material equal to and to maintain fire rating of wall.

3.2 Identification and Labelling

.1 Provide identification schedule for Maintenance Manuals.

.2 Isolation Valves: Stamped or engraved metal or engraved plastic tags identifying valves.

.3 Flow Test Modules or Flow Test Valve: Stamped or engraved metal or engraved plastic tags identifying zone of service.

3.3 Sprinkler Heads

.1 Head type, configuration and placement shall comply with the specification requirements as well as notation requirements on plans.

.2 Provide extended escutcheons if necessary to clear obstructions.

.3 Align heads in common locations.

.4 Heads in T -bar ceilings shall be positioned on both centrelines of standard lay-in panels. If it is not possible to install heads on both centrelines, heads are to be installed on one centreline which is common with adjacent panels. All heads in T-bar ceilings are to be aligned in both directions. Heads are not to be re-positioned from the locations shown on drawings in order to reduce the number of heads.

.5 Provide approved sidewall heads where required, or shown. Ensure heads are approved for range required to provide coverage.

.6 Temperature rating shall suit the specific area with a minimum margin of safety of 10 degrees C.

.7 The proximity of head to heat generating equipment shall be taken into consideration in determining the temperature ratings.

.8 All sprinklers in concealed spaces subject to excessive temperature such as roof spaces, to be the 100 degree C rating.

.9 Where piping is being used to feed upright sprinklers from below the ceiling, the hole is to be cut to allow the passage of pipe and head, and an escutcheon plate shall be used to finish the opening. Provide insulation if piping passes from heated to unheated space.

.10 The support stems on upright heads shall be aligned with the centre line of the pipe on which they are mounted.

.11 Make minor sprinkler head placement changes on site due to site conditions at no extra cost.

.12 Provide preliminary head layout to the Departmental Representative for review and coordination. Allow for one meeting in Vancouver with the Coordinating Professional to make adjustments as required to suit architectural requirements. Re-submit the final drawing for review and approval electronically.

3.4 Sprinkler Head Guards

.1 Any sprinkler head that is subject to mechanical injury shall be protected with a listed head guard.

.2 Be prepared to demonstrate acceptability of selected guard by activation of an installed head, by melting the link.

.3 Areas in which sprinklers are considered to be at risk from mechanical damage and require guards are as follows:

.1 All areas throughout where sprinkler heads are less than 2,900 mm above floor.

.2 Mechanical Rooms

.3 Electrical Rooms

.4 All exterior sprinkler heads.

3.5 Test Modules and Test Pipes

.1 Wet Pipe System: A test module controlling a 25 mm inspector's test with a smooth bore corrosion resistant orifice to provide a flow equivalent to one sprinkler of a type installed on the particular system shall be installed on the end of the most distant sprinkler line in the upper story and shall be equipped with a cast iron or brass plug.

3.6 Piping

.1 Route piping in orderly manner and maintain proper grades.

.2 Install to conserve head room and interfere as little as possible with use of space.

.3 Run exposed piping parallel to walls.

.4 Group piping wherever practical at common elevations.

.5 Slope piping as required and arrange to drain at low points.

.6 Install piping to allow for expansion and contraction without unduly stressing pipe or equipment connected.

.7 Provide clearance for proper installation of fittings, and for access to valves, drains and unions.

.8 Wet system piping is not to be run in areas which are unheated and considered theoretically cold.

.9 Piping shall be run in such a manner as not to pass under light fixtures. Field measurements, not the drawings, will determine routing. Extra will not be allowed for changes due to this requirement.

.10 Make minor piping placement changes on site due to site conditions at no extra cost.

3.7 Hangers

.1 In finished areas, plastic or chrome plated ceiling plates shall be provided for all hanging rods.

.2 All piping shall be braced and provided with flexible couplings to provide protection against earthquakes as required by the current edition of NFPA Standards 13, 14 and 20.

.3 The distance between a hanger and the centreline of an upright sprinkler shall be no less than 75 mm.

.4 The unsupported length between the end sprinkler and the last hanger shall not be more than 450 mm for 25 mm pipe, or 600 mm for 30 mm pipe. When these limits are exceeded, the pipe shall be extended beyond the end sprinklers and supported by an additional hanger.

.5 Risers shall be supported by attachments directly to the riser or by hangers located on the horizontal connections close to the riser.

.6 Riser supports shall be provided at ground level and at each third level above. Where risers are supported from the ground, the ground support constitutes the first level of riser support.

.7 Sprinkler risers in vertical shafts, shall have at least one support for each riser pipe section.

3.8 Drains

.1 The 50 mm or 30 mm system drains shall be run to outside of the building. Auxiliary drains shall be run to a point where they are accessible and equipped with valve, nipple, and cap or drum drips, as per current NFPA requirements.

.2 Water alarm drains shall be run to outside of building, to an adequate disposal area or storm sewer.

.3 Drains shall be positioned so as not to cause undue destruction of landscaping or create water or ice hazards. Discharges shall be located to prevent damage during full flow testing. Selection of locations is the responsibility of this Division.

.4 Drain outlets are not to be positioned less than 2.0 metres above outside finished grade.

.5 Drains shall be provided with NPT, male threads at discharge, and threaded cap.

.6 A copy of location and size of all drains and low points on these systems must be kept at valve station.

3.9 Fire Extinguishers and Cabinets

.1 Extinguishers greater than 18 kg: Mount cabinets so top of extinguisher is 1,000 mm from floor.

.2 Extinguishers less than 18 kg: Mount cabinets so top of extinguisher is 1,500 mm from floor.

.3 Turn over extinguisher cabinets to Prime Contractor for installation.

3.10 Flushing of Piping

.1 Connection for flushing shall be made to the building services shutoff valve through properly secured pipe work to the outside of the building.

.2 Flushing water must not be passed through the double check valve assembly.

.3 The Fire Department sprinkler inlet pipe may be used for discharge service if the check valve clapper is removed.

.4 Discharge of the large amounts of water required must not lead to any damage at either discharge point or surrounding area.

.5 The Department Representative must be given 48 hours' notice of the fire main flush after permission has been received from the water utility.

.6 The flushing test must be properly recorded on the Contractor's Material and Test Certificate for Underground piping.

3.11 Inspections and Tests

.1 Provide all labour and equipment for all phases of final inspections, examinations, and tests required to obtain complete and final acceptance of the fire protection system.

.2 Notify the Department Representative in writing when final inspection of the installation may be performed. The Department Representative shall be reimbursed by the Contractor for time and expenses involved in subsequent inspections resulting from deficiencies noted during final inspection.

.3 Flow and pressure tests shall be conducted only when weather permits. Contracts will not be considered totally performed until satisfactory tests are conducted and reported.

.4 Bleed all air from system so that alarm devices shall activate no less than 60 seconds after test valves are opened.

.5 Sprinkler system discharge tests shall be conducted using system test pipes described. Pressure gauges shall be installed at critical points and readings taken under various modes of auxiliary equipment operation. Water flow alarm signals shall be responsive to discharge of water through system test pipes while auxiliary equipment is in each of the possible modes of operation.

.6 Tests shall be executed with all trim and accessories in normal operating condition, air compressors and excess pressure pumps in auto mode, accelerators and retarders enabled, etc.

3.12 Wet System Test and System Pressure Integrity:

.1 Comply with all requirements of NFPA and this specification with respect to testing, reports and certifications.

.2 Substantial Performance Inspection: Demonstrate that the fully charged system does not loose water pressure greater than 10 kPa (1.5 psig) over a 72 hour period. Submit reports.

.3 Warranty Inspection: Demonstrate that the fully charged system does not loose pressure greater than 10 kPa (1.5 psig) over a 72 hour period. Note that this requirement for integrity of the piping system and accessories will be applied to the performance of the system during and after the warranty period. Failure of the system to maintain this standard, due to deterioration or failure of piping, couplings or accessories, will be viewed as a latent construction defect. Correction of such a defect will be considered as the responsibility of the Contractor. Since failures of this type are usually a fault of the couplings and seals, the Contractor is admonished to carefully select, install and test the couplings as well as all other accessories.

3.13 Placing in Service

.1 When the entire fire protection system has been completed to the satisfaction of the Departmental Representative, including deficiencies, this Contractor shall demonstrate the complete operation and maintenance required to the Departmental Representative, and the local fire department.

3.14 Existing Systems

.1 Install isolation valves on existing fire protection systems to isolate only piping feeding the area of work. Piping systems outside the area of work may be left in inoperable condition only for the period of time necessary to complete direct renovation of the piping systems. Activate the systems as soon as the piping systems are complete.

.2 Isolation valves must be removed from the fire protection system when all work is complete.

.3 Fire protection systems outside the work are not to be left in inoperable conditions overnight.

1. GENERAL

1.1 Work Included

.1 Fire protection system, accessories testing and inspection and reports including but not limited to:

.1 Fire sprinkler systems and accessories.

.2 Alarm initiating devices and annunciation.

1.2 Quality Assurance

.1 All tests, certifications and work shall be executed in accordance with the following standards:

.1 NFPA No. 13, Standard for Installation of Sprinkler Systems.

.2 NFPA No. 14, Standard for Installation of Standpipe and Hose Systems.

.3 NFPA No. 25, Standard for Water-Based Fire Protection Systems, 1992 Edition.

.2 Testing technicians shall be certified by the Association of Applied Science Technologists and Technicians of British Columbia as Registered Fire Protection Technicians.

.3 All workers engaged in the testing and certification of the fire protection systems shall be journeymen who have Trades Qualifications as Sprinkler Fitters under Province of British Columbia legislation. Trades Qualification certificates must be submitted prior to commencing work and must be on site for inspection.

1.3 Design Criteria

.1 Prior to commencing tests and certifications, review record drawings and calculations with respect to systems operation requirements, design density requirements, history, etc.

1.4 Submittals - Prior to Construction

.1 Submission details and requirements shall be on forms and as prescribed in:

.1 The current edition of applicable NFPA Standards, or

.2 The BC Association of Applied Science Technologists and Technicians Fire Protection Testing curriculum, or

.3 Other forms approved by the Department Representative,

1.5 Submittals - Prior to Substantial Performance

.1 Copy and complete report forms included at the end of this section.

.2 Submit final test results and certifications to:

.1 Departmental Representative.

1.6 Record Documents

.1 Will be provided by the Departmental Representative.

1.7 Special Conditions

.1 Provide 48 hours' notice to the Departmental Representative prior to disruption of systems. Obtain approval prior to proceeding with systems shutdown or disruption.

.2 Inform Departmental Representative's Maintenance Department and Emergency Reception Centre of intention to carry out sprinkler testing.

.3 Systems are to be provided with temporary work as required to maintain systems in operation at all times.

.4 During periods of normal school operating, work must be done without disruption of normal school activities. As an alternative, work could be executed either before or after normal school operating hours.

2. PRODUCTS

2.1 General

.1 The sprinkler system forms part of a fire alarm detection system. Tests must consider the impact on all components of the system including but not limited to flow switches, low water and air pressure trouble monitoring devices and supervisory tamper switches on all gate valves.

2.2 System Test Pipes – Existing

.1 Wet Systems: A test pipe is installed for each system, of not less than 25 mm diameter. For test purposes, provide a smooth bore corrosion resistant orifice giving a flow equivalent to one sprinkler. Remove after test.

.2 Where water flow alarm devices are provided at each riser on each floor or where more than one alarm device is provided in one sprinkler system, a test pipe is provided for testing each alarm device.

3. EXECUTION

3.1 Sprinkler Heads

.1 Check general configuration and placement of all heads in system. Confirm that heads are positioned in a manner that does not impair performance, activation, spray pattern, etc.

.2 Check several, but not all heads on each system to confirm that temperature rating, K factor, flow characteristics match design record drawings and calculations.

.3 Inspect heads in cupboards and storage areas to check that they are not obstructed by storage materials.

3.2 Sprinkler Head Guards

.1 Confirm that guards on dry sidewall or dry pendant heads are a type that has a large hole in the centre to allow the plunger rod to be thrown clear of the head during activation.

.2 Confirm that guards are installed in all heads in areas as follows:

.1 All areas throughout where ceiling height is less than 2,900 mm.

.2 Mechanical Rooms

.3 Electrical Rooms

3.3 Sprinkler Station - Wet Systems

.1 Remove inspection cover on each valve and confirm all fittings and components in good working order and condition. Change valve washer and consumable components as required.

.2 Submit the following data on test reports:

.1 Location, including street address.

.2 System or device identification and schematic diagram.

.3 Date of original installation.

.4 Design water pressure and flow requirements for each system.

.5 Copy of original Materials and Testing Certificate.

.6 Sprinkler valve(s): manufacturer, model identification, ratings, approvals and listings.

.7 Water service: street pressure.

.8 Static test reports: systems identifications, water utility side pressure, intermediate chamber pressure, systems side pressure, excess pressure pump start and stop settings.

.9 Flow test reports: systems identifications, test pipe or module locations, pressure before, during and after tests, test duration, water motor gong confirmation, etc.

.10 Trouble monitoring test reports: systems identifications, confirm all tamper switch operations, test and record pressure monitoring device activations.

.11 Annunciation reports: Individually confirm and report that the proper indication of each trouble and alarm device is correctly annunciated on the fire alarm panel and the graphic annunciator.

.12 Example of form to be used is attached.

3.4 Main Drain Floor Test

.1 The main drain valve shall be opened and remain open until the system pressure stabilizes. The static and residual pressures shall be recorded on the contractor's test certificate.

.2 The reading must be compared to the original test certificate pressure to ascertain if there has been any degradation in water flow and pressure available.

3.5 Piping

.1 Generally check and comment on condition, support, and configuration of piping, drain ability and grades.

.2 If necessary, provide temporary discharge piping from each test point or module to the exterior or to the nearest storm drain.

3.6 Hangers

.1 Generally check and comment on condition, support, and configuration of hangers.

3.7 Inspections and Tests

.1 Provide labour and equipment for all inspections, examinations, and tests required.

.2 Notify the Departmental Representative when inspections and tests are to be performed.

.3 At the discretion of the Departmental Representative, the Departmental Representative may attend or request a repeat demonstration of any tests.

.4 Flow and pressure tests shall be conducted only when weather permits.

.5 Sprinkler system discharge tests shall be conducted using system test pipes described. Pressure gauges shall be installed at critical points and readings taken under various modes of auxiliary equipment operation. Water flow alarm signals shall be responsive to discharge of water through system test pipes while auxiliary equipment is in each of the possible modes of operation.

.6 Tests shall be executed with all trim and accessories in normal operating condition, air compressors and excess pressure pumps in auto mode, accelerators and retarders enabled, etc.

3.8 Placing in Service

.1 When the entire fire protection system has been tested, activate the system for automatic operation.

.2 Confirm in writing to the Departmental Representative that tests are complete and reports are being prepared.

.3 Submit reports as specified, as soon as possible.

1. GENERAL

1.1 Work Included

.1 Cleanouts.

.2 Floor drains.

.3 Plumbing vents.

.4 Trap primers

.5 Sanitary sewer disposal systems and connections.

1.2 General Requirements

.1 Provide materials, equipment and labour to install plumbing as required by Provincial and local codes as specified herein.

.2 Provide water and drainage connections to equipment specified in other sections of this specification.

1.3 Quality Assurance

.1 Provide new equipment, CSA approved.

1.4 Submittals - Prior to Construction

.1 Floor drains: Accessories, dimensions and installation details.

1.5 Acceptable Manufacturers

.1 Manufacturers of floor drains whose products are approved in principle, but subject to requirements of drawings and specifications are:

.1 Zurn, Ancon, Mifab, Smith, Watts, Wade.

2. PRODUCTS

2.1 Cleanouts and Cleanout Accessories

.1 Sanitary: Provide caulked or threaded type cleanouts extended to unfinished floor or wall surface.

.2 Floor cleanout access covers in unfinished areas shall be round with nickel bronze scoriated frames and plates. Wall cleanouts shall be located behind approved access panels.

2.2 Floor Drains

.1 Floor drains in equipment rooms for picking up indirect waste, shall have integral cast funnel type strainer.

.2 Floor drain, concrete floor, above grade: Floor drain shall have lacquered cast iron body with double drainage flange, primer connection, combined two piece body, reversible clamping device and adjustable nickel bronze strainer. Equal to Ancon FD-100-C-A-1-7.

2.3 Trap Primers

.1 Electronic timed trap primers shall be complete with internal air gap, manifold, 120V controller, solenoid valve and enclosure. Equal to Precision Plumbing Products Mini-Prime or Precision Plumbing Products Prime-Time.

3. EXECUTION

3.1 Installation

.1 Install gas piping in open or ventilated spaces. Pitch lines and provide drip legs for condensation collection points. Where gas piping is run in a concealed space, provide ventilation grilles as required.

.2 Each trap primer should serve only one piece of equipment. Install trap primers:

.1 Where required by Codes

.2 Funnel floor drain

.3 Drainage lines shall grade 2% grade unless otherwise shown on drawings.

.4 Underground drainage lines shall be sized at 75 mm minimum unless otherwise noted.

.5 Install sanitary wye or double wye fittings on all drainage systems. Tee or double tee fittings are not permitted.

.6 Provide individual domestic water isolation valves for all plumbing fixtures, including water closets, lavatories, trap seal primer and sink.

3.2 Cleanouts and Access Covers

.1 Unless otherwise noted, floor cleanouts in finished areas are not approved.

.2 Ensure ample clearance at cleanout for rodding of drainage systems.

3.3 Vents and Pipe Penetrating Roof/Walls

.1 Vent, gas and refrigerant pipes shall project through the roof (or walls) shall be provided with specified roof jack and flashing flange. Flashing shall be extended 300 mm clear on all sides of projecting pipe.

.2 Provide standard flashing caps as specified.

.3 Vents specified or provided with vandal resistant, close slotted vent caps shall not be sized less than 50 mm.

.4 Refer to Section 23 05 23 Hangers and Supports for HVAC Piping and Equipment.

.5 Cap and seal existing unused vents. Seal vents by removing the vent pipe, caulking and crimping the lead jack, secure with clamp or other approved means.

3.4 Floor Drains

.1 Connect to trap primer.

.2 Set drain at elevation to allow finished floor to slope to mouth. Coordinate setting elevation with floor finish thickness.

.3 Provide flashing of sheet lead or approved non-metallic membrane where floor drains are located over occupied spaces.

3.5 Trap Primers

.1 Each manifold connection shall serve no more than one trap.

3.6 Service Connections

.1 Before commencing work, check invert elevations required for sewer connections. Confirm inverts and ensure that these can be properly connected with sufficient slope for drainage.

.2 Connect to existing sanitary sewer services as shown on drawings.

.3 Connect to existing domestic water services as shown on drawings.

.4 Connect to existing natural gas services as shown on the drawings. Gas service distribution piping shall have initial minimum pressure as shown on drawings. Provide regulators on each line servicing appliances, sized in accordance with equipment

3.7 Condensate Drains

.1 Extend drains from heat pump drain pans to nearby sink, connect above trap, or to indirect drain as shown on drawings.

.2 Provide backwater valve on drain line to prevent storm water back up through the condensate pan. Back water valve to be installed with unions to allow removal and service. Refer to detail.

Refer to Division 23.

Refer to Division 23.

Refer to Division 23

1. GENERAL

1.1 Work Included

.1 Plumbing fixtures and trim.

.2 Thermostatic mixing valves.

1.2 General Requirements

.1 Provide new fixtures, CSA approved, free from flaws and blemishes with finished surfaces clear, smooth and bright.

.2 Provide CSA approved plumbing fittings. Visible parts of fixture brass and accessories shall be heavily chrome plated.

.3 Provide fixtures in compliance with local municipality limitations on water consumption.

.4 Fixtures of any one type shall be by the same manufacturer. Fittings of any one type shall all be by the same manufacturer.

1.3 Job Conditions

.1 Check millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

1.4 Submittals - Prior to Construction

.1 Each fixture including related trim and accessories.

1.5 Acceptable Manufacturers

.1 Manufacturers of plumbing fixtures and accessories whose products are approved in principle, but subject to requirements of drawings and specifications are as follows:

.1 Water closets - standard: Mansfield, American Standard, Kohler, Western Pottery, Toto.

.2 Water closets - handicapped: Mansfield, American Standard, Kohler, Western Pottery, Toto.

.3 Lavatories - vitreous china: American Standard, Crane, Kohler.

.4 Kitchen sinks - steel: American Standard, Crane, KIL, Elkay, Kindred, Steel Queen, Novanni, Kohler.

.5 Handicapped wash basins - china: American Standard, Crane, Kohler.

.2 Manufacturers of plumbing fixture trim or accessories whose products are approved in principle, but subject to requirements of drawings and specifications are as follows:

.1 Lavatory trim: American Standard, Crane, Delta, Emco, Moen Commercial, Sterling, Waltec, Cambridge, Chicago, Kohler.

.2 Mixing valves - Domestic Water Supply: Lawler, Leonard, Powers, Symmons, Watts, Danfoss, Acorn

.3 Toilet seats: Olsen, Centeco, Moldex, Bemis.

2. PRODUCTS

2.1 Water Closets

.1 Type WC-1 equal to American Standard Cadet Pro Right Height Elongated ADA Compliant white toilet model 215AA.165.020. Floor mounted vitreous china with EverClean antimicrobial surface, Powerwash rim siphon, raised sanitary bar and 4 points tank stabilization, 2-piece tank assembly, unlined right hand trip lever, oversized flush valve, metal fill valve and elongated bowl. Consisting of 3517A.101 bowl and 4188A.165 tank, dimensions 438mm wide X 768mm front to back X 768mm high. Water consumption = 4.8L per flush. Centoco 820STSS.001 extra heavy duty elongated Toilet Seat, McGuire LFH172BVRB Toilet Supplies and floor flange.

.2 Type WC-2 equal to American Standard Cadet Pro Right Height Elongated white toilet model 214AA.174.020 floor mounted vitreous china with EverClean antimicrobial surface, Powerwash rim siphon, raised sanitary bar and 4 points tank stabilization , 2 piece tank assembly, unlined right hand trip lever, oversized flush valve, metal fill valve and elongated bowl. Consisting of 3517A.101 bowl and 4188A.174 tank, dimensions 438mm wide X 768mm front to back X 768mm high. Water consumption = 4.8L per flush. 500STSCCSS.001 Centoco Toilet Seat, Mcquire LFH172BVRB Toilet supplies and floor flange.

2.2 Lavatories

.1 Type LV-1 equal to American Standard Cadet Universal Access ADA compliant model 9494.001 Self rimming drop in basin, vitreous china and c/w overflow. Bowl dimensions: 441mmX279mmx133mm. Sloan electronic faucet model SF-23350/SFP-46 SF-2000 Series, chrome plated finish, 4” centerset, 1.9L/M outlet, infrared sensor, solenoid valve, control assembly, battery powered, Lawler TMM0-1070 Below deck mixing valve, McGuire 155WC Offset Grid drain & LFH170BVRB supplies.

.2 Type L-2 equal to wall hung American Standard Murro 0954/0955/0958 series, vitreous china, 127mm deep 540mm WX520mmX165mm high c/w ledge, overflow, self-draining and semi pedestal P-trap cover 0059.020EC. Sloan SF-2350 Electronic Faucet, chrome plated, 4”, 1.9 LPM infrared sensor solenoid valve splash proof junction box, battery powered. Lawler 1070 series mixing valve, McGuire 155A series open grid drain and LFH170 series faucet supplies and P-trap. Basin Carrier equal to Watts WCA-411-CA-481.

2.3 Sinks

.1 Type SK-1. Franke LBD6408-1/4, 3 holes, 8” center plus one 4” hole to right, double bowl, type 302 SS., self-rimming, back ledge, dimensions 794mmX521mmX203mm high c/w Chicago faucet 2301-8abcp single handle faucet, chrome plated, 8” centerset, 2.2 gpm, swing spout 250mm projection, lever handle, side spray c/w McGuire LFH170BVRB Faucet Supplies and P-trap.

2.4 Handicapped Lavatory Trim Insulation

.1 Insulation: Self-extinguishing, cellular foam insulation.

.2 Covers: Pre moulded to required shape for trap and drain fittings, secured with a nylon lace or other approved removal method.

.3 Trap: Removable insulation and cover for trap service without the requirement to remove remaining insulation and covers.

.4 Supply, hot and cold: Fully covered taps or stops with insulation and pre moulded PVC cover. Stop covers to be 'flip top' removable for quick access to stops without removal of other insulation or covers.

.5 Colour: White.

3. EXECUTION

3.1 Installation

.1 Protect fixtures against use and damage during construction.

.2 Provide chrome plated rigid or flexible supplies to fixtures with ¼ turn ball valve type screwdriver stops, reducers and escutcheons.

.3 Install wall mounted fixtures with approved wall carriers, model to suit installation.

.4 Caulk around base, rim or mounting face of all fixtures to seal between floor, counter top or wall.

.5 Unless otherwise noted rough - in dimensions shall be in compliance with fixture manufacturer's recommendations. Refer to shop drawings or rough - in handbook.

.6 Install hose and faucets and hose connections with vacuum breakers.

3.2 Thermostatic Mixing Valves

.1 Provide pressure balanced thermostatic mixing valves on all lavatory and sink faucets.

3.3 Traps

.1 Sink, lavatory and similar fixture traps to be re to be provided with unions or other approved method for easy and complete removal for servicing and cleaning.

.2 Trap assemblies concealed in millwork under lavatories and sinks can be converted to approved ABS.

3.4 Handicapped Lavatory Trim

.1 Set screw stop maximum temperature on supplied fitting to 40 degrees Celsius.

.2 Exposed supply tail pieces, drains and traps on handicapped fixtures are to be insulated with specified insulation system.

3.5 Lavatory Overflow Drain

.1 Overflow drain fitting shall be located at the front of the lavatory, or in the least visible location. The ferule shall be an integral part of the lavatory and not visible from the front of the lavatory.

.2 A single pipe or hose without joints or connections and free of any kinks shall connect the overflow drain to the trap.

.3 Connectors used to connect the pipe or hose to the overflow drain and trap shall be vandal-proof and positioned in such a manner to prevent injury.

3.6 Fixture Mounting

.1 Mount plumbing fixtures in accordance with standards set out in the British Columbia Plumbing Code, and the standard rough in dimensions or rough-in hand book for the particular fixtures.

.2 Obtain confirmation of mounting heights from Department Representative prior to rough-in.

Osoyoos POE						
Air Outlet Schedule						
Ident	A	E	G	X	J	K
Description	Plaque	13 x 13 Aluminum Grid Eggcrate	Heavy Duty Gym Grille	Single Delfection EA Grille	Double Delfection SA Grille	Steel Door Grille
Manufacturer	PRICE	PRICE	PRICE	PRICE	PRICE	PRICE
Model	SPD	80	91	530	520	STG1 - 1 BF
Color	White	Prime, White, Metallic	Prime, White, Metallic	Prime, White, Metallic	Prime, White, Metallic	Prime, White
Balancing Damper	NO	No	No	No	No	No
Fire Damper	No	No	No	No	No	No
Backdraft Damper	no	No	No	No	No	No
Accessories And Notes	● 600 x 600 Nominal Module		● Heavy Duty ● 10 mm Spacing ● 45 Deg Deflection	● 20 mm Spacing ● Single Deflection	● 20 mm Spacing ● Double Deflection	● Auxiliary Frame For Back Side of Door

Osoyoos POE			
Air Source Heat Pump Schedule			
Ident			CU-1
Status			New
Location			Ground
Service			Fancoil Condensing Unit
Description			Outdoor Air Source VRF, 2 Modules (units) required for this output. Refer to drawings.
Manufacturer			Mitsubishi
Model			PUHY-HP144TSJMU-A
Nominal Size	Ton		12 (Combined Module Output - 6 tons each)
Compressor Cooling Capacity @ 35°C OAT	kW		46.0
Capacity Control			Single stage
Refrigerant			VRF
Compressor Heating Capacity @ -5°C OAT	kW		46.0
Capacity Control			
Width	mm		760 (Each Module - 2 Required)
Length	mm		920 (Each Module - 2 Required)
Height	mm		1650 (Each Module - 2 Required)
Filter	mm		
Weight	kg		450 (Each Module - 2 Required)
Motor	W		See attached.
Voltage/Phase			208V/3ph
MCA	Amps		36.0
Accessories And Notes			● c/w snow and rain gaurds ● hyper heat low ambient model (-23 degs C) ● c/w gas and liquid pipe twinning kit
Controls Coordination			● Controlled by DDC System
Electrical Coordination			● Div 16 to provide disconnect. Connect power.

Osoyoos POE		
Heat Recovery Ventilator Schedule		
Ident		HRV-1
Status		New
Location		Service Space
Service		O/A Requirements
Description		Indoor Heat Recovery Ventilator
Manufacturer		Renew Air
Model		HE 1X1NH
Outside Air		
Air Flow	l/s	406
External Air Pressure Drop	Pa	125.0
Entering Air Temp	°C	-17
Leaving Air Temp	°C	18
Heat Recovered	kW	
Exhaust Air		
Air Flow	l/s	288
External Air Pressure Drop	Pa	125.0
Entering Air Temp	°C	22
Leaving Air Temp	°C	-17
Core Efficiency		100%
Width	mm	600
Length	mm	1,375
Height	mm	900
Weight	kg	125
Outdoor Air Motor	W	1,270.0
Exhaust Air Motor	W	1,270.0
Voltage/Phase		208/3ph
Accessories And Notes		
Electrical Coordination		● Div 16 to provide disconnect. Connect power.

Osoyoos POE				
Fan Coil Schedule				
Ident		FC-1	FC-2	FC-3
Status		New	New	New
Location		Gen Office Ceiling	Gen Office Ceiling	Gen Office Ceiling
Service		OFFICE 2,3,North NC215	East NC215	West NC215, OFFICE 1, Quiet
Description		Fan Coil Unit	Fan Coil Unit	Fan Coil Unit
Manufacturer		Mitsubishi	Mitsubishi	Mitsubishi
Model		PEFY-24NMHU-E	PEFY-30NMHU-E	PEFY-27NMHU-E
Nominal Size				
Heating	k/w	7.9	10.0	8.8
Cooling	k/w	7.0	8.8	7.9
Design Air Flow	l/s	317	417	367
Minimum Air Flow	l/s			
External Air Pressure Drop	Pa	200	200	200
Width	mm	750	1,000	1,000
Length	mm	900	900	900
Height	mm	375	375	375
Motor	W	270	360	297
Weight	kg	45	50	50
Voltage/Phase		208/1/60	208/1/60	208/1/60
Accessories And Notes		●Provide factory disconnect ●Provide I/O Interface for DDC Connection	●Provide factory disconnect ●Provide I/O Interface for DDC Connection	●Provide factory disconnect ●Provide I/O Interface for DDC Connection
Electrical Coordination		●Wire to disconnect	●Wire to disconnect	●Wire to disconnect

Osoyoos POE			
Fan Coil Schedule			
Ident		FC-4	FC-5
Status		New	New
Location		Gen Office Ceiling	Gen Office Ceiling
Service		MEETING ROOM	KITCHENETTE
Description		Fan Coil Unit	Fan Coil Unit
Manufacturer		Mitsubishi	Mitsubishi
Model		PEFY-24NMHU-E	PEFY-15NMHU-E
Nominal Size			
Heating	k/w	7.9	5.0
Cooling	k/w	7.0	4.4
Design Air Flow	l/s	317	233
Minimum Air Flow	l/s		
External Air Pressure Drop	Pa	200	200
Width	mm	750	750
Length	mm	900	900
Height	mm	375	375
Motor	W	270	207
Weight	kg	45	45
Voltage/Phase		208/1/60	208/1/60
Accessories And Notes		●Provide factory disconnect ●Provide I/O Interface for DDC Connection	●Provide factory disconnect ●Provide I/O Interface for DDC Connection
Electrical Coordination		●Wire to disconnect	●Wire to disconnect

Osoyoos POE				
Fan Schedule				
Ident		EXH-F1	EXH-F2	EF-2
Status		new	new	Existing to be relocated to roughly same location
Location		Service Space	Mech	2nd Floor low level
Service		Photocopy Exhaust	Kitchenette Exhaust	Warehouse Exhaust
Description		Cabinet - In Line	Cabinet - In Line	Inline
Manufacturer		Cook	Cook	Cook
Model		70SQN17DEC	90SQN17DEC	
Air Flow	l/s	71	36	3,500
External Air Pressure Drop	KPa	1.1	1.1	95
Width	mm	300	250	
Length	mm	375	300	
Height	mm	400	350	
Weight	kg	41	32	
Motor	W	50.0	49.0	3000 Watts
Voltage/Phase		120/1	120/1	208/3
Accessories And Notes		● Direct Drive ● EC Motor with factory mounted speed control For balancing ● Prewired Disconnect ● Low Leak Backdraft Damper ● Select for Less than 4 Sones ● In-Line Fan c/w Suspension kit and 8 ViscoElastic Washers ● Fan status to be controlled monitored by local controls system.	● Direct Drive ● EC Motor with factory mounted speed control For balancing ● Prewired Disconnect ● Low Leak Backdraft Damper ● Select for Less than 4 Sones ● In-Line Fan c/w Suspension kit and 8 ViscoElastic Washers ● Fan status to be controlled monitored by local controls system.	
Electrical Coordination		● Hardwire interlock with lights. ● Wire to power.	● Provide adjustable timer switch. ● Wire to power.	Reconnect as required

Osoyoos POE			
Unit Heater Schedule			
Ident		UH - 14	UH-15
Status		Existing - No change	**Existing to be relocated**
Location		Devanning Warehouse NC116	Devanning Warehouse NC116
Service		Heating	Heating
Description		Hot Water Unit Heater	Hot Water Unit Heater
Manufacturer		Reznor	Reznor
Model		WS140/175	WS140/175
Nominal Size	(MBH)	WS140/175	WS140/175
Heating Capacity	kW	41-52	41-52
Capacity Control		2 stage	2 stage
Air Flow	l/s		
Entering Air Temp	°C	4	4
Leaving Air Temp	°C	47	47
Fluid Type		30% Prop. Glycol	30% Prop. Glycol
Fluid Flow	l/s	0.5	0.5
Fluid Pressure Drop	kPa	8	8
Entering Fluid Temp	°C	82	82
Leaving Fluid Temp	°C	71	71
Width	mm	688	688
Length	mm	488	488
Height	mm	688	688
Weight	kg	45	45
Motor	W	0	0
Voltage/Phase		120/1	120/1
Accessories And Notes			
Electrical Coordination		• No Scope	• Disconnect existing electrical service and relocate to new position

Osoyoos POE			
Unit Heater Schedule			
Ident		UH-16	UH-17
Status		Existing - No change	**Existing to be relocated**
Location		Devanning Warehouse NC116	New location in mechanical room
Service		Heating	Heating
Description		Hot Water Unit Heater	Hot Water Unit Heater
Manufacturer		Reznor	Reznor
Model		WS140/175	WS140/175
Nominal Size	(MBH)	WS140/175	WS140/175
Heating Capacity	kW	41-52	41-52
Capacity Control		2 stage	2 stage
Air Flow	l/s		
Entering Air Temp	°C	4	4
Leaving Air Temp	°C	47	47
Fluid Type		30% Prop. Glycol	30% Prop. Glycol
Fluid Flow	l/s	0.5	0.5
Fluid Pressure Drop	kPa	8	8
Entering Fluid Temp	°C	82	82
Leaving Fluid Temp	°C	71	71
Width	mm	688	688
Length	mm	488	488
Height	mm	688	688
Weight	kg	45	45
Motor	W	0	0
Voltage/Phase		120/1	120/1
Accessories And Notes			
Electrical Coordination		• No Scope	• Disconnect existing electrical service and relocate to new position

Osoyoos POE			
Pump Schedule			
Ident		HWCP-2A	HWCP-2B
Status		Existing to remain / rebalance	Existing to remain / rebalance
Location		NC205	NC205
Service		Heating Pumps	Heating Pumps
Description		Vertical Inline - Centrifugal	Vertical Inline - Centrifugal
Manufacturer		-	-
Model		-	-
Nominal Size		-	-
Fluid Type		Water	Water
Fluid Flow	l/s	2.5	2.5
Fluid Pressure Rise	kPa	120	120
Width	mm	-	-
Length	mm	-	-
Height	mm	-	-
Inlet	mm	-	-
Outlet	mm	-	-
Weight	kg	-	-
Motor	kW	1.5 kW	1.5 kW
RPM		1750	1750
Voltage/Phase		208/3	208/3
Accessories And Notes		-Lead/Lag	-Lead/Lag
Electrical Coordination			

Osoyoos POE			
Pump Schedule			
Ident		HWC-1	DHWRP-1
Status		Existing to be Removed	New
Location		Water Meter Room	Water Meter Room
Service		Dom Hot Water Recirc	Dom Hot Water Recirc
Description		In-Line Circulator	In-Line Circulator
Manufacturer		-	Grundfos
Model		-	UP 15-29 SU/LC
Nominal Size			
Fluid Type		Dom Hot Water Recirc	Dom Hot Water Recirc
Fluid Flow	l/s	1.0	0.07
Fluid Pressure Rise	kPa	60	21
Width	mm	-	150
Length	mm	-	150
Height	mm	-	125
Inlet	mm	-	
Outlet	mm	-	
Weight	kg	-	
Motor	kW	500 Watts	0.75 Amps
RPM			
Voltage/Phase		120/1	120/1
Accessories And Notes		-Bronze fitted	● 5ft Line Cod with plug ● 1/2" Sweat Fitting
Electrical Coordination		● Disconnect	● Provife Disconnect ● Provide electrical receptical .

Osoyoos POE		
Tank Schedule		
Ident		NC205-TK1
Status		New
Location		Mech Room NC205
Service		Glycol Fill Tank
Description		Glycol Fill TAnk
Manufacturer		Axiom
Model		SF100
Nominal Size		208 L
System Fill Pressure	kPa	
Capacity	litre	208
Height	mm	1,245
Diameter	mm	610
Inlet	mm	
Outlet	mm	
Full Weight	kg	
Motor	W	0.7A
Voltage/Phase		120/1/60
Accessories And Notes		● c/w pump, inlet striner, pressure switch, check valve, cord and plug ● CSA approved ● 30% P.G.
Electrical Coordination		● Duplex Plug in Near Tank

Osoyoos POE			
Electric Coil Schedule			
Ident		EDH-2	EDH-2
Status		**Existing to be Replaced**	**New**
Location		Mech Room NC 205	Mech Room NC 205
Service		HP-2	HP-2
Description		HP-2 Preheat	HP-2 Preheat
Manufacturer			Thermolec
Model			
Heating Capacity	kW	25.0	25.0
Air Flow	l/s	500	500
Air Pressure Drop	Pa		
Face Velosity	m/s		
Entering Air Temp	°C	-20	-20
Leaving Air Temp	°C	21	21
Length	mm		
Height	mm		
Diameter	mm		
Weight	kg		
Voltage/Phase		208/3 phase	208/3 phase
Accessories And Notes		5 stage heater	SCR Control
Electrical Coordination			

Osoyoos POE		
Hot Water Coil Schedule		
Ident		HRV1-HC-1
Status		New
Location		HRV-1
Service		Outside Air
Description		Preheat Coil
Manufacturer		Eng Air
Model		3R12
Nominal Size		304x559x3/12
Heating Capacity	kW	25.0
Air Flow	l/s	406
Air Pressure Drop	Pa	78
Face Velosity	m/s	2.5
Entering Air Temp	°C	-17
Leaving Air Temp	°C	30
Fluid Type		30% Prop. Glycol
Fluid Flow	l/s	0.57
Fluid Pressure Drop	kPa	2
Entering Fluid Temp	°C	60
Leaving Fluid Temp	°C	49
Length	mm	559
Height	mm	304
Inlet	mm	0
Outlet	mm	0
Weight	kg	0
Accessories And Notes		● Isolation Valves ● Drain Valves c/w Cap ● Union or Flange Connection ● AAV c/w Ball Valve at High Point ● Three Way Control Valve ● Leaving Water temperature Sensor and Well
Electrical Coordination		● None

Osoyoos POE				
Boiler Schedule				
Ident		B-2	NC205-B1	NC205-B2
Status		**Existing to be Replaced**	**New**	**New**
Location		Mechanical NC205	Mechanical NC205	Mechanical NC205
Service		Hydronic Heating	Hydronic Heating	Hydronic Heating
Description		Standard Efficiency Power Vented Boiler	Condensing Boiler - Wall Mount	Condensing Boiler - Wall Mount
Manufacturer		Lochinvar	IBC	IBC
Model		CBND495	SL 80-399	SL 80-399
Nominal Size		495	399	399
Heating Input	kW	145.0	116.9	116.9
Heating Output	kW	127.0	112.0	112.0
Efficiency	%	81.0%	95.7%	95.7%
Capacity Control		2 stage	20% to 100% Modulation	20% to 100% Modulation
Fluid Type		Water	30% Prop Glycol	30% Prop Glycol
Fluid Flow	l/s		2.9	2.9
Fluid Pressure Drop	kPa		18	18
Entering Fluid Temp	°C		49	49
Leaving Fluid Temp	°C		60	60
Minimum Operating Temperature	°C		1	1
Maximum Operating Temperature	°C		85	85
Width	mm	585	700	700
Depth	mm	1,168	500	500
Height	mm	1,100	1,000	1,000
Inlet	mm	50	38	38
Outlet	mm	50	38	38
Vent	mm	150	100 PPS	100 PPS
Combustion Air	mm		100 ABS or PVC c/w Plastic Bug screen c/w Filter	100 ABS or PVC c/w Plastic Bug screen c/w Filter
Weight	kg	227	140	140
Voltage/Phase		120/1	120/1	120/1
MCA	Amps		0.0	0.0
Accessories And Notes		• Natural Gas	• Natural Gas • Sealed Combustion • Stainless Steel Heat Exchanger • Integral LWCO • Integral High Limit • Integral Condensate Trap • BACnet Interface • Mounting Rack By Manufacturer • 13.8 to 3.5 kPa Pietro Fiorentini Gas Regulator • 200 kPa 30 PSI Safety Valve • Isolation Valves • Drain Valves c/w Cap • AAV c/w Ball Valve near Pressure Relief •Pressure & Temperature Gauge on Outlet • 0-10V DDC Firing Rate Control for Individual Boilers • Terminate Vent and Combustion Air to Manufacturers and Code Clearance • Acid Neutralizer to Drain	• Natural Gas • Sealed Combustion • Stainless Steel Heat Exchanger • Integral LWCO • Integral High Limit • Integral Condensate Trap • BACnet Interface • Mounting Rack By Manufacturer • 13.8 to 3.5 kPa Pietro Fiorentini Gas Regulator • 200 kPa 30 PSI Safety Valve • Isolation Valves • Drain Valves c/w Cap • AAV c/w Ball Valve near Pressure Relief •Pressure & Temperature Gauge on Outlet • 0-10V DDC Firing Rate Control for Individual Boilers • Terminate Vent and Combustion Air to Manufacturers and Code Clearance • Acid Neutralizer to Drain
Electrical Coordination		• Disconnect Existing Electrical Service	• 2 Mushroom Type Emergency Shutdown on Power near Boiler Room Doors • Connect Dedicated Boiler Circulator to Boiler • Install Communication Wiring Between Boilers	• 2 Mushroom Type Emergency Shutdown on Power near Boiler Room Doors • Connect Dedicated Boiler Circulator to Boiler • Install Communication Wiring Between Boilers

1. GENERAL

1.1 Work Included

.1 Operating and Maintenance Manuals.

.2 Assembly of equipment start up and performance tests and reports for new, renovated or necessary existing systems.

.3 Assembly of equipment details sheets and shop drawings for new, renovated or necessary existing systems.

.4 Assembly of equipment and systems operating and maintenance instructions for new, renovated or necessary existing systems.

.5 Assembly of final permits for new, renovated or necessary existing systems.

.6 Record Drawings.

1.2 Acceptable Agencies

.1 Agencies who are approved in principle, but subject to requirements of drawings and specifications are:

.1 KD Engineering Ltd., Vancouver

.2 Vesta Dynamics, Kelowna.

.3 Inland Technical Services Ltd., Kelowna.

.4 West Rockies Services, Abbotsford

2. PRODUCTS

2.1 Operation and Maintenance Materials

.1 Provide one hard copy in a 215 mm x 280 mm 3 post type catalogue binder, lettering front and spine, plastic tab dividers. Binder should be identified by both volumes if required.

.2 Provide one readable/writeable (R/W-CD) compact disk labelled and contains the specified materials in Portable Document Format (PDF).

.3 Manufacturers' data section is to be indexed and ordered to exactly match the sections of the specifications, including section numbering. Each section of the manufacturers' data section is to include an up to date copy of the equipment schedule for that section, with the same format as the equipment schedules in the tender document. The schedule is to be revised to suit all addenda, change orders and field changes, as well as manufacturers and model numbers matching the equipment supplied. Assemble or develop complete and correct documentation for the operation and preventative maintenance of equipment and systems provided.

.4 Assemble or develop copies of all certified shop drawings and material required to complete the documentation. This generally includes but is not limited to the following:

.1 Comprehensive description of the operation of the systems, including the function of each item of equipment within the system.

.2 Permits

.1 Plumbing

.2 Gas

.3 Boiler

.4 Refrigeration

.3 Detailed instructions for the normal maintenance of all systems and equipment installed including procedures and frequency of operational checks and service, and troubleshooting instructions.

.4 Operating and maintenance schedule, indicating location, grades (grease or oil) for all lubricated equipment components.

.5 Local source of supply for each item of equipment.

.6 Shop drawings, including the Department representative's review stamp and comments.

.7 Air system balance report.

.8 Water system balance report.

.9 Equipment start up reports as per manufacturer requirements.

.10 Equipment start up reports to detail as left settings

.11 Material Safety Data Sheets for all chemicals.

.12 Chemical cleaning and treatment report for piping systems.

.13 Disposal procedures for all chemicals provided.

.14 Chemical emergency procedures.

.15 Cleaning report for air duct systems.

.16 Chlorination report for water mains.

.17 Warranties, certificates and miscellaneous reports.

.18 Manufacturers' operating and maintenance brochures, and shop drawings, including wiring diagrams, fan performance data, pump curves with the operating point indicated, and control maintenance bulletins.

.19 Plumbing Fixture Brochure.

.20 Filter type, specification, model number, efficiency rating, and thickness, correlated with air handling equipment identification.

.21 Completed equipment inventory and submittal sheets.

.22 Statutory inspection details.

.23 Control device setting record sheets.

.24 N.F.P.A. Standard No.25, "Standard for the Inspection, Testing and Maintenance of Water Based Fire Protection Systems".

.25 Sprinkler system materials and testing certificate.

.26 Departmental Representative approved working plans and hydraulic calculations for sprinkler system.

.27 Insurance company approval letter for sprinkler system.

.28 Letters of assurance from Fire Protection Department representative.

.29 Letters of assurance from Seismic Specialty Engineer.

.30 Instructions for emergency operation, maintenance and shutdown of all systems.

.31 Record Drawings photo reduced to 430 mm x 280 mm.

.32 Copies of all Receipts for equipment handed over to the Departmental Representative.

2.2 Record Drawings

.1 Contractors shall certify final reproducible Record Drawings to be correct by notation and signature on the drawings.

.2 Record drawings shall precisely identify the configuration, size and location of all systems and equipment installed under this Division, including but not limited to:

.3 Before Substantial Completion submit for approval to the Department representative, completed and detailed marked up white prints to reflect the record drawing status.

.4 A Cash Allowance has been specified to cover the Departmental Representative's cost of the following:

.1 Updating the original computer software to include all changes recorded on the record white prints.

.2 Plotting one set of full size reproducible record drawings.

.5 The Departmental Representative shall distribute the following record materials provided under the Cash Allowance.

.1 One set of full size white printed Division 15 record drawings.

.2 One set of reduced size Division 15 record drawings bound in each Maintenance Manual.

.3 One set of full size reproducible Division 15 record drawings to the Department representative.

.4 One set of full size sprinkler system record drawings at each Sprinkler Station. Refer to Division 21 Fire Suppression.

2.3 Balance Reports

.1 Refer to Section 23 05 93.1 Testing, 23 05 93.2 Adjusting and 23 05 93.3 Balancing

.2 Provide specified number of final copies for inclusion in Operating and Maintenance Manuals.

2.4 Permits

.1 Refer to Section 23 05 93.1 Testing, 23 05 93.3 Adjusting and Balancing and Section 23 05 00, Common Work Results for HVAC.

2.5 Equipment Test Reports

.1 Refer to Section 23 05 93.1 Testing and 23 05 93.2 Balancing.

2.6 Commissioning Reports

.1 Refer to Section 23 05 93.1 Testing, 23 05 93.2 Balancing and Section 23 05 00, Common Work Results for HVAC.

3. EXECUTION

3.1 Maintenance Manuals

.1 Substantial Performance cannot be declared until reviewed Manuals are in the hands of the Departmental Representative.

.2 Submit a draft copy of proposed content, including comprehensive systems description, for approval prior to Substantial Performance.

.3 Provide one corrected and final copy of the Maintenance Manual along with an electronic version (CD Read-Write or flash drive) of the maintenance manual, to the Departmental Representative at least five days prior to Substantial Performance.

3.2 Record Drawings

.1 The contractor is to maintain on site a clean set of drawings to be used to mark on any changes made during the course of construction. Changes must be kept up to date on a daily basis.

1. GENERAL

1.1 Description of Work

.1 The scope of this contract includes but is not limited to the provision and installation of:

- .1 Heating, ventilating and air conditioning equipment and accessories.
- .2 Hot water piping and accessories, new and renovated.
- .3 Natural gas piping and accessories.
- .4 Ductwork and accessories, new and renovated.
- .5 Domestic water piping and accessories, new and renovated.
- .6 Sanitary Drainage Piping and accessories, new and renovated.
- .7 Vent piping and accessories, new and renovated.
- .8 Plumbing fixtures and accessories.
- .9 Controls and accessories.
- .10 Renovation or removal of existing systems, services and equipment.
- .11 New and Renovated automatic fire sprinkler system and accessories.
- .12 Renovations, cutting and patching.
- .13 Cutting and patching for wall and floor openings less than 150 mm in any dimension.
- .14 Roof repair, roof curbs, and roof openings of any dimension.

2. PRODUCTS

2.1 Access Doors and Panels

.1 Provide schedule and samples of access doors to Department Representative prior to installation. Improperly located or sized access to equipment shall be corrected prior to final inspection.

.2 Provide access doors for maintenance of adjustment purposes for all mechanical system components including, but not limited to:

- .1 Valves.
- .2 Volume dampers.
- .3 Fire dampers.
- .4 Cleanouts and traps.
- .5 Controls, coils and terminal units.
- .6 Turning vanes.

.3 Access doors shall:

- .1 Have flush type steel framed panel with concealed hinges.
- .2 Be brushed 14-gauge stainless steel in ceramic tiled surfaces, recessed tile bearing type in vinyl tiled or carpeted surfaces, and prime coat in plastic or drywall surfaces unless otherwise directed.
- .3 In concrete, stonework or terrazzo tile surfaces, provide heavy flush nickel plated cast bronze access covers.
- .4 Fire rated construction shall have ULC rated doors compatible with construction.
- .5 Cam type locking device, with Allen key operator.
- .6 Minimum 300 mm x 300 mm for inspection and hand access.
- .7 Minimum 450 mm x 600 mm for man access.

.8 Provide locked access doors located in public corridors and washrooms complete with master keys.

.9 Access doors to turning vanes, need only be a patch of similar gauge galvanized sheet metal secured to the duct and sealed with approved sealing compound.

2.2 Accessibility and Location of Equipment & 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 Install all work so as to be readily accessible for adjustment, operation and maintenance. Furnish access panels where required in building surfaces for installation by building trades.

.4 Locate access panels in service areas wherever possible. Do not locate in panelled or special finish walls, without prior approval.

.5 If any doubt exists, inform Departmental Representative of impending installation and obtain his approval for actual location.

2.3 Alternative Products or Systems

.1 Where a list of acceptable materials, equipment or suppliers is included in this Division of the specification, Tenders are to be based on use of the specified equipment or equipment included in the acceptable materials clauses.

.2 Where no list of acceptable materials, equipment or suppliers is included in the specification sections, Tenders are to be based on use of the specified materials, equipment or suppliers or any other material that complies with the specifications for quality, certification, material, performance, etc. A request for approval to supply alternative materials, equipment or suppliers is not required.

.3 Request to have alternative materials, equipment or suppliers added to the list of acceptable materials, equipment or suppliers will be considered. Submit proposals to supply alternative materials, equipment or suppliers of equipment in writing, to the Department Representative at least seven days, unless otherwise noted, prior to Tender Closing Date for Divisions 21, 22, 23 and 25.

.4 Materials or equipment alternatives: Identify specific materials or equipment for which alternates are requested. Provide specific technical data indicating dimensions, performance, weight, size, arrangement, etc. and other data as necessary or requested.

.5 Suppliers or contractor alternatives: Provide references, project history, technicians qualifications, etc. and other data as necessary or requested.

.6 Where specified equipment is included in a schedule, the request for approval must include an identical schedule, with each value of the alternate equipment compared to the specified equipment value. Photo copied schedules, marked with the alternate characteristics, would be acceptable.

.7 All costs, including fees for re-design and record document correction, required to adapt alternative materials, equipment or suppliers shall be the responsibility of the Contractor.

.8 Addition of materials, equipment or supplier's to the specifications will be by written addendum only.

2.4 Drives, Guards and Accessories

.1 Provide guard for every new exposed coupling constructed of heavy gauge diamond mesh wire screen welded to steel angle frame. Prime coat.

.2 Secure guards to driven machine, foundations or floors with heavy angle supports and anchor bolts. Do not short circuit vibration isolators.

.3 Provide for movement of motor to adjust belt tension. Make provision for lubrication, use of tachometer, other maintenance and testing operations with guard in place.

2.5 Electrical Motors

.1 Supply mechanical equipment complete with electrical motors. Motors provided under this Division shall have the characteristics as herein described.

.2 Provide motors to CMA and CSA Standards for hard, continuous service, designed to limit temperature rise to 40°C for open housing and 50°C for drip proof housing and operate at 1200 or 1800 r/min. unless otherwise specified.

.3 Polyphase, squirrel cage, single speed NEMA/EEMAC Design A or B induction motors, between 746 watts (1 hp) and 149.2 kw (200 hp), whether in packaged equipment or not, shall comply with the current requirements of the British Columbia Energy Efficiency Standards Regulation, and specifically, CSA C390-93 Energy Efficiency Test Methods for Three Phase Induction Motors.

.4 For other three phase motors totally enclosed fan cooled, or ordinary drip proof motors provide energy efficient type motors with full-load efficiencies next step better than those listed in the following table:

Full Load		Full Load	
HP	Efficiency	HP	Efficiency
1.0	82.5	7.5	89.5
1.5	84.0	10.0	89.5

.5 Motors shall have permanently lubricated ball or roller type bearings.

.6 Refer to Division 16, Electrical for exact voltage, phase, requirements of electrically driven mechanical equipment, but generally motors shall follow this schedule.

.1 For motors up to and including 373 watts (1/2 HP) 120/1/60.

.2 For motors 560 watts and over, (3/4 HP) 208/3/60.

.7 Provide all motors with terminal boxes, suitable for power connections.

.8 Select motors for centrifugal fan applications, which are capable of being automatically cycled at 10 minute intervals.

.9 Unless otherwise noted, starters and protection devices will be included under the Electrical Division of the Specification.

.10 Motors less than 740 watts (1 hp) are to be provided with internal thermal motor protection feature.

.11 Motors exposed to outdoor temperatures shall be lubricated with lubricants suitable for operation at -30 degrees C.

.12 Assist the electrical trade to ensure proper connection, correct thermal overload selection and correct start/stop controls. Verify all motor voltages with electrical trade prior to operation.

.13 Where starters are included in this Division of the Specification, they shall contain thermal overload protection in all ungrounded lines.

.14 Equipment, which has more than one voltage rating, shall be fed from a single power source through a disconnect switch, supplied under this Division.

2.6 Materials and Equipment

.1 Material and Equipment:

.1 Use new material and equipment unless otherwise specified.

.2 Provide material and equipment of specified design and quality, performing to published ratings and for which replacement parts are readily available.

.3 Use products of one manufacturer for equipment or material of same type or classification unless otherwise specified.

.4 All Equipment and materials shall conform to the requirements of ASHRAE 90.1.

.2 Manufacturer's Instructions:

.1 Unless otherwise specified, comply with manufacturer's latest printed instructions for materials and installation methods.

.2 Notify Departmental Representative in writing of any conflict between these specifications and manufacturer's instructions. Departmental Representative will designate which document is to be followed.

.3 Fastenings, General:

.1 Provide metal fastenings and accessories in same texture, colour and finish as base metal in which they occur. Prevent electrolytic action between dissimilar metals. Use non-corrosive fasteners, anchors and spacers for securing exterior Work.

.2 Space anchors within limits of load bearing or shear capacity and ensure that they provide positive permanent anchorage. Wood plugs not acceptable.

.3 Keep exposed fastenings to minimum, space evenly and lay out neatly.

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

.5 Explosive actuated fastening devices shall comply with CSA Z166.

.4 Fastenings, Equipment:

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

.2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.

.3 Bolts may not project more than one diameter beyond nuts.

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

.5 Delivery and Storage:

.1 Deliver, store and maintain packaged material and equipment with manufacturer's seals and labels intact.

.2 Prevent damage, adulteration and soiling of material and equipment during delivery, handling and storage. Immediately remove rejected material and equipment from site.

.3 Store material and equipment in accordance with supplier's instructions.

.4 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use primer or enamel to match original. Do not paint over name plates.

3. EXECUTION

3.1 Balancing, Commissioning and Documentation

.1 The Balancing, Commissioning and Documentation work will be performed by this contractor under direction from the Commissioning Authority.

.2 Record Drawings: The contractor is to maintain on site a clean set of drawings to be used to mark on any changes made during the course of construction. Changes must be kept up to date on a daily basis. Turn over drawings to Departmental Representative at Substantial Completion.

.3 Maintenance Manual Materials: Turn over 3 paper copies and electronic copy of all maintenance materials to Departmental Representative's Documentation agent prior to substantial completion. These documents are to include but not limited to:

.1 Permits.

.2 Equipment start up reports.

.3 Chlorination report for water mains.

.4 Warranties, certificates and miscellaneous reports.

.5 Manufacturers' operating and maintenance brochures, and shop drawings, including wiring diagrams, fan performance data, pump curves with the operating point indicated, and control maintenance bulletins.

.6 Plumbing Fixture Brochure.

.7 Filter type, specification, model number, efficiency rating, and thickness; correlated with air handling equipment identification.

.8 Statutory inspection details.

.9 Control device setting record sheets.

.10 Instructions for emergency operation, maintenance and shutdown of all systems.

.11 Training Records.

3.2 Certificates & Transcripts

.1 Submittals prior to start of construction:

.1 Certified copy of Insurance required to be provided by the Contractor.

.2 Letter of compliance with WorkSafeBC.

.3 Building permit compliance.

.4 Submittals as required elsewhere in this specification.

.2 Submittals prior to initial progress claims:

.1 Cost breakdown.

.2 Submittals as required elsewhere in this specification.

.3 Submittals during construction:

.1 Contractor's Statutory Declaration, on forms approved by C.C.A. is to accompany all progress claims subsequent to initial claim. Declaration is to certify that all past claims have been paid as certified or as noted and must be properly signed and notarized.

.2 Submittals as required elsewhere in this specification.

.4 Submittals prior to Substantial Performance:

.1 Occupancy Permit and Inspection Certificates from authorities having jurisdiction and as required for equipment items to comply with governing Codes and Regulations.

.2 Operation and maintenance manuals.

.3 Record drawings.

.4 Results of all Tests required by the specification.

.5 Refer to Substantial Performance in this Section.

.6 Refer to Agreement GC 5.4 and GC 5.5.

.7 Submittals as required elsewhere in this specification.

.5 Submittals at Total Performance:

.1 Refer to Project Close-out in this Section.

.2 Refer to Agreement GC 5.7.

.3 Submittals as required elsewhere in this specification.

3.3 Changes and Clarifications to the Contract

.1 During tender period: Errors, omissions or any questions regarding this Project must be referred to the Departmental Representative for clarification or correction not later than five working days prior to the Tender Closing Date. Any corrections or changes necessary to the Tender Documents will be contained in an Addendum issued by the Departmental Representative. All such corrections or changes confirmed by Addendum shall become part of the Tender Documents and their effect shall be included in the Tenderer's Contract Price. No extras will be permitted for elements of the Project which may be reasonably inferred from the Tender Documents to complete the Project. No proposed changes to the Contract, verbal or otherwise, shall be considered valid unless they are also included in a written addendum.

.2 After tenders have been submitted, but prior to award of contract: Any corrections or changes necessary to the Tender Documents will be contained in a Post Tender Addendum issued by the Departmental Representative. Submit the cost for each change itemized in the Post Tender Addendum. Changes will not be considered part of the Contract unless confirmed in the letter of intent.

.3 During the course of construction, after award of the Contract: Any corrections, changes or clarifications necessary to the Contract Documents will be contained in either a Change Notice, a Change Order, a Change Directive, or a Site Instruction issued by the Departmental Representative. No proposed changes to the contract, verbal or otherwise, shall be considered valid unless they are also included in a written Change Directive or Change Order.

.1 Change Notice: All Change Notice items are contemplated changes. Work is not to proceed until authorized by a Change Order. All materials and workmanship are to be as described in the contract documents unless otherwise stated. Provide a price for each item, including materials and labour breakdown. Provide further breakdowns as directed by the Departmental Representative. Indicate any change to the time of completion that will result from acceptance of the Change Notice items.

.2 Change Order: Change Order items refer to Change Notice items that have been accepted and become part of the contract. The work is to proceed at the agreed upon price, which will be attached to the Change Order.

.3 Change Directive: All Change Directive items become part of the contract. The work described shall proceed on a time and materials basis. Time and material costs must be submitted to the Departmental Representative for review. Provide further breakdowns as directed by the Departmental Representative.

.4 Site Instruction: All Site Instruction items are to be considered as clarifications to the contract, and not as additional work. No change to the Contract Price or time of completion will be accepted.

3.4 Codes and Standards

.1 The work, including all materials, labour and other services shall conform, but not be limited to the requirements of the latest editions of the following Codes, Bylaws, Standards and Regulations:

.1 British Columbia Building Code.

.2 British Columbia Fire Code.

.3 Local Building Bylaws.

.4 WorkSafeBC.

.5 Canadian Standards Association.

.6 British Columbia Plumbing Code.

.7 Canadian Electrical Code.

.8 CSA B149.1 Natural Gas and Propane Installation Code.

.9 National Fire Protection Association.

.10 Provincial Boiler Inspection Department.

.11 National Board Inspection Code – Boiler and Pressure Vessel

.12 Other relevant codes as noted in each individual specification section. Note the most stringent code will apply.

3.5 Concealment

.1 Conceal all piping, ductwork and conduit in partitions, walls, crawl spaces and ceiling spaces unless otherwise noted.

.2 Do not install piping and conduit in outside walls or roof slabs unless otherwise directed, in which case install them with the building insulation between them and the outside face of the building.

3.6 Contract Breakdown

.1 After tenders close, submit a breakdown of contract price into divisions to the satisfaction of the Departmental Representative with aggregate of breakdown totalling total contract amount. Breakdown will be used in computing of progress claims. Progress claims, when submitted, are to be itemized against each item of the contract breakdown.

.2 Progress claims will not be approved unless broken down in a form approved by the Department representative. A typical format is as follows:

.1 Miscellaneous Mobilization

.2 Testing & Balancing

.3 Commissioning

.4 Manuals and Documentation

.5 Record drawings

.6 Chemical Treatment

.7 Pipe and Pipe Fittings

.8 Vibration Isolation

.9 Insulation

.10 Plumbing Rough in

.11 Plumbing Fixtures and Trim

.12 Fire Protection

.13 HVAC Equipment

.14 Ductwork

.15 Controls

.16 Cash Allowances

.17 Change Orders with Divisions 21, 22, 23 and 25 Change Notice reference.

.3 Progress claims for major systems or equipment will not be approved to 100% status until after complete commissioning and testing of the systems or equipment. This includes, but is not limited to systems such as boilers, heat pump systems control systems, heat exchangers, chemical treatment. At the contractors option, such systems or equipment may be identified as separate line items to allow approval of other sections of the work that have been completed.

3.7 Cutting and Patching - Renovation

.1 Execute cutting, fitting and patching required to make Work fit properly together.

.2 Making good is defined as matching the adjacent surfaces such that there be no visible difference between existing and new surfaces when viewed from 1.5 m in the ambient light, and includes painting the whole surface to the next change of plane.

.3 Obtain Departmental Representative's approval before cutting, boring or sleeving load-bearing members.

.4 Make cuts with clean, true, smooth edges. Make patches inconspicuous in final assembly.

.5 Fit work airtight to pipes, sleeves, ducts and conduits.

.6 At penetrations of fire rated assemblies, with any services or ducts completely seal voids with approved fire resistive material, for the full thickness of the construction element and to comply with Code requirements.

.7 Before cutting or coring existing concrete slabs, X-ray locations to ensure that there are no concealed services or structural elements such as rebar.

3.8 Demolition of Existing Systems and Equipment

.1 Remove all identified equipment and systems complete with controls, mounting devices, electrical connections, control connections, mechanical services, gas connection, domestic water connection, hydronic water connection, etc.

.2 Cut and cap services at the nearest main. Do not leave dead legs.

.3 Where existing service is insulated, provide equivalent insulation at the capped location. Ensure that new and existing insulation is continuous and that the vapour barrier is intact.

.4 Do not abandon equipment or systems in place unless otherwise indicated.

.5 Patch and make good any building elements damaged by demolition work. This includes mounting points.

3.9 Demonstration Instruction to Departmental Representative

.1 Demonstrate to and instruct representatives designated by the building operator on the complete systems operating and maintenance procedures using the assistance of specialist sub trades and manufacturers' representatives.

.2 Allow for a minimum of 1 full day for demonstration.

.3 Participate in, and aid the Commissioning Agent in, the Commissioning and Demonstration process for each system. Demonstration and training sessions will be convened separately for each piece of equipment and each individual system.

.4 Submit a program for approval. When approval is obtained from the Commissioning Authority, arrange an acceptable time for the instruction periods.

.5 Obtain a signed statement from the Departmental Representative certifying that the demonstration and instruction have been given to his satisfaction.

.6 Obtain a list of all persons attending commissioning, demonstration, or training sessions, including their signatures and job title.

3.10 Documents Required

.1 Maintain at job site, one copy of each of the following:

.1 Contract Drawings.

.2 Specifications.

.3 Addenda.

.4 Reviewed shop drawings.

.5 Change Orders.

.6 Other modifications to Contract.

.7 Field test reports.

.8 Copy of the Construction Schedule.

.9 Manufacturer's installation and application instructions.

.10 Standards listed in Part 1 of specification sections under codes and standards.

3.11 Drawings and Measurements

.1 Drawings are generally diagrammatic and intended to indicate the scope and general arrangement of work. Do not scale the drawings. Take field measurements where equipment and material dimensions are dependent upon building dimensions.

.2 Review all drawings and documents for all trades on the project. Coordinate work specified in this Division with that of other Divisions. Advise other trades of requirements specified in this Division, and how those requirements affect the other trades.

.3 Consult the Architectural, Structural, Electrical, and all other drawings and details for exact locations of fixtures and equipment, mechanical and otherwise. Obtain this information from the Departmental Representative where definite locations are not detailed.

3.12 Departmental Representative Approval

.1 It is not incumbent upon the Departmental Representative to superintend the work so as to relieve the Contractor of any responsibility.

.2 Permission to proceed does not constitute approval of the work, or portion thereof.

.3 Approval of the work shall be made only upon the successful conclusion of tests and satisfactory performance under design operating conditions.

3.13 Equipment Protection Cleanup

.1 Protect equipment and materials in storage and on site, during and after installation until final acceptance. Leave factory covers in place and take special precautions to prevent entry of foreign material into working parts of piping and duct systems.

.2 Protect equipment with polyethylene covers and crates.

.3 Thoroughly clean piping, ducts and equipment of dirt, cuttings and other foreign substances.

.4 Protect bearings and shafts during installation. Grease shafts and sheaves to prevent corrosion.

.5 Cover and protect all floors, furniture, millwork, computers, servers and other information technology equipment. Coordinate with the Departmental Representative to remove any equipment that is at risk and cannot be protected.

3.14 Excavation and Backfill

.1 Refer to requirements of Division 2.

.2 Excavation is specified under other Divisions.

.3 Provide bedding and backfill with sand or other approved material to minimum of 150 mm over pipe or as necessary to protect mechanical work. Remainder of backfilling, compaction and disposal of surplus material shall be as specified in other Sections.

3.15 Existing Utilities

.1 When breaking into or connecting to existing services or utilities, carry out work at times directed by local governing authorities, with a minimum of disturbance to work and/or building occupants and pedestrian and vehicular traffic. Notify Designated Representative at least 24 hours before carrying out such work.

.2 Protect, relocate or maintain existing active services as required. When inactive services are encountered, cap off in a manner approved by local governing authorities having jurisdiction and stake or otherwise record location of capped service.

3.16 Gas Inspection

.1 Submit to the Provincial Gas Inspection Department, drawings, applicable sections of specifications and detailed drawings as required to obtain approval for the gas installation.

3.17 Handover of New or Renovated Systems

.1 Prior to Substantial Performance, some new or renovated sections of the building may be re-occupied by the building operator for normal operations. When new or renovated mechanical systems are activated for service on sections of the building being re-occupied, the systems must be formally handed over to the Departmental Representative.

.2 Subject to the Departmental Representative accepting these reactivated systems, the Departmental Representative will assume responsibility for normal maintenance such as filter changes, lubrication, etc.

3.18 Identification and Labelling

.1 Equipment and panels: Provide engraved plastic identification plates for the following items:

.1 Control panels.

.2 Electrical devices supplied under this Division of the Specification.

.3 All equipment provided under this Division.

.4 Refer to Section 25 01 05, Controls.

.2 Ducts and pipes: Label with 25 mm high black letters on a white background on the following items, after painting is complete. Use stencil or pressure sensitive tape labels.

.1 All pieces of equipment supplied under this Division.

.2 Duct runs, pipe runs including zone heads. Identify system and/or zone. Identify at 15 meter intervals or less, as required.

.3 Gas piping: not more than 6.0 metre intervals, at change of direction, where passing through walls and ceilings, or entering or leaving other concealed space.

.4 Non-Potable Water piping: not more than 6.0 metre intervals, at change of direction, where passing through walls and ceilings, or entering or leaving other concealed space.

.5 Piping system label abbreviations must match the Existing building system.

.3 Temporary equipment labels: Until permanent equipment labels have been installed, provide temporary labeling for use during course of construction to aid site coordination. Temporary labeling shall be completed once equipment has been uncrated and prior installation. Temporary labels shall be either removed or hidden once permanent labels are installed.

.4 Where services are installed above suspended ceilings, or behind access doors, secure self-adhesive coloured dots to the access door or ceiling T-bar member, to identify the location of access to equipment concealed. To indicate exactly which tile or panel has to removed, the coloured dots should be placed on two of the bars adjacent to the subject tile.

.5 Provide coloured circular stickers, minimum 12mm diameter, to identify access locations for mechanical equipment and services. The access shall be identified in accordance with the colour schedule shown below:

Item	Colour
Fire Damper	Red
Cleaning Access	Black
Dampers (auto or back draft)	Dark Green
Balancing Dampers	Dark Green
Filter	Brown
Sprinkler Test Valve	Light Green
Control Device - Controller	Dark Blue
Control Relay Cabinets	Yellow
Controls Device - General	Orange

3.19 Intent

.1 Provide complete and fully operational mechanical systems with facilities and services to meet requirements described herein and in complete accord with applicable codes and ordinances.

.2 Follow manufacturer's recommended installation details and procedure for equipment supplemented by the contract documents

.3 Install equipment in locations and routes shown, close to building structure with minimum interference with other services or free space. Remove and replace improperly installed equipment.

.4 Provide labour and materials required to install, test and place into operation on the mechanical systems. Provide additional material for modifications required to correct job conflictions.

.5 The word "provide" shall mean "supply and install" unless otherwise indicated.

.6 In the event of a disagreement between the drawings and specifications, the specifications shall take precedence.

.7 Any reference to the Department Representative in this Division shall mean Smith + Andersen.

.8 The main divisions of the work of this Division generally includes the supply and installation of the following:

.1 Heating, Ventilating, Air Conditioning Systems.

.2 Exhaust and Ventilation Systems.

.3 Plumbing Systems.

.4 Equipment Control Systems.

.5 Fire Protection Systems.

3.20 Location of Equipment & 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 Install all work so as to be readily accessible for adjustment, operation and maintenance. Furnish access panels where required in building surfaces for installation by building trades.

.4 Locate access panels in service areas wherever possible. Do not locate in panelled or special finish walls, without prior approval.

.5 If any doubt exists, inform Departmental Representative of impending installation and obtain his approval for actual location.

3.21 Miscellaneous Metal

.1 Be responsible for all miscellaneous steel work relative to Divisions 21, 22, 23 and 25 of the Specifications, including but not limited to:

.1 Support of equipment.

.2 Hanging, support, anchoring, guiding and relative work as it applies to piping, ductwork fans and mechanical equipment.

.3 Pipe anchor and/or support posts.

.4 Ceiling ring bolts - secure to structure or steel supports.

3.22 Building Operator Occupancy

.1 The building operator will occupy the premises during the entire period of construction for the conduct of his normal operations. It is mandatory to cooperate with the building operator in all construction operations to minimize conflict, and to facilitate the building operator's continued and uninterrupted usage.

.2 Schedule work so as not to disturb, disrupt, or endanger building occupants or normal facility operations. Coordinate work with the Departmental Representative.

.3 Provide 48 hours' notice to the Designated Representative prior to disruption of systems. Obtain approval prior to proceeding with systems shutdown or disruption.

.4 Provide temporary work as required to maintain systems in operation at all times. Short periods of discontinuous service may be approved for reconnection, modification or renovation of services or systems.

.5 The Departmental Representative may instruct the contractor to activate systems in the area of work even if the remainder of the construction and installation of building components is not complete. The Contractor must schedule his work to allow minimal periods of inoperable system operation in the area of work.

3.23 Permits and Fees

.1 Unless otherwise specified, give all necessary notices, obtain all necessary permits, and pay all fees in order that the work may be carried out.

.2 Furnish any certificates necessary and evidence that the work installed conforms with regulations of all authorities having jurisdiction before final certificates are issued.

3.24 Prior Tests and Inspections

.1 Test all work prior to concealment.

.2 Notify the Departmental Representative of the requirements for inspections or tests with forty-eight hours' notice.

.3 If instructed by the Departmental Representative, material installed under this Division and covered before approval, must be exposed or uncovered at contractor's cost for the necessary inspection.

3.25 Project Coordination

.1 Coordinate progress of the Work, progress schedules, submittals, use of site, temporary utilities and construction facilities.

.2 All Contractors are required to perform an on-site examination prior to commencing Work and notify the Departmental Representative of any deviation from the Contract Documents. Commencement of Work shall indicate acceptance of existing conditions.

.3 The responsibility as to which sub-trade supplies and installs any and all materials rests solely with the Prime Contractor.

.4 Extras to the Contract will not be considered based on grounds of difference in interpretation of plans and specifications as to which trade involved shall be responsible for certain materials, installation or specialties.

.5 The Contractor shall do all cutting and remedial Work that may be required to make several parts of the Work come together properly. Coordinate the schedule to ensure that as much as possible is built into the Work and that this requirement is kept to a minimum.

3.26 Project Meetings

.1 Attend project meetings as detailed in Division 1.

3.27 Protective Coatings and Painting

.1 All exposed steel piping, hangers, supports, brackets, stands and other miscellaneous metal and uncoated steel surfaces which is supplied under this Division are to be prime coated. Ceiling spaces, pipe shafts, and crawl spaces are not considered exposed.

.2 Finish painting of all equipment and material installed under this Division is specified under Division 9 of the specification, unless specified otherwise.

.3 Apply one coat of galvanizing paint to all steel which has had its galvanized coating damaged or sheared.

3.28 Record Drawings

.1 Keep on site, an extra set of drawings and specifications recording changes and deviations daily.

.2 Include all details from revision drawings, supplementary drawings, change order and addenda.

.3 Before Substantial Completion submit for approval to the Department representative, completed and detailed marked up white prints to reflect the record drawing status.

.4 Contractors shall certify final reproducible record drawings to be correct by notation and signature.

.5 The Departmental Representative will provide services for the following:

.1 Updating the original computer software to include all changes recorded on the record white prints.

.2 Plotting one set of full size reproducible record drawings.

.3 Plotting one set of reduced size reproducible record drawings.

.4 Photocopying three sets of reduced sized record drawings.

.6 After the contractor certifies and signs the completed record drawings, the contractor shall provide with each Maintenance Manual, the following record materials provided under the Cash Allowance.

.1 One set of full size record drawings attached with each Manual.

.2 One set of reduced size record drawings bound in each Manual.

.7 After the contractor certifies and signs the completed record drawings, the contractor shall submit or distribute the following record materials provided under the Cash Allowance.

.1 One set of full size reproducible record drawings to the Department representative.

.2 One set of full size sprinkler system record drawings at each Sprinkler Station. Refer to Division 21 Fire Suppression.

.3 One set of full size sprinkler system record drawings to the Departmental Representative's Insurance Company. Refer to Division 21 Fire Suppression. Attach with other specified submittals.

3.29 Responsibility

.1 Check drawings of all trades to verify space and headroom limitations for work to be installed. Coordinate work with all trades and make changes to facilitate a satisfactory installation. Make no deviations to the design intent involving extra cost to the Departmental Representative without written approval.

.2 Promptly advise the Departmental Representative of any specified equipment, material, or installation of same which appears inadequate or unsuitable, in violation of laws, ordinances, rules or regulations of authorities having jurisdiction; of any necessary items of work omitted from the Contract Documents; or of any discrepancies in the Specifications.

.3 When the Contract Documents do not contain sufficient information for proper selection or bidding, notify the Department Representative during the tendering period. Failure to do this shall not relieve the Contractor of responsibility to supply the intended equipment.

.4 The Contractor is to consider that this is a renovation project. Reasonable allowances must be included for refitting or relocation of services and components that may be discovered during the course of construction that were not apparent at the commencement of the project, shown on plans, or concealed in walls, ceilings or floors. Necessary accessories for connection and modifications of configurations or materials shall be included at no extra cost to the Departmental Representative.

3.30 Separate Prices

.1 Refer to Division 01

3.31 Setting Out of Work

.1 Assume full responsibility for and execute complete layout of Work to locations, lines and elevations indicated. Provide devices needed to lay out and construct Work.

.2 Exercise proper precautions to verify figures shown on the drawings, before laying out of work, and be responsible for any errors resulting from failure to exercise such precautions.

.3 The drawings indicate the general location and route to be followed by the pipes and ducts, etc. Install so as to conserve headroom and interfere as little as possible with the free use of the space through which they pass. Keep all ducts, pipes, etc. at the ceilings as tight as possible to beams or other limiting members. Where headroom or space conditions appear inadequate, notify the Departmental Representative before proceeding with fabrication and/or installation.

.4 Ensure non-interference between heating, plumbing, drainage, electrical and other equipment.

.5 Make any corrections required in order to avoid the work of other trades, and/or as required by the Departmental Representative.

.6 Maintain integrity of fire separations and compartments.

3.32 Shop Drawings, Product Data and Samples

.1 Shop drawings must be submitted and reviewed by the Departmental Representative prior to the contractor ordering or shipping any subject equipment. Payments will not be processed for equipment not properly documented and reviewed under the terms of submittal.

.2 Shop drawings shall be submitted in S.I. (Metric) Units. Shop drawings not submitted in the correct units may be automatically returned without review.

.3 Submit materials and equipment by manufacturer, trade name and model number. Include copies of applicable brochure or catalogue material. Do not assume applicable catalogues are available in the Department representative's office. Maintenance and operating manuals are not suitable submittal material.

.4 Review of the shop drawings by the Departmental Representative does not relieve the contractor or his supplier of the responsibility to provide the correct and complete equipment, material or installation.

.5 Prior to submission to the Department representative, the Contractor shall review all shop drawings. By this review the Contractor represents that he has determined and verified all field measurements, field construction criteria, materials, catalogue numbers and similar data or will do so and that he has checked and coordinated each shop drawing with the requirements of the Work and of the Contract Documents.

.6 The Contractor's review of each shop drawing shall be indicated by his approval stamp, date and signature on the front of each page. Drawings will not be considered if not previously checked by the Contractor.

.7 Clearly mark each sheet of printed submittal material, using arrows, underlining or circling, to show particular sizes, dimensions, wiring diagrams, operating clearances, control diagrams, project identification, types, model numbers, ratings, capacities and options actually being proposed. Cross out non-applicable material. Note on the submittal specified features such as special tank linings, pump seals, materials or painting.

.8 The contractor shall identify in writing, on the shop drawings, all aspects, accessories, options etc. that do not conform to the tender documents. Failure to do so will result in work being rejected.

.9 The mechanical contractor and the general contractor shall each review the shop drawings then stamp and initial the front page of each submission package and sign the original transmittal form. The contractor’s shop drawing review shall include a detailed review of all installation details to ensure that they do not conflict with other trades, and to ensure that the system can be installed as intended.

.10 **Submit ONE reproducible copy or PDF version** of each shop drawing and all supporting material, sufficiently in advance of requirements to allow time for review. Reproducible means photocopy capable for small sheets up to 280 mm by 430 mm (11 inches by 17 inches). Larger sheets shall be printed full scale.

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

.12 Schedule submissions with adequate lead time for review by all concerned parties before the dates when reviewed submissions are required for ordering of equipment.

.13 Coordination of Submissions:

.1 Coordinate with field construction criteria.

.2 Coordinate each submittal with requirements of the work of all trades and Contract Documents.

3.33 Site Assessment

.1 Refer to Division 0 and Division 1.

.2 Visit the site before tendering and examine all local and existing conditions on which the work is dependent.

.3 No consideration will be granted for any misunderstanding of work to be done resulting from failure to visit the site or insufficient site examination.

3.34 Sleeves, Hangers, and Inserts

.1 Provide and set sleeves where conduits pass through walls, floors or ceilings. Pack sleeves with material approved for use in fire separations.

.2 Obtain Departmental Representative's approval before cutting for sleeves.

.3 Provide and install hangers and inserts where required.

3.35 Substantial Performance Procedure

.1 Prior to the Substantial Performance Inspection, provide complete list of items which are not finished or deficient at the time of the inspection.

.2 Provide all required submittals in a timely fashion prior to requesting substantial performance review. Confirm the required documentation with the Department representative.

.3 Final cleaning:

.1 Make the work area clean before the inspection process commences.

.2 Clean and polish finish surfaces.

.3 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls and ceilings.

.4 Vacuum clean and dust building interiors, behind grilles, louvres and screens.

.5 Broom clean and wash exterior walks, steps and surfaces.

.6 Remove dirt and other disfigurations from exterior surfaces.

.7 Final clean-up of existing premises shall only be performed in areas where alteration work has been performed.

.4 Demonstration and Inspection to Departmental Representative:

.1 Refer to Section 23 05 93.1 Testing, 23 05 93.2 Balancing, 23 05 93.3 Commissioning, 23 01 00 Documentation, Manuals and Record Drawings.

.2 Prior to Substantial Performance, demonstrate to and instruct the Departmental Representative on the complete systems operating and maintenance procedures using the assistance of specialist sub-trades and manufacturer's representatives.

.3 Submit a program for approval to the Departmental Representative. When approval is obtained from the Departmental Representative, arrange an acceptable time for the instruction periods.

.4 Obtain a signed statement from the Departmental Representative certifying that the demonstration and instruction have been given to his satisfaction.

.5 Completion of Phase 4 Commissioning to be complete prior to substantial performance. Refer to 23 05 93.3 Commissioning.

.6 Prior to application for Certificate of Substantial Performance, carefully inspect the Work and ensure it is complete, that major and minor construction deficiencies are complete, defects are corrected and the building is clean and in condition for occupancy.

.7 Notify the Departmental Representative in writing that the project is ready for inspection for Substantial Performance.

.8 During the Substantial Performance Inspection a list of deficiencies and defects will be tabulated.

.9 A deficiency holdback will be established as specified. This holdback shall be retained until all items on the deficiency list are completed. No interim payments will be released.

.10 Deficiency items shall be confirmed completed by all parties prior to Total Performance.

.11 Should the Departmental Representative perform re-inspection due to failure of the Work to comply with the claims of status of completion made by the Contractor:

.1 Building operator will compensate the Departmental Representative for such additional services.

.2 Building operator will deduct the amount of such compensation from the final payment to the Contractor.

.12 Submittals: As required, including but not limited to requirements specified in this section.

3.36 Taxes

.1 Pay all taxes levied by law, including Federal, Provincial, Municipal and Goods and Services Taxes.

.2 Goods and Services Tax is to be shown as a separate item on all progress claims.

3.37 Temporary Facilities

.1 The Contractor shall provide the following temporary services and connections.

.2 Heating and Ventilating:

.1 When the EF- 2 is relocated, provide a temporary exhaust fan at the building warehouse entrance to allow for exhaust removal during use Fan should be approximately 3,500 l/s at 95Pa static pressure. The fan will be manually operated if air quality in the warehouse is compromised.

.2 Maintain existing space environment to conditions acceptable to the Departmental Representative and the occupiers of the building.

.3 When permanent heating system is in operable condition, it may be used for heating the building prior to the final inspection, upon written approval from the Departmental Representative who will require cleaning, maintenance and conditioning of the complete system prior to Substantial Performance.

.4 Pay for costs of temporary heat and ventilation required for construction purposes including costs of installation, fuel, operation, maintenance and removal of equipment.

.5 Use of direct fired heaters discharging waste products into occupied or work areas will not be permitted.

.3 Removal of Temporary Facilities:

.1 Remove temporary facilities from site when directed by Departmental Representative.

3.38 Temporary Heat

.1 Refer to Division 1.

.2 Do not use the permanent system for temporary heating purposes, during the construction period, without written permission from the Department representative.

.3 Thoroughly clean and overhaul permanent equipment used during the construction period, replacing worn or damaged parts. Exchange equipment or components operating improperly at final inspection with new equipment or components.

.4 Use of permanent systems for temporary heat shall not modify the terms of the warranty for all systems and equipment as specified elsewhere.

.5 Operating heating systems under conditions which ensure no temporary or permanent damage. Operate fans at proper resistance with filters installed. Change filters at regular intervals. Operate with proper safety devices and controls installed and fully operational. Operate water systems with proper water treatment.

.6 Where air systems are used during temporary heating, provide filter media on return and exhaust air inlets. Clean duct systems which have become dirty.

3.39 Temporary or Trial Usage

.1 Temporary or trial usage by the building operator of mechanical equipment before Substantial Completion shall not represent acceptance.

.2 Temporary use of mechanical systems and equipment for temporary heating service, either for construction or occupant benefit, before Substantial Completion shall not represent acceptance. Warranty periods shall not commence until the date of Substantial Completion.

.3 Repair or replace permanent equipment used temporarily.

.4 Take responsibility for damage caused by defective materials or workmanship during temporary or trial usage.

3.40 Time of Completion

.1 Commence work immediately upon official notification of acceptance of Tender and complete the Work as stated in the Contract Documents.

3.41 Total Performance Inspections and Project Close Out

.1 Prior to Total Performance provide a declaration, in writing, that deficiencies as noted on current Inspection Report are not outstanding.

.2 Notify the Departmental Representative in writing that all deficiencies have been corrected and that the building is ready for Final Inspection.

.3 Submit a final Statement of Account showing total adjusted Contract Price, previous payments and any other adjustments and monies due.

.4 Submit a current Statutory Declaration.

.5 Submit WorkSafeBC (Workers' Compensation Board) Certificate of Compliance.

.6 Departmental Representative will issue a final change order reflecting approved adjustments to contract price not previously made.

3.42 Trades Qualifications, Competency Assurance, Licenses

.1 All workers engaged in the construction or renovation of systems or equipment, shall be journeymen who have Trades Qualifications under Province of British Columbia legislation, or are indentured apprentices working under a journeyman who is on the site.

.2 All workers engaged in the construction or renovation of systems or equipment governed by other agencies such as the Federal or Provincial Ministry of Labour, Ministry of Health or the Ministry of Environment shall be appropriately licensed under Federal or Provincial legislation.

.3 Tradesmen shall perform only work that their certificate permits.

.4 Trades Qualification certificates or other licenses must be submitted prior to commencing work and must be on site for inspection.

.5 Trades Qualifications or certificates or competency or licenses must be carried for workers including, but not limited to the following:

.1 Plumbing

.2 Gas fitting

.3 Pipe fitting

.4 Pipe Insulation

.5 Duct Insulation

.6 Sprinkler Fitting

.7 Refrigeration

.8 Boiler installation

.9 Sheet Metal Work

3.43 Workmanship

.1 Standards of Workmanship shall be in accordance with well-established practices and standards accepted and recognized by the Departmental Representative and the Trade.

.2 Do not employ any unfit person or anyone unskilled in their required duties.

.3 The Departmental Representative shall have the right to reject any item of work that does not conform to the Contract Documents and accepted standards of performance, quietness of operation, finish and acceptance.

3.44 Warranty

.1 Refer to Division 0 and Division 1.

.2 The warranty period with regard to the Contract, other than for latent defects, is limited to one year from the date of Substantial Performance of the Work unless otherwise specified.

.3 Correct any defects in the work due to faulty products or workmanship appearing within the warranty period.

.4 The warranty shall not apply to work or other products damaged after Acceptance, by causes beyond the Contractor's control such as lack of prescribed maintenance, vandalism and abuse.

.5 Correct and pay for any damage to other work resulting from any correction required under these conditions.

.6 In the event that the repair time of defective equipment or systems is delayed for whatever reason, maintain the equipment or system in an approved manner until repairs can be made.

1. GENERAL

1.1 Work Included

.1 Renovations to existing sanitary drainage and vent piping.

.2 Renovations to existing fuel system piping.

.3 Renovations to existing domestic water piping.

.4 Renovations to existing fire protection system piping.

.5 Renovations to existing heating and chilled water system piping.

.6 Refrigerant system piping.

.7 Pressure and temperature relief piping.

.8 Strainers.

.9 Unions and mechanical couplings.

1.2 Welding

.1 Welding materials and labour shall conform to ASME Code and the Provincial Regulations.

.2 Use welders fully qualified and licensed by Provincial Authorities.

1.3 Quality Assurance

.1 Domestic water, drainage and vent piping shall meet the requirements of the British Columbia Building Code, British Columbia Plumbing Code, and Municipal Codes.

.2 Copper tube domestic water piping shall comply with the requirements of the British Columbia Building Code AND with the requirements of Standard ASTM B88–83a. All tubing shall be marked by the manufacturer as complying with this standard. This Division shall be responsible for any costs, including direct charges by the Department representative, for testing, inspection and certification required by the Authority having jurisdiction, to certify that copper tubing in domestic water systems meets all requirements of this specification and those of the Authority having jurisdiction.

.3 Sprinkler light wall pipe shall be ULC listed, FM listed, manufactured to ASTM-A-135 NHA-300-PSI. Equal to Allied XL.

.4 Roll form joint light wall sprinkler pipe shall be ULC listed, FM listed, manufactured to ASTM-A-795-A-ERW-NH-300-PSI. Equal to Allied Super Flo.

.5 Sprinkler System piping shall meet the requirements of NFPA No. 13 Standard for the Installation of Sprinkler Systems.

.6 Fire hose standpipe piping shall meet the requirements of NFPA No. 14 Standard for the Installation of Standpipe and Hose Systems.

.7 Pipe fittings shall conform to the following standards:

.1 ANSI/ASME B1.20.1-1983 (Pipe Threads)

.2 ASTM-197-47 (Materials)

.3 ANSI B16.3-1977 (Dimensions)

.4 USAS B2.1-1968 (Pipe Threads)

.5 JIS B 2301-1988 (Screwed Type Malleable Cast Iron Pipe Fittings)

.6 JIS H 8641-1982 (Zinc Hot Dip Galvanizing)

.7 JIS G 5702-1988 (Blackheart Malleable Iron Castings)

1.4 Acceptable Manufacturers

.1 Manufacturers of groove and clamp pipe fittings whose products are approved in principle, but subject to requirements of drawings and specifications are:

.1 Victaulic.

.2 Manufacturers of sprinkler pipe fittings whose products are approved in principle, but subject to the requirements of drawings and specifications are:

.1 Victaulic (V-brand) - malleable iron, ductile iron, steel

1.5 Submittals – Prior to Construction

.1 Pipe Fittings: Submit one sample piece for each type of fitting including but not limited to screwed, welded or clamped elbows, tees, flanges and couplings.

.2 Grooved coupling Gaskets: Full technical information including but not limited to material, service temperature, installation instructions, identification, compatibility with proposed coupling hardware, etc.

.3 Mechanical Joint Couplings: Listed to CAN/ULC S102.2-10 & CSA-B602.

2. PRODUCTS

2.1 Pipe - Service & Material

.1 Equipment Drains and Overflows:

.1 Material: Galvanized Steel Schedule 40

.1 Fittings: Galvanized - threaded

.2 Material: Type K or L Hard Copper

.1 Fittings: Wrought copper, cast brass - 50/50 solder

.2 Fittings: Cast brass - threaded

.3 Material: PVC schedule 40

.1 Fittings: PVC - solvent weld

.2 Boiler Condensate Drains:

.1 Material: PVC schedule 40

.1 Fittings: PVC - solvent weld

.3 Sanitary Drainage and Vent (above grade including crawlspace):

.1 Material: Type M or DWV Copper

.1 Fittings: Wrought copper, cast brass - 50/50 solder

.2 Material: Cast Iron

.1 Fittings: Mechanical joint

.4 Sanitary Drainage and Vent (buried under building):

.1 Material: Cast Iron

.1 Fittings: Mechanical joint, hub and spigot

.2 Material: ABS Solid Core, PVC (CSA Approved)

.1 Fittings: ABS Solid Core, PVC - solvent weld

.5 Domestic Water (above grade):

.1 Material: Type L Hard Copper

.1 Fittings: Wrought copper - lead free solder

.2 Fittings: Cast brass, bronze - threaded

.6 Domestic Water (below grade):
- .1 Material: Type K or Type L Soft Copper
  - .1 Fittings: Cast bronze - Flared tube
- .2 Material: PVC SCM 150
  - .1 Fittings: Hub and spigot, thrust block at elbows, rod connection at end of line
- .3 Material: Cast Iron
  - .1 Fittings: Hub and spigot, thrust block at elbows, rod connection at end of line
- .4 Material: Non-metallic cross linked polyethylene (PEX) to CSA B137.5
  - .1 Proprietary compression joint.
  - .2 Below grade piping must be continuous and not have joints.

.7 Fire Protection (above grade):
- .1 64 mm and smaller:
  - .1 Material: Steel schedule 40
  - .2 Fittings: Forged steel - welded, flanged
  - .3 Fittings: Malleable steel - threaded, flanged, grooved mechanical coupling;
- .2 75 mm and larger:
  - .1 Material: Steel Light wall - grooved mechanical, compression fit. Corrosion Resistance Rating equal to schedule 40 steel pipe.

.8 Natural Gas (above grade):
- .1 Material: Steel Schedule 40
  - .1 Fittings: Malleable steel - threaded under 63 mm if approved
  - .2 Fittings: Forged steel - welded 63 mm and over and where required by service
  - .3 Press type fittings are not permitted.
  - .4 Flexible corrugated piping of aluminum or any other material is not acceptable, except at the final connection to equipment.

.9 Hot Water Heating to 120°C (250°F):
- .1 Material: Steel Schedule 40
  - .1 Fittings: Malleable steel – threaded
  - .2 Fittings: Forged steel - welded, flanged
  - .3 Fittings: Grooved Mechanical Couplings
- .2 Material: Type M Hard Copper
  - .1 Fittings: Wrought copper, cast bronze - 95/5 solder
- .3 Material: Type M Soft Copper
  - .1 Fittings: Wrought copper, cast bronze - 95/5 solder

.10 Relief valve piping – boiler
- .1 Material: Steel Schedule 40
  - .1 Fittings: Malleable steel - threaded

.11 Refrigerant:
- .1 Material: ACR Copper Grade 2
  - .1 Fittings: Wrought copper - Brazed phoscopper alloy
  - .2 Fittings: Forged brass - brazed silver copper

2.2 Unions

.1 Size 51 and under: 1035 kPa (150 psi) malleable iron, bronze to iron ground joint unions for threaded ferrous piping, air tested for gas service, all bronze for copper piping.

.2 Sizes 64 mm and over: 1035 kPa (150 psi) forged steel slip on flanges for ferrous piping, 150 lb. bronze flanges for copper piping. Gaskets shall be 1.6 mm thick performed synthetic rubber bonded fibre material. Gaskets for gas service shall be synthetic rubber.

2.3 Grooved Mechanical Couplings

.1 Only grooved pipe end type, non-reducing, bolted connection couplings are approved. Gasketed and set screw, non-bolted lever clamp, or jaw grip type couplings are not approved.

.2 Fire protection systems must use couplings certified for use in fire protection systems, and must be listed by NFPA, FM and ULC.

.3 Housing: Ductile Iron conforming to ASTM-A536 or Malleable Iron conforming to ASTN-A47.

.4 Gasket: EPDM composition to suit temperature service requirements.

.5 Bolts and Nuts: Heat treated carbon steel, conforming to ASTM-A183, minimum tensile strength, 758,400 kPa.

.6 Mechanical couplings for non-threaded pipe are to be certified for use with that pipe, by all agencies certifying the piping systems.

.7 Flanges with integral grooved neck adapter are approved. Grooved mechanical coupling split flange systems are not approved as reducing fittings.

2.4 Strainers

.1 Size 51 mm and under: Screwed or grooved, brass, or iron body, Y pattern with 0.8 mm stainless steel perforated screen.

.2 Size 64 mm to 102 mm: Flanged or grooved iron body, Y pattern with 1.2 mm stainless steel perforated screen.

.3 Size 127 mm and larger: Flanged or grooved iron body, basket pattern with 3 mm stainless steel perforated screen.

.4 Screen free area shall be minimum three times area of inlet pipe. Provide valved drain and hose connection off strainer bottom.

2.5 Solder

.1 Potable water systems have lead content less than 0.2%.

2.6 Flanges

.1 Forged steel, 125 pound, slip on or weld neck configuration.

2.7 Overflow Drain Spout

.1 Cast bronze, lip extension, full face plate and wall flange.

.2 Equal to Zurn ZAB-199.

3. EXECUTION

3.1 General

.1 Make connections to equipment and branch mains with unions.

.2 Provide non-conducting type connections wherever jointing dissimilar metals.

.3 Do not run combustible or non-approved pipe through fire separations. Use approved materials and methods only.

.4 Install piping to allow for expansion and contraction without unduly stressing pipe or equipment connected.

.5 Provide clearance for proper installation of insulation and for access to valves, air vents, drains and unions.

3.2 Existing Systems

.1 Relocate existing services and piping systems to suit new work. Determine the extent of the requirements by inspection of the site and conditions.

.2 Relocate existing systems and components as required to allow for installation of new or renovated systems.

3.3 Preparation

.1 Ream pipes and tubes. Clean off scale and dirt, inside and outside, before assembling. Remove welding slag or other foreign material from piping.

3.4 Steel Pipe Connection

.1 Screw joint steel piping up to and including 38 mm. Screw or weld 51 mm piping. Weld piping 64 mm and larger, including branch connections.

.2 Make screwed joints with standard NPT configuration. Use approved nontoxic joint compound or teflon tape.

.3 Use full sized tees or main sized saddle type branch connections for directly connecting branch lines to mains in steel piping. Do not project branch pipes inside the main pipe.

.4 Make reductions in large water pipes with eccentric reducing fittings installed to provide drainage and venting.

3.5 Hub and Spigot Connections

.1 Clamp hub and spigot pressure pipe at end of line fittings with 19 mm rods and properly clamped and anchored support.

.2 In-ground hub and spigot elbows and tees shall be founded with thrust blocks as specified elsewhere. Clamp and rod connections only, are not approved.

3.6 Grooved Mechanical Couplings

.1 Use grooved mechanical coupling and mechanical fasteners only in accessible locations.

.2 Use grooved mechanical coupling to engage and lock grooved or shouldered pipe ends. Use flexible grooved fittings where required to allow for some angular deflection, contraction and expansion.

.3 Contractor to provide proof of completion of installation training by grooved mechanical coupling manufacturer or manufacturer’s representative on site prior to start of construction.

3.7 Grades, Routes and Installations

.1 Route piping in orderly manner and maintain proper grades. Install to conserve headroom and interfere as little as possible with use of space.

.2 Run exposed piping parallel to walls. Group piping wherever practical at common elevations.

.3 Install concealed pipes close to the building structure to keep furrings to a minimum.

.4 On closed systems, equip low points with 19 mm drain valves and hose connection.

.5 At high points, provide collecting chambers and high capacity float operated automatic air vents.

3.8 Priming

.1 Prime coat exposed pipe, pipe hangers and supports. Pipes, pipe hangers and supports located in crawlspaces, pipe shafts and suspended ceiling spaces are not considered exposed.

1. GENERAL

1.1 Work Included

.1 Pressure gauges and pressure gauge taps.

.2 Thermometers and thermometer wells.

.3 Combination instrumentation taps and gauges.

1.2 Submittals - Prior to Construction

.1 Submit with shop drawings list which indicates use, operating range, and suitable range of each gauge and thermometer.

1.3 General Requirements

.1 All meters, gauges and thermometers shall be calibrated in SI (Metric) Units.

2. PRODUCTS

2.1 Pressure Gauges

.1 Steel case, 90 mm diameter minimum, phosphor bronze bourdon tube brass movement, extruded brass socket.

2.2 Pressure Gauge Taps

.1 Brass needle valve, ball valve.

2.3 Stem Thermometers

.1 230 mm long, adjustable scale, red indicator, brass separable socket.

.2 Well: Brass separable socket complete with gasket and cap, size as required.

.3 Provide tilt adjustment on devices if required to view without climbing from floor.

2.4 Dial Face Thermometers

.1 70 mm diameter, white background, black scale indicator, brass separable socket.

.2 Well: Brass separable socket complete with gasket and cap, size as required.

2.5 Combination Tapping for Instrumentation

.1 Brass fitting with concentric hole fitted with self-sealing probe, two self closing synthetic rubber gaskets, 6 mm threaded application, threaded brass dust cap with gasket and strap.

.2 Equal to Petersen 311 Series (Pete's Plug II).

3. EXECUTION

3.1 Pressure Gauges and Taps

.1 As described on drawings and schedules.

.2 Install pressure gauges in welded thread-o-lets or mechanical tee fittings. Do not tap piping.

.3 Provide only one pressure gauge per pump. Install common header, 12 mm diameter pipe, complete with control ball valves to allow selection of pressure reading from each of the following points. Refer to schematic diagram.

.1 Before strainers.

.2 On pump suction.

.3 On pump discharge.

.4 Provide pressure gauges on new fire sprinkler zone as follows:

.1 Upstream of automatic valve

.2 Downstream of automatic valve

.3 At zone branch take-offs

3.2 Thermometers

.1 As described on drawings and schedules.

.2 Install in locations allowing ease of accurate observation without obstruction, light glare or danger to the reading technicians.

.3 Provide tilt adjustment on devices if required to view without climbing from floor.

3.3 Combination Tapping for Instrumentation

.1 As described on drawings and schedules.

.2 On schedule 40 or thicker steel pipe, operating at pressures less than 450 kPa (65 psig), drill and tap the pipe for installation of the combination tap fitting.

1. GENERAL

1.1 Work Included

.1 Butterfly valves.
.2 Ball valves.
.3 Relief valves.
.4 Check valves.
.5 Drain valves.
.6 Hose bibbs.
.7 Backflow preventers.
.8 Backflow preventers testing devices.
.9 Backflow preventers test reports.
.10 Pressure regulating valves - gas.
.11 Combination metering and balancing valves.
.12 Constant flow devices.

1.2 Manufacturer

.1 Provide valves of same manufacturer throughout where possible.
.2 Provide valves with manufacturer's name and pressure rating clearly marked on outside of body.

1.3 Quality Assurance

.1 Valves for fire protection systems shall be approved by Factory Mutual & Underwriters Laboratories Canada.
.2 Valves for gas service shall be trimmed and approved for specified service.

1.4 Submittals – Prior to Construction

.1 Manufacturers' data and shop drawings for all valves and accessories including dimensions, pressure ratings, materials, service acceptability.
.2 Manufacturers' data, shop drawings and instructions for backflow preventer testing equipment including dimensions, pressure ratings, materials, service acceptability.

1.5 Submittals – Prior to Substantial Completion

.1 Backflow preventer test report and certification.

1.6 Acceptable Manufacturers

.1 Manufacturers of combination metering and balancing valves whose products are approved in principle, but subject to requirements of drawings and specifications are:
  .1 Tour & Anderson, Wheatley, Bell and Gossett.
.2 Manufacturers of constant flow devices whose products are approved in principle, but subject to requirements of drawings and specifications are:
  .1 Hayes, Victaulic, Griswold
.3 Manufacturers of water service ball valves whose products are approved in principle, but subject to requirements of drawings and specifications are:
  .1 Kitz, Newman Hattersley, Red and White, Toyo.

.4 Manufacturers of gas service ball valves whose products are approved in principle, but subject to requirements of drawings and specifications are:

.1 Newman Hattersley, Red and White, Toyo.

.5 Manufacturers of spring loaded check valves whose products are approved in principle, but subject to requirements of drawings and specifications are:

.1 Centre Line, DeZurik, Hagen, Mission, Mueller, M&G, Singer, Crane, Jenkins, Lunkenheimer.

.6 Manufacturers of relief valves whose products are approved in principle, but subject to requirements of drawings and specifications are:

.1 Consolidated, Crosby Aston, Farris, Kunkle, Lonergan, Singer, Watts, Lunkenheimer, Crane.

.7 Manufacturers of reduced pressure backflow preventers whose products are approved in principle, but subject to requirements of drawings and specifications are:

.1 Watts, Febco, Combraco.

.8 Manufacturers of water pressure regulating valves whose products are approved in principle, but subject to requirements of drawings and specifications are:

.1 Braukman, Watts, Singer, Febco, Mueller.

.9 Manufacturers of natural gas pressure regulating valves intended for boiler service whose products are approved in principle, but subject to requirements of drawings and specifications are:

.1 Pietro Fiorentini, Fisher.

.10 Manufacturers of butterfly valves whose products are approved in principle, but subject to requirements of drawings and specifications are:

.1 Crane, Demco, DeZurik, ITT, Grinnell, Jenkins, Keystone, Hattersly.

.11 Manufacturers of hose bibbs whose products are approved in principle, but subject to requirements of drawings and specifications are:

.1 Watts, Zurn, Woodford, Mifab.

.12 Manufacturers of valves for grooved pipe whose products are approved in principle, but subject to requirements of drawings and specifications are:

.1 Victaulic

2. PRODUCTS

2.1 Valve Connections

.1 Provide valves suitable to connect to adjoining piping as specified for pipe joints. Use pipe size valves.

.2 Thread pipe sizes 51 mm and smaller.

.3 Flange pipe sizes 64 mm and larger.

.4 Solder or screw to solder adaptors for copper piping.

.5 Use grooved body valves with mechanical grooved jointed piping.

.6 Provide butterfly valves with tapped lug body when used for isolating service.

2.2 Check Valves – Clear Water, Domestic, Hydronic

.1 Bronze, swing disc, solder, grooved or screwed ends.

.2 Iron body, bronze trim, swing disc, renewable disc and seat, flanged ends.

.3 Iron body, bronze trim, spring loaded, renewable composition disc, flanged ends.

2.3 Butterfly Valves

.1 Bi-directional and dead-end service, ductile iron with blowout proof stainless steel stems and electroless nickel coated ductile iron disc. Seat material shall be EPDM and have a full 360 deg. continuous contact with the seating surface. Disc shall be offset from the centre line.

2.4 Pressure Regulating Valves - Natural Gas – Boiler Service

.1 Metal body, composition rubber diaphragm, plated or stainless steel spring, internal strainer.

.2 Internal and external vent limiters, positive dead-end lockup, inlet and outlet test ports, 500 to 1 turndown.

.3 Acceptable Model: Pietro Fiorentini Governor Over Pressure Device (OPD) Model.

2.5 Relief Valves

.1 Provide ASME rated direct spring loaded type, lever operated nonadjustable factory set discharge pressure as indicated.

2.6 Drain Valves

.1 Bronze compression stop with 19 mm hose threaded.

.2 Brass ball valve with 19 mm hose thread.

.3 Provide hose thread connection on valve or piping.

2.7 Hose Bibbs

.1 Type HB-1: Non-freeze type with wall plate, extended hose thread spout, removable key, integral vacuum breaker. Equal to Woodford model 65

.2 Type HB-2: Non-freeze type, solid brass operation rod, chrome double-check backflow preventer, chrome hose thread spout, hardened steel operating stem, semi-recessed box, locking drainable cover, equal to Woodford 68.

.3 Type HB-3: Non-freeze post roof hydrant, cast iron RH-MS roof hydrant mounting kit, aluminum casing guard, extended NHT spout with vacuum breaker, NPT inlet, brass trim, removable handle, drain port in warm space to be piped to exterior. Equal to Woodford RHY2-1-MS.

.4 All hose bibbs to be provided with approved shut-off valves and vacuum breakers or backflow preventers as required. Note that flush box hose bibb HB-2 will not be approved with a spout mounted vacuum breaker. Provide in-line vacuum breaker in supply line if not included in hose bib assembly.

2.8 Backflow Preventers - Reduced Pressure Type

.1 Bronze or red brass body, stainless steel springs, composition diaphragm.

.2 Independent acting spring loaded double internal disc valve, three chamber, discharge to atmosphere.

.3 Acceptable Models:

.1 Watts 009 QT

.2 Febco 825 Y

.3 Combraco 40-200

.4 Non-electronic testing apparatus including gauge, hoses, fittings, accessories, and case. Maximum temperature 105 degrees Celsius, maximum pressure 1,050 kPa. Equal to Watts TK-9A.

2.9 Ball Valves

.1 Up to 64 mm: Forged bronze body, delrin seat and seals, chrome plated ball, forged steel pin, screwed ends, 1200 kPa (175 psig) WOG.

.2 Tail piece supply isolation valves: ball type valves, angle configuration, screw driver operated, compression fittings or threaded as required, chrome plated if exposed.

2.10 Combination Balancing and Metering Valves

.1 Brass body, brass plugs and washers, screwed ends, calibrated gauge, lockable.

.2 Integral ports for sensing flow and connection of meter tubes. Ports complete with integral check valves.

2.11 Constant Flow Device

.1 Valve shall maintain constant flow independent of pressure differential.

.2 Maintain design flow rate at a differential pressure of 14 kPa (2 psi).

.3 Brass body with union coupling on inlet and threaded connection on outlet.

.4 Valve size to equal the inlet and outlet size of the heat pump, sized for the unit water flow.

.5 Capacity, flow and pressure drop clearly stamped on body.

.6 Capacity control cartridge must be replaceable so that design flow rate can be changed without changing the valve body.

.7 Valves used for domestic water recirculation shall be stainless steel and NSF listed for hot potable water.

2.12 Pressure Ratings

.1 Unless otherwise indicated, use valves suitable for minimum 862 kPa (125 psig) WSP and 230 degrees C (450 degrees F).

.2 Use valves for fire protection suitable for 1207 kPa (175 psig) WOG.

2.13 Valve Operators

.1 Balance Valves any type: provide locking memory stop.

.2 Provide one plug cock wrench for every plug cock valve.

.3 Butterfly Valves HVAC service:

.1 Less than 200 mm: Provide 10 – position handle with memory stops for shutoff service

.4 Butterfly Valves Fire Protection: Infinitely adjustable handle with locknut and memory stop, and integral tamper switch.

3. EXECUTION

3.1 Installation and Application

.1 Install valves with stems upright or horizontal, not inverted, unless otherwise noted.

.2 Install gate valves with stems horizontal or 45 degrees down from horizontal.

.3 Use ball valves for gas service. Plug cocks are not to be used for gas isolation service.

.4 Use only combination balance and metering valves in water systems for throttling service.

.5 Use butterfly valves in heating water systems.

3.2 Isolation Valves

.1 Isolation valves are to be ball type valves, pipe size as required, but in no case less than 12 mm diameter.

.2 For equipment removal purposes, isolation valves are to be installed with companion screwed unions on piping less than 75 mm diameter, or flanged connections on piping 75 mm and larger. Grooved mechanical couplings may be used for equipment removal, subject to accessibility, suitability and where approved by specification terms for that piping system or equipment.

.3 Install valves as close as possible to isolated equipment in order to minimize the amount of water lost during maintenance, replacement or drain down operations.

.4 Isolation drain valves are to be provided with combination air inlet fitting as required to relieve vacuum during draining operations.

.5 Install gate valves or ball valves where approved for shutoff and isolating service, or to isolate equipment, parts of systems or vertical risers.

.6 Provide drain valves at main shutoff valves, low points of piping and equipment including but not limited to:

.1 Pumps

.2 Tanks

.3 Mixing or other automatic valves

.4 Heat exchangers

.5 Coils

.6 Hydronic heaters

.7 Air vents - manual or automatic

.8 Washroom groups

.9 Hose bibbs

.10 Branch lines from mains - plumbing and HVAC

.11 All equipment

.12 All plumbing fixtures

3.3 Drain Valves

.1 Provide ball valves for drains on open systems such as evaporative sprays or HVAC storage tanks, or other systems where valves are likely to be plugged by silt or precipitate. This type of valve will allow rodding of the valve in the open position to clear the stoppage.

.2 Provide unions downstream of the valve to allow breaking the piping system.

.3 Provide hose thread connection on drain valve and piping.

3.4 Relief Valves

.1 Test relief valve. Ensure that it reseats correctly without leaking and does not splash or cause flooding at discharge.

.2 Pipe directly to drain, with discharge facing down into drain. Do not terminate horizontally or in any other configuration where discharge may splash out of drain.

3.5 Hose Bibbs

.1 All hose bibbs to be provided with approved shut-off valves, inside the building. Provide drain valve on leg if necessary.

3.6 Specialty Valves

.1 Provide relief valves on boilers, pressure or hot water tanks, or where required. Unless otherwise specified, pipe overflow to drain.

.2 For glycol based systems pipe relief valve overflow to glycol recovery/storage/makeup tank.

.3 Provide pressure reducing valves where shown or where required. Provide valved bypass around PRV station, one nominal pipe size smaller than water service. Provide PRV on by-pass pipe in parallel with the main PRV. Provide adequately rated shutoff gate valve and bypass globe valve.

3.7 Backflow Preventers

.1 Provide reduced pressure type backflow preventers where shown or where required as follows: Irrigation system connection, boiler make up, glycol storage tanks, cooling towers, laboratory equipment supplies. Pipe overflow to drain with air gap.

3.8 Combination Balancing and Metering Valve

.1 Provide combination balancing and metering valves in the following locations:

.1 As shown on drawings

.2 Boilers

.3 Mixing or other automatic valves

.4 Coils

.5 Hydronic heaters

.6 Branch lines from mains

.2 Valves to be sized for designed flow, regardless of pipe size. Provide reducers from pipe size if required.

.3 Install in location suitable for installation of meter.

.4 Balancing valves with memory stop feature, that can be closed tightly, can be used also as isolation valves, subject to all other requirements for clearance, drain ability, position to minimize lost water, etc. and proper position for metering function can be met. If any of these issues, or other critical limitations cannot be met, the balancing valve cannot be used as an isolation valve. A separate dedicated isolation valve must be provided.

3.9 Constant Flow Devices

.1 Provide constant flow valves in the following locations:

.1 As shown on drawings

.2 Hydronic heaters

.3 Branch lines from mains

.2 Devices to be sized for designed flow, regardless of pipe size. Provide reducers from pipe size if required.

.3 Install in location suitable for inspection.

.4 Install constant flow devices with internal cartridges removed and tie-wrapped to the valve bodies. Do not install cartridges until flushing and cleaning are complete.

3.10 Pressure Regulating Valve - Natural Gas

.1 Provide pressure reducing valves where shown or where required.

.2 Provide schedule 40 steel pipe on vent to discharge outdoors or above rooftop unit as required.

SECTION 23 05 29 – HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

1. GENERAL

1.1 Work Included

.1 Pipe hangers and supports.

.2 Duct hangers and supports.

.3 Roof pads.

1.2 Quality Assurance

.1 Plumbing pipe supports shall meet the requirements of BC Plumbing Code.

.2 Natural gas pipe supports shall meet the requirements of CGA B 149.1 Installation Code for Natural Gas Fired Appliances.

.3 Duct hangers shall follow the recommendations of the SMACNA Duct Manuals.

.4 Sprinkler or Standpipe supports shall meet the requirements of NFPA.

.5 Hydronic water pipe supports shall meet the requirements of ANSI B31.1, Power Piping.

1.3 Acceptable Manufacturers

.1 Manufacturers of roof pad supports whose products are approved in principle, but subject to requirements of drawings and specifications are:

.1 Dura-Blok, Mifab.

2. PRODUCTS

2.1 Pipe Hangers and Supports

.1 Hangers:

.1 Pipe Sizes 13 mm to 38 mm: Adjustable wrought steel ring, or plated strap.

.2 Pipe Sizes 51 mm and over: Adjustable wrought steel clevis.

.3 Hot Pipe Sizes: 152 mm and Over: Adjustable steel yoke and cast iron roll.

.2 Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods, cast iron roll and stand for hot pipe sizes 152 mm and over.

.3 Wall Support:

.1 Pipe Sizes to 75 mm: Cast iron hook, or fabricated bracket of 25 mm x 25 mm x 6 mm angle bar.

.2 Pipe Sizes 100 mm and Over: Welded steel bracket and wrought steel clamp.

.3 Hot Pipe Sizes 150 mm and Over: Adjustable steel yoke and cast iron roll.

.4 Vertical Support: Steel riser clamp.

.5 Roof Pads:

.1 UV resistant rubber with bolted galvanised steel channel.

2.2 Hanger Rods

.1 Provide steel hanger rods, threaded both ends, or continuous threaded, complete with lock nuts on both ends.

2.3 Duct Hangers and Supports

.1 Hangers:

.1 Concealed - Round Duct: Galvanized steel band iron.

.2 Concealed - Rectangular Duct: Galvanized steel band iron or rolled angle and 9 mm rods.

.3 Exposed - Round Duct: Continuous galvanized steel band iron secured to single 9 mm hanger rod.

.2 Wall Supports: Galvanized steel band iron or fabricated angle brackets.

.3 Vertical Support at Floor: Rolled angle.

2.4 Inserts

.1 Inserts shall be malleable iron case or galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms.

.2 Size inserts to suit threaded hanger rods.

3. EXECUTION

3.1 General Requirements

.1 Provide hangers and supports to secure equipment in place, prevent vibration, maintain grade, provide for expansion and contraction.

.2 Install supports of strength and rigidity to suit loading without unduly stressing building. Locate adjacent to equipment to prevent undue stresses in piping and equipment.

.3 Select hangers and supports for the service and in accordance with the manufacturer's recommended maximum loading. Hangers shall have a safety factor of 5 to 1.

.4 Do not cut, drill or weld to structural elements without prior approval from the department representative.

.5 Perforated metal strapping is not an acceptable means of supporting piping, ducting or mechanical equipment.

3.2 Pipe Hangers and Support

.1 Fasten hangers and supports to building structure or inserts in concrete construction.

.2 Support horizontal steel and copper piping as follows:

Nominal Pipe Size		Distance Between Supports	Hanger Rod Diameter
.1	0 mm to13 mm	2m	10 mm
.2	19 mm to 38 mm	2m	10 mm
.3	51 mm to 64 mm	3m	10 mm
.4	76 mm to102 mm	3m	13 mm

.3 Install hangers to provide minimum 15 mm clear space between finished covering and adjacent work.

.4 Place a hanger within 300 mm of each horizontal elbow.

.5 Use hangers which are vertically adjustable 40 mm minimum after piping is erected.

.6 Support vertical piping at every floor. Support vertical soil pipe at each joint.

.7 Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

.8 Where practical, support riser piping independently of connected horizontal piping.

.9 Support horizontal soil pipe near each joint, with 1,500 mm maximum spacing between hangers.

.10 Provide copper plated hangers and supports for copper piping or provide nonferrous packing between hanger or support and piping.

.11 Large capacity piping with vibration potential shall not be suspended from any building structure that will allow transfer of vibrations to the occupied spaces.

.12 Pipe Hanger and Supports - Fire Protection; Comply with NFPA requirements. Refer to Specification Section 15530, Fire Protection System.

3.3 Low Pressure Duct Hangers and Supports

.1 Hanger minimum sizes:

.1 Up to 760 mm wide or 460 mm diameter: 15 mm x 16 gauge at 3.0 m spacing.

.2 760 mm to 1,200 mm wide, or over 460 mm diameter: 38 mm x 16 gauge at 3.0 m spacing.

.3 Over 1,200 mm wide: 38 mm x 16 gauge at 3.4 m spacing.

.2 Horizontal duct on wall supports minimum sizes:

.1 Up to 460 mm wide: 38 mm x 16 gauge or 25 mm x 25 mm x 3 mm at 2.5 m spacing.

.2 460 mm to 1,000 mm wide: 38 mm x 38 mm x 2 mm at 1.5 m spacing.

.3 Vertical duct on wall supports minimum sizes:

.1 Riveted or screwed to duct:

.2 Up to 1,520 mm wide: 38 mm x 38 mm x 3 mm.

.3 Over 1,520 mm wide: 51 mm x 3 mm.

.4 Vertical duct floor supports minimum sizes:

.1 Riveted or screwed to duct:

.2 Up to 1,500 mm wide: 38 mm x 38 mm x 3 mm.

.3 Over 1,500 mm wide: 51 mm x 51 mm x 3 mm.

3.4 Priming and Coating

.1 Prime coat exposed steel hangers and supports. Hangers and supports located in crawlspaces, pipe shafts and suspended ceiling spaces are not considered exposed.

3.5 Equipment Bases and Supports

.1 Concrete housekeeping pads are specified under other divisions of the specification. Bases shall be 100 mm thick minimum, extended 100 mm minimum beyond machinery bedplates. This Division will provide templates anchor bolts and accessories required for mounting and anchoring equipment.

.2 Construct supports of structural steel members or steel pipe and fittings. Brace and fasten with flanges bolted to structure.

.3 Provide rigid anchors for ducts and pipes immediately after vibration connections to equipment.

.4 Suspend mechanical equipment from structure with adjustable length steel rods. Provide spreader beams to distribute weight.

3.6 Inserts

.1 Use inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams wherever practicable.

.2 Set inserts in position in advance of concrete work. Provide reinforcement rod in concrete for inserts carrying pipe over 102 mm or ducts over 1,500 mm wide.

.3 Where concrete slabs form finished ceiling, finish inserts flush with slab surface.

.4 Where inserts are omitted, drill through concrete slab from below and provide rod with recessed square steel plate and nut above slab.

.5 Expansion bolt type connections will be approved under certain conditions. Obtain approval from the Department representative. Generally pipe 51 mm or smaller, and duct less than 600 mm x 300 mm will be approved, subject to adequate number of support points.

3.7 Exposed Duct Support

.1 Supply and return ducts exposed in the finished areas are to be supported by continuous strap installed around the duct. Only one joint on the strap is approved, at the top to secure the strap ends together and to connect to a threaded rod.

.2 The threaded rod shall be secured to trusses or to steel angle bars spanning the trusses. The steel spanning bars are to be provided by this division.

.3 Supports for equipment suspended within the space frame, are to be connected to the bolted node joints of the space frames. The locations of duct and piping suspension connections to the node joints must be coordinated and installed before the space frames are assembled and lifted to position. Refer to detail.

.4 Supports for equipment supported above the space frame, may be connected to the bolted node joints of the space frames, or from the fluted steel deck above. The locations of duct and piping suspension connections to the node joints must be coordinated and installed before the space frames are assembled and lifted to position. Refer to detail.

1. GENERAL

1.1 Work Included

.1 Flashing for mechanical equipment.

.2 Sleeving for mechanical equipment.

.3 Fire stop seals.

1.2 Quality Assurance - Firestop Sealants

.1 Standard method of fire tests : CAN4-S115-M85, ASTM E814, UL1479, UL 2079.

.2 Materials shall be listed by FM and certified by UL or ULC for the service application.

1.3 Quality Assurance - Firestop Collars

.1 Standard method of fire tests : CAN4-S115-M85, ASTM E814, UL1479, UL 2079.

.2 Seals, assemblies and materials for penetration of fire rated surfaces shall be listed by FM and certified by UL or ULC for the service application.

1.4 Submittals – Prior to Construction

.1 Firestop materials: Submit service limitations, installation instructions, UL certification and FM listing.

.2 Fire rated penetration seals: Submit dimensional data, service limitations, installation instructions, UL certification and FM listing.

1.5 Acceptable Manufacturers

.1 Manufacturers of fire stopping materials whose products are approved in principle, but subject to requirements of drawings and specifications are:

.1 Self Seal, Hilti, 3M.

2. PRODUCTS

2.1 Sleeves - Duct

.1 Round Ducts: Form with galvanized steel.

.2 Rectangular Ducts: Form with galvanized steel.

2.2 Sleeves - Pipe

.1 Domestic water, gas, hydronic, chilled, glycol, fire protection, drainage, etc.: Pipes through beams, wall, fire proofing, footings, floor: Form with steel pipe, schedule 20, galvanized.

.2 Underground sleeve for gas pipe: PVC or other approved non-metallic material, minimum diameter 25 mm greater than outside diameter of gas pipe.

2.3 Flashing

.1 Steel Flashing: 26 gauge galvanized steel.

.2 Aluminum flashing: 26 gauge sheet aluminum.

2.4 Firestop Sealant

.1 Tested and rated for mechanical fire protection for protection of penetrations utilizing PVC or CPVC pipe, PVC conduit, polyethylene conduit or pipe, other non-metallic pipes, cables, and combustible pipe insulations as the penetrant.

.2 Single component, low modulus flexible sealant to form pressure tight seal resistant to water, smoke and toxic gases, resistant to cracking, degradation by ultraviolet radiation and ozone.

.3 Compatible with construction materials of galvanized steel, aluminum, concrete, gypsum board.

.4 Contain no water soluble expansion ingredients.

.5 Wall and floor openings: equal to Self Seal GG-200.

.6 Floor openings: equal to Self Seal SL-100.

2.5 Firestop Collars

.1 Tested and approved for protection of penetrations utilizing PVC or CPVC pipe, PVC conduit, polyethylene conduit or pipe, other non-metallic pipes, cables, and combustible pipe insulations as the penetrant.

.2 Intumescent insert: Flexible, elastomeric strip, two stage expansion, designed to firestop penetrations in fire-rated walls and floors and floor/ceiling assemblies.

.3 Provide a minimum of 15 time free expansion.

.4 Contain no water soluble expansion ingredients.

3. EXECUTION

3.1 Sleeves

.1 Provide and set sleeves required for equipment, including openings required for placing equipment.

.2 Set sleeves in position in advance of other work. Provide suitable reinforcing around sleeves.

.3 Extend sleeves through potentially wet floors 50 mm above finished floor level. Caulk sleeves full depth and provide floor plate.

.4 Where ductwork passes through floor, ceiling or wall, close off space between duct and sleeve with non-combustible insulation. Provide tight fitting metal caps on both sides.

.5 Where piping passes through floor, ceiling or wall, close off space between pipe and sleeve with non-combustible insulation or approved non-combustible insulation, fire rated as required to match the rating of the penetrated surface. Provide tight fitting metal caps on both sides.

.6 Install chrome plated escutcheons where piping passes through finished surfaces.

.7 Size large enough to allow for movement due to expansion and to provide for continuous insulation.

3.2 Flashing

.1 Where mechanical equipment passes through weather or waterproofed walls and roofs, counter flashing shall be provided under this Division. Roof flashing is specified under other divisions of this specification.

.2 Curbs for mechanical roof installations are specified under other divisions of this specification. Curbs must be minimum 200 mm higher than the top of the finished roof, unless noted otherwise.

3.3 Firestop Sealant

.1 Apply in conjunction with manufacturer's instructions and all related codes.

.2 Clean all concrete, masonry and stone penetrations of all contaminants and impurities, concrete form release agents, water repellents, oils, surface dirt and rust, scale, all old sealants and other surface treatments.

.3 Metal surfaces shall be cleaned by wiping them with an oil-free absorbent cloth saturated with solvent such as xylol or toluol. Do not use alcohols.

.4 Pack voids with approved, non-combustible void filling material, recessed the appropriate dimension and fill the cavity with approved sealant. Prime mating surfaces if necessary.

.5 Installation only when temperatures are between 5 degrees Celsius and 35 degrees Celsius.

3.4 Firestop Collars

.1 Apply in conjunction with manufacturer's instructions and all related codes.

.2 Clean all concrete, masonry and stone penetrations of all contaminants and impurities, concrete form release agents, water repellents, oils, surface dirt and rust, scale, all old sealants and other surface treatments.

.3 Metal surfaces shall be cleaned by wiping them with an oil-free absorbent cloth saturated with solvent such as xylol or toluol. Do not use alcohols.

.4 Do not apply to polycarbonates or to building materials that bleed oils, plasticizers or solvents, or where sealant is not exposed to atmospheric moisture, or to surfaces which have been or will be painted.

.5 Collars are to be installed with steel fasteners or steel expansion anchors. Low melting temperature anchors of lead, plastic or aluminum are not approved.

.6 Installation only when temperatures are between 5 degrees Celsius and 35 degrees Celsius.

1. GENERAL

1.1 Work Included

.1 Seismic restraints for suspended piping systems.

.2 Seismic restraints for floor mounted equipment and tanks.

.3 Certification by a Professional Department representative.

1.2 General Requirements

.1 All seismic restraining devices shall be supplied by an approved supplier with the exception of seismic restraining devices which are factory installed and are standard equipment with the machinery.

.2 All submittals shall bear the seal and signature of a registered Professional Department representative.

1.3 Standards

.1 Seismic restraint devices, accessories and methods shall meet the requirements of the British Columbia Building Code.

1.4 Submittals - Prior to Construction

.1 Letters of Assurance: Submit Supporting Registered Professional Schedule S-B covering the mechanical systems, within the scope of this project, in their entirety. Schedules shall not be qualified or include any notes that would reduce the scope or responsibility.

1.5 Submittals - Prior to Substantial Performance

.1 Letters of Assurance: Submit Supporting Registered Professional Schedule S-C covering the mechanical systems, within the scope of this project, in their entirety. Schedules shall not be qualified or include any notes that would reduce the scope or responsibility.

1.6 Inspection and Certification

.1 Mechanical systems Seismic Specialty Engineer: Include for and pay the necessary fees for the services of a qualified Professional Department representative, registered in the province of British Columbia, to provide the necessary certifications required by the British Columbia Building Code, all local codes, and as herein specified.

2. PRODUCTS

2.1 Seismic Restraints

.1 The restraints shall conform to the requirements of the mechanical systems Seismic Specialty Engineer.

3. EXECUTION

3.1 Application

.1 It is the responsibility of the contractor to ensure that device sizing and application is correct for each individual system or piece of equipment.

.2 Provide restraints on all new piping, tanks and equipment that are provided under the scope of the mechanical contract.

3.2 Inspection and Certification

.1 The Seismic Specialty Engineer shall inspect all components of the completed seismic restraints installation.

.2 Submit a sealed inspection report declaring that the completed seismic installation is installed in accordance with the plans and specifications prepared by the Seismic Specialty Engineer.

.3 Letters of Assurance: Submit Supporting Registered Professional Schedules S-B and S-C covering the mechanical systems in their entirety. Schedules shall not be qualified or include any notes that would reduce the scope or responsibility.

SECTION 23 05 93.1 – TESTING

1. GENERAL

1.1 Work Included

.1 Test and report of existing and new heating, air conditioning and ventilation systems specified, renovated or modified under Division 23.

.2 Test and report of existing and new plumbing systems specified, renovated or modified under Division 22.

.3 Test and report of existing and new backflow preventers specified, renovated or modified under Division 21, 22, 23.

.4 Test and report of existing and new fire sprinkler systems - inside building, specified, renovated or modified under Division 21

1.2 Quality Assurance

.1 Test equipment and material where specified required by authority having jurisdiction to demonstrate its proper and safe operation.

.2 Test procedures shall be in accordance with applicable portions of:

.1 CSA B149.1 Natural Gas and Propane Installation Code.

.2 BC Municipal Affairs Departmental Representative Services Division

.3 BC Plumbing Code

.4 National Fire Protection Association

.5 American Society of Heating, Refrigeration and Air Conditioning Department representatives

.6 Sheet Metal and Air Conditioning National Association

.7 American Society of Mechanical Department representatives

.8 BC Ministry of Health

.9 Local codes and ordinances

.10 Other recognized test codes

.3 Provide two days notice to the Departmental Representative before tests.

1.3 Submittals – Prior to Construction

.1 Qualifications of technicians installing, testing and reporting test results on back flow preventer.

1.4 Submittals – Prior to Substantial Performance

.1 Obtain certificates of approval and acceptance from authorities having jurisdiction and include in Operating and Maintenance Manuals.

.2 On completion of mechanical installation, provide certification of tests with detailed data as required. Itemize tests as to time performed and personnel responsible. Include a copy of field data in Operating and Maintenance Manuals.

1.5 Liability

.1 During tests, assume responsibility for damages in the event of injury to personnel, building or equipment and bear costs for liability, repairs and restoration.

2. PRODUCTS - Not Applicable.

3. EXECUTION

3.1 Pressure Tests

.1 Piping, fixtures or equipment shall not be concealed or covered until inspected and reviewed by the Department representative.

.2 Provide equipment, materials and labour for tests. Use test instruments from approved laboratory or manufacturer and furnish certificate showing degree of accuracy. Install permanent gauges and thermometers just prior to tests to avoid changes in calibration.

.3 Carry out pressure and hydraulic tests for 8 hours and maintain pressure. Where leakage occurs, repair and retest.

.4 Domestic Water Piping: Test to 1-1/2 times maximum working pressure or 1,035 kPa (150 psi) water pressure measured at system low point.

.5 Drainage Systems: Test by filling with water to produce water pressure of 30 kPa (3,000 mm) minimum and 75 kPa (8,000 mm) maximum. Check for proper grade and obstruction by ball test, or other approved means.

.6 Natural Gas Piping: Test as required by authority having jurisdiction.

.7 Low Pressure Ducts: Test for tightness such that leakage is inaudible and not detectable by feel.

.8 Fire Sprinkler System Piping: shall be tested to 1,380 kPa (200 psi) for two hours.

.9 Heating Water Piping: Test to 1-1/2 times maximum working pressure or 1,035 kPa (150 psig), whichever is greater.

.10 During heating and cooling piping system tests, check linear expansion at elbows, U-bends, expansion joints and offsets for proper clearance.

.11 Should tests indicate defective work or variance with specified requirements, make changes immediately to correct the defects. Correct leaks by remaking joints in screwed fittings, cutting out and re-welding welded joints, remaking joints in copper lines. Do not caulk.

3.2 Performance Tests

.1 Refer to Section 23 05 93.3, Commissioning, and assist the Commissioning Agent.

.2 Provide fresh filters for all air handling equipment prior to testing or balancing.

.3 Conduct performance tests to demonstrate equipment and systems meet specified requirements after mechanical installations are completed and pressure tested. Conduct tests as soon as conditions permit. Make changes, repairs, and adjustments required as tests may indicate prior to operating tests.

.4 Use or modify manufacturers' reports. Test and adjust equipment and systems as specified, and as required by the manufacturer. Ensure that manufacturers' start up reports are complete and acceptable.

.5 Provide detailed listing of equipment set up parameters “as left”.

.6 Make operating tests for minimum of five days during heating season of first year of operation and at times when directed, for proper setting of controls under peak load conditions.

.7 Conduct final operating tests in presence of the Departmental Representative. Vary loads to illustrate start-up and shutdown sequence, and simulate emergency conditions for safety shutdowns, with automatic and manual reset. Make final adjustments to suit exact building conditions.

.8 Provide labour, ladders, tools and associated equipment required to assist in all tests.

3.3 Back Flow Preventer

.1 Refer to Section 15100 Valves.

.2 Conduct commissioning operations and tests to confirm the backflow preventers are properly installed. Reports are to be submitted on forms approved by the local Authority Having Jurisdiction.

3.4 Fire Sprinkler System

.1 Wet Systems: A test pipe of not less than 5 mm diameter terminating in a smooth bore corrosion resistant orifice giving a flow equivalent to one sprinkler shall be provided for each system.

.2 Where flow switches, water flow alarm devices or other zone flow detectors, are provided, or where more than one alarm device is provided in one sprinkler system, a test pipe shall be provided for testing each alarm device.

.3 Sprinkler system discharge tests shall be conducted using system test modules described. Pressure gauges shall be installed at critical points and readings taken under various modes of auxiliary equipment operation. Water flow alarm signals shall be responsive to discharge of water through system test pipes while auxiliary equipment is in each of the possible modes of operation.

.4 Contractor's Material and Test Certificate: Additional information shall be appended to the Contractor's Material and Test Certificate described in NFPA No. 13.

.1 Certification that all auxiliary devices have a pressure rating of 1,210 kPa (175 psi).

.2 Water flow tests have been conducted and water flow alarms have operated while auxiliary equipment is in each of the possible modes of operation.

.3 With auxiliary equipment tested in each possible mode of operation and with no flow from sprinklers or test connection, water flow alarm signals did not operate.

1. GENERAL

1.1 Work Included

.1 Balancing and adjustment of all new, renovated or necessary existing systems specified under Division 15 and submit reports.

.2 Balance, adjust and test HVAC air systems and equipment and submit reports.

.3 Balance, adjust and test HVAC water systems and equipment and submit reports.

.4 Balance, adjust and test domestic water circulating systems and equipment and submit reports.

.5 Fire damper drop test report.

.6 Assisting in the commissioning of all new, renovated or necessary existing systems specified under Divisions 21, 22, 23 and 25.

1.2 Balance Reports

.1 Submit draft copies for approval prior to proceeding. Sample balancing report forms for some equipment are available from the Departmental Representative to indicate a minimum expected level of testing. Written approval of draft copies must be obtained before balancing begins.

.2 Balancing information for each system should be organized and presented in a manner that groups all relevant information about that system in a continuous and contiguous manner.

.3 Provide reports suitable for inclusion in Maintenance Manuals. Reports not considered acceptable to the Departmental Representative will be revised to a standard and format acceptable to the Department representative.

.4 Provide initial or interim balancing reports for review by the Department representative. The contractor will contact the Departmental Representative to arrange a meeting for further adjustment of the systems. A minimum of one initial report and meeting will occur, with further reports and meetings as deemed necessary by the Department representative.

.5 Balance reports to include ‘as found’ values along with final values.

1.3 System Data

.1 Reports shall include balance and equipment data listed in S.I. (Metric) units.

.2 Report data shall include system description, manufacturer, model, serial number, arrangements, motor size, electrical characteristics, equipment size, design and actual temperature, flows, RPM, power, amperage, pressure (air and water, static and velocity), water temperature, room temperature and humidity, outdoor temperature and humidity, etc.

.3 Provide calibration reports for all instrumentation used, including range and minimum accuracy.

.4 Provide an as-found system schematic noting the approximate locations of all equipment tested, measured or balanced. Cross reference all diffusers, grilles, terminal equipment etc. with the reported data.

.5 Indicate all ductwork traverse points on the system schematic.

1.4 Acceptable Balancing Agencies

.1 Testing and balancing agencies who are approved in principle, but subject to requirements of drawings and specifications are:

- .1 KD Engineering Ltd., Vancouver
- .2 Vesta Dynamics, Kelowna.
- .3 Inland Technical Services Ltd., Kelowna.
- .4 West Rockies Services, Abbotsford

1.5 Commissioning and Documentation

.1 Refer to Section 23 05 93.3 Commissioning.

.2 Refer to Section 23 01 00 Documentation, Manuals and Record Drawings.

.3 Provide all necessary coordination services between the documentation-balancing operations and the commissioning operations.

.4 Work with the Commissioning Agent throughout the project to provide necessary tests, adjustments, reports, certifications to complete the project.

2. PRODUCTS

2.1 Maintenance Manual Materials

.1 Provide copies to the Commissioning Agent, of all shop drawings, reports and forms, materials, etc., required to complete the documentation. This generally includes but is not limited to the following:

.1 HVAC air system balance reports.

.2 HVAC air equipment test reports.

.3 HVAC water system balance reports.

.4 HVAC water equipment test reports.

.5 Domestic water system balance reports.

.6 Boiler balance reports.

.7 Pump test reports.

.8 Test reports for all equipment provided or installed under Division 15.

2.2 Pump Test Reports

.1 Report designed and adjusted water flow, water pressure at inlet and discharge, water temperature, pump speed, manufacturer, model, serial number, impeller size, and block tight pressure based on pump curve.

.2 Test, adjust and report actual water flow, water pressure at inlet and discharge, block tight pressure, water temperature, pump speed, manufacturer, model, serial number, and impeller size.

.3 For pumps with power greater than 250 watts, plot design and actual pressure and flow on manufacturer's or drafted pump performance curve.

.4 Report the motor manufacturer, model, serial number, horsepower, current, voltage.

2.3 Fan Test Reports

.1 Report designed and adjusted air flow, air pressure at inlet and discharge, air pressure differential between inlet and outlet, external static pressure, air temperature, initial and final fan speeds, manufacturer, model, serial number, fan wheel size, sheave sizes and position, belt size and quantities,.

.2 Test, adjust and report air flow, air pressure at inlet and discharge, air pressure differential between inlet and outlet, external static pressure, air temperature, initial and final fan speeds, manufacturer, model, serial number, fan wheel size, sheave sizes and position, belt size and quantities,.

.3 For fans with power greater than 250 watts, plot design and actual pressure and flow on manufacturer's or drafted fan performance curve.

.4 Report the motor manufacturer, model, serial number, horsepower, current, voltage, speed.

2.4 Heat Recovery Unit Test Reports

.1 Follow and submit manufacturer's testing and reporting methods.

.2 Perform specified testing on both Outdoor Air Supply and Exhaust sections of unit.

.3 Report designed and adjusted air flow, air pressure at inlet, across filters, and discharge, air pressure differential between inlet and outlet, external static pressure, air temperature at inlet and outlet during operation, initial and final fan speeds, manufacturer, model, serial number, fan wheel size.

.4 Test, adjust and report air flow, air pressure at inlet, across filters, and discharge, air pressure differential between inlet and outlet, external static pressure, air temperature at inlet and outlet operation, initial and final fan speeds, manufacturer, model, serial number, fan wheel size.

.5 For each motor, report the manufacturer, model, serial number, horsepower, current, voltage, speed.

2.5 Heating Coil Test Reports

.1 Report designed and adjusted water flow, water pressure at inlet and discharge, water temperature at inlet and discharge, heat transfer capacity, manufacturer, model, size.

.2 Report designed and adjusted air flow, air pressure at inlet and discharge, air temperature at inlet and discharge, heat transfer capacity.

.3 Test, adjust and report actual water flow, water pressure at inlet and discharge, water temperature at inlet and discharge, calculated heat transfer, manufacturer, model, size.

.4 Test, adjust and report actual air flow, air pressure at inlet and discharge, air temperature at inlet and discharge, calculated heat transfer.

2.6 Air Source Heat Pump Test Reports

.1 Follow and submit manufacturer's testing and reporting methods.

.2 Report manufacturer, model, size.

.3 For both heating and cooling operations, report heat transfer capacity.

2.7 Boiler Test Reports

.1 Follow and submit manufacturer's testing and reporting methods.

.2 Report designed and adjusted water flow, water pressure at inlet and discharge, water temperature at inlet and discharge, heat transfer capacity, manufacturer, model, size.

.3 Test, adjust and report actual water flow, water pressure at inlet and discharge, water temperature at inlet and discharge, calculated heat transfer, flue gas temperature and combustion test, manufacturer, model, size.

2.8 Fan Coil Unit Test Reports

.1 Report designed and adjusted air flow, air pressure at inlet, across filters, and discharge, air temperature at inlet and outlet during heating and cooling operation, air temperature in inlet, heating capacity, cooling capacity, initial and final fan speeds, manufacturer, model, serial number, fan wheel size.

.2 Test, adjust and report air flow, air pressure at inlet, across filters, and discharge, air temperature at inlet and outlet during heating and cooling operation, heating capacity, cooling capacity, initial and final fan speeds, manufacturer, model, serial number fan wheel size.

.3 Report the fan motor manufacturer, model, serial number, horsepower, current, voltage, speed.

2.9 Air Outlets and Inlets

.1 The word “outlet” shall also mean “inlet” where appropriate.

.2 Report initial, designed and adjusted air flows, air velocity, outlet size, flow factor (Ak), method used to obtain Ak factor, and supply air temperature.

.3 Test, adjust and report initial, design and adjusted air flow, air velocity, outlet size, flow factor (Ak), method used to obtain Ak factor, and supply air temperature.

2.10 Fire Damper Drop Test Report

.1 Report the functioning of each fire damper.

.2 The report shall list all fire dampers and indicate whether or not they close freely.

2.11 Outdoor Air Adjustment and Report

.1 Outdoor air values for specific zones, are shown on the drawings.

.2 Report designed and adjusted return and outdoor air flow at point of mixing.

2.12 Building Pressurization

.1 Report final building pressurization, including, but not limited to the following:

.1 All supply outlets quantities and total.

.2 All return inlets quantities and total.

.3 All outdoor air quantities and total.

.4 All relief exhaust quantities and total.

.5 All exhaust fan quantities and total.

.6 All other air supplies and exhausts, along with the corresponding totals.

.7 Final building pressure.

.8 Outdoor air pressure at each building entrance at the time of final balancing, including date and time pressures recorded.

3. EXECUTION

3.1 General Procedure

.1 Ensure clean filters are installed prior to balancing.

.2 Balance to maximum measured flow deviation from specified values of 10% at terminal device and 5% at equipment.

.3 If design air or water flow rates cannot be achieved, investigate the cause and report to the department representative. Review motor sizes, motor rotation, balancing damper and valve dispositions, static pressures, dead-head pressures, system effects and any other elements required to ascertain the cause of the shortfall. Report the maximum water or air flow that can be achieved with the current configuration. Provide any additional site visits that may be required to complete the investigation.

.4 Mark settings on valves, dampers and other adjustment devices.

.5 Take measurements to verify balance has not been disrupted or that such disruption has been rectified.

.6 At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Department representative.

.7 Balancing to include ‘as found’ values along with final values.

.8 Report duct dimensions and air velocities when using a pitot traverse to determine airflow in a duct.

3.2 Air System Procedure

.1 Adjust air handling and distribution systems to provide required or design supply, return and exhaust air quantities.

.2 Make air quantity measurements in ducts by Pitot tube traverse of entire cross-sectional area of duct.

.3 Measure air quantities at air inlet and outlet.

.4 Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices, such as dampers and splitters.

.5 Vary total system air quantities by adjustment of fan speeds. Vary branch air quantities by damper regulation.

.6 Provide system schematic with required and actual air quantities at each outlet or inlet.

.7 Provide and adjust belts and sheaves as required to meet required air flows.

3.3 Water System Procedure - Heating or Cooling Systems

.1 Adjust water systems to provide required or design quantities.

.2 Use calibrated venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

.3 Adjust systems to provide specified pressure drops and flow through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

.4 Effect system balance with automatic control valves fully open to heat transfer elements.

.5 Effect adjustment of water distribution systems by means of balancing cocks, valves and fittings. Do not use service or shutoff valves for balancing unless indexed for balance point.

.6 Where pump capacity available is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

.7 Where Constant Flow Devices are installed, confirm that the device flow rates match the required equipment flow rates, and confirm that the total pressure drop across the devices are sufficient to provide the desired flow. Include results in the test reports.

3.4 Water System Procedure - Domestic Water System

.1 Adjust recirculating water systems to provide constant flow conditions.

.2 Adjust tempered water control and recirculating systems to provide constant temperature conditions under all flow conditions.

.3 Measure temperatures at control devices and at fixtures outlets.

.4 Submit written report.

3.5 Fire Damper Drop Test Report

.1 The sheet metal trade shall remove the fusible links and demonstrate that damper can close freely and without obstruction.

.2 Report obstructed or non-functioning dampers to the mechanical trade. Perform test again once repairs have been completed and as required.

3.6 Outdoor Air Adjustment

.1 Outdoor air values for specific zones are shown on the drawings. On systems with the specified outdoor air component, the return air duct is sized for 100 % return air flow to accommodate the specified air flow during unoccupied mode. The air flow value identified on drawings for such return air grilles is the value for 100 % return. During occupied mode, the return air flow will not be at this identified value, but will be the difference between supply air flow, less the outdoor air component.

.2 Manual dampers are to be adjusted to provide the specified outdoor air component during occupied mode. The adjustment is to be determined by comparing the mixed air temperature, return air temperature, and outdoor air temperature. During periods when the temperature difference between outdoor and return air is less than 10 degrees Celsius, the Departmental Representative may approve an alternate method of measurement by air flow through tight fitting, well calibrated, air flow measuring hoods.

.3 Report the designed and adjusted supply, return and outdoor air flow at point of mixing, and include temperatures recorded during the test and adjustment process.

1. GENERAL

1.1 Work Included

.1 Commissioning and final adjustment of all systems provided or installed under Divisions 21 22 23 25 under supervision from the Commissioning Authority.

.2 Cooperate with the Commissioning Authority.

.3 Verification of building automation system sequences, schedules, and normal operation.

.4 Verification of correct normal and emergency operations for all systems provided or installed under Division 21 22 23 25.

.5 Verification of balancing reports.

.6 Direction to the contractors for minor system revisions during the construction process.

.7 Direction to the contractors for system adjustment for all systems provided or installed under Division 15.

.8 Coordination of system testing and balancing with other systems requiring set-up by manufacturers.

.9 Coordination of contractor and manufacturer presented training sessions for all systems and equipment provided or installed by Division 15.

.10 Participation in the handover of systems to the Departmental Representative.

.11 Development of a scheduled, planned and certified handover process of systems to the Departmental Representative.

.12 Training and instructions to Departmental Representative of all systems provided or installed under Division 15.

1.2 System Data

.1 Reports shall include balance and equipment data listed in S.I. (Metric) units.

.2 Report data shall include system description, manufacturer, arrangements, motor size, electrical characteristics, equipment size, design and actual temperature, flows, RPM, power, amperage, a pressure (air and water, static and velocity), water temperature, room temperature and humidity, outdoor temperature and humidity, etc.

.3 Review requirements with the Balancing contractor.

1.3 Submittals

.1 Balance reports: Refer to Section 23 05 93.1, Testing 20 05 93.2 Balancing.

.2 Equipment start up reports: refer to requirements specified in other Sections of this specification.

.3 Provide receipts from Departmental Representative for components, spare parts, testing equipment, etc., as specified in this section.

1.4 Quality Assurance

.1 Commissioning of mechanical systems shall be performed by an agency that specializes in this type of work.

.2 Technicians performing the work shall be experienced in projects of similar scale and nature.

1.5 Acceptable Agencies

.1 Commissioning agencies who are approved in principle, but subject to requirements of drawings and specifications are:

.1 KD Engineering Ltd., Vancouver

.2 Vesta Dynamics, Kelowna.

.3 Inland Technical Services Ltd., Kelowna.

.4 West Rockies Services, Abbotsford

2. PRODUCTS

2.1 Operation and Maintenance Manuals Materials

.1 Ensure copies of all shop drawings, reports and forms, materials, etc., required to complete the documentation are provided.

.2 Prepare proper documentation to instruct the building operator in the operation and preventative maintenance of equipment and systems provided. Complete and turn over documentation prior to Substantial Performance inspection.

.3 Refer to Section 23 01 00 Documentation, Manuals and Record Drawings.

2.2 Balance Reports

.1 Coordinate submission of draft copies of reports.

.2 Ensure specified number of final copies for inclusion in Operating and Maintenance Manuals are provided.

.3 Verify reports specified under Section 23 05 93.1 Testing, Adjusting and Balancing.

2.3 Equipment Test Reports

.1 Use or modify reports specified under Section 23 05 93.1 Testing and 23 05 93.2 Balancing.

.2 Use or modify manufacturers' reports. Test and adjust equipment and systems as specified, and as required by the manufacturer. Ensure that manufacturers' start up reports are complete and acceptable.

.3 Provide detailed listing of equipment set up parameters “as left”

2.4 Commissioning Services - General

.1 Prior to start of the commissioning process, the contractor shall submit to the Commissioning Authority, the following:

.1 Proposed commissioning schedule and procedures.

.2 Forms and checklists showing the entire list of actual systems and equipment, including all operations and set points that will be checked and reported.

.3 Personnel and equipment that will be used.

.2 Pre-commissioning Meeting: The Commissioning Agent shall organize a meeting with the Commissioning Authority, Department representative, heating sub-contractor, plumbing sub-contractor, controls sub-contractor, major equipment suppliers (boilers, air source heat pumps automatic sprinklers) prior to the start of Phase One Commissioning. The meeting will establish and clarify the requirements and schedule of each member of the construction team, and the method and format of certification and test reports.

.3 Descriptive Data: Review design concepts and general function of each system including associated equipment and operation cycles. Confirm listing of flow and terminal measurements to be performed.

.4 Procedure Data: Outline procedures for taking test measurements to establish compliance with requirements. Specify type of instrument to be used, method of instrument application and correct factors.

3. EXECUTION

3.1 Construction Period Services

.1 The Commissioning Agent will attend at the site during the construction period. Cooperate with the Commissioning Authority and undertake the required modifications and renovations as instructed. The number of site visits shall be as required, and shall be coordinated with the construction process to provide the following:

.1 Attend and organize commissioning meetings as outlined by the Commissioning Authority.

.2 Comment to the Departmental Representative with respect to system configuration and provide recommendations for changes that should be considered in order to achieve the specified system performance.

.3 Comment to the Division 21 22 23 & 25 contractors with respect to system configuration and the effect that the construction conditions will have on system performance.

.4 Instruct the Division 21 22 23 & 25 contractors with respect to configuration changes required to achieve the specified system performance.

.5 Review all specified water flows and compare required flow to balancing and metering valve, or automatic valve selection.

.6 Provide written report on recommendations.

3.2 Commissioning Phase One - Pre-Commissioning

.1 Prior to commencing commissioning tasks on any system, confirm or provide the following:

.1 Certification that the subject systems are ready for the commissioning process.

.2 Permanent electrical connections are complete and accepted by the Electrical Department representative.

.3 All safety controls are complete and operational.

.4 All operating controls are complete and activated.

.5 Flushing and cleaning of piping systems related to the subject systems have been completed.

.6 Ductwork related to the subject systems are cleaned, and satisfactory filters are installed.

.7 Refrigeration systems related to the subject systems are fully charged and commissioned.

.8 Related vibration isolation components are properly adjusted.

.9 Schedule of all electric motors provided under this division, identifying manufacturer, model number, power rating, frame size, voltage, speed, and efficiency.

.10 Fire sprinkler systems are complete and activated.

.11 All permits are in hands of the contractor.

.2 Provide written reports on all necessary systems. Do not proceed to the next phase, without written acceptance of this phase, by the Department representative.

3.3 Commissioning Phase Two - Commissioning Operations

.1 As each system is started and tested, and balancing and adjusting is underway or completed, the overall performance of the components and systems, including the controls, shall be tested, properly adjusted, verified under all operating conditions and reported.

.2 Commissioning tasks shall include but not be limited to the following:

.1 In the accompany of equipment suppliers and the Division 21, 22, 23, and 25 contractors, each piece of equipment provided by these Divisions shall be started and checked for correct operation and for correct interlocking and parallel operation with other equipment and systems.

.2 Activation of all components, systems and sub-systems, both manually and through the automatic control systems.

.3 Testing and adjustment of all components, systems and sub-systems.

.4 Adjustment and securing of all adjustment devices such as dampers, balancing valves, etc.

.5 Adjustment and calibration of all control and safety devices.

.6 Adjustment and calibration of air volume control devices on air handling systems.

.7 Adjustment and securing of all air inlet or outlet balancing devices.

.8 Adjustment and setting of automatic controls for accurate response and precise sequencing.

.9 Confirmation that all pressure maintenance, alarm and trouble annunciation devices on the fire protection systems are properly adjusted, and properly connected to the fire alarm panel. These tests are not to be commenced until the fire alarm panel is complete and tested as specified in Division 26 of the specification. Certification of the devices provided under Divisions 21 22 23 25 are to be completed by actual operation of the fire protection system. Testing continuity of the device and wiring is not satisfactory.

.10 Adjustment of vibration isolators and earthquake restraints.

.11 Operation of fire dampers.

.3 Receipts from Departmental Representative for all equipment provided to the building operator under this Division, including but not limited to the following:

.1 Chemical - Hydronic system

.2 Circuit setter equipment & tables

.3 Spare sprinkler heads

.4 Spare filters - identify by system and unit

.4 Provide written reports on all necessary systems. Do not proceed to the next phase, without written acceptance of this phase, by the Department representative.

3.4 Commissioning Phase Three - Verification of Commissioning

.1 Verification of commissioning by the Departmental Representative shall not commence until Phase Two Commissioning is totally complete.

.2 Operate and demonstrate entire system operation with the Departmental Representative present. The Departmental Representative will indicate acceptance of the tests by initialling items on the checklists. The commissioning process will not be considered complete until all system components are tested and accepted in concert with all other systems.

.3 Submit test reports, test completion certificates, and related data at the time of requesting the commencement of the verification phase.

.4 The verification process will include, but not be limited to the following:

.1 Locating and demonstrating the opening capability of all access panels, and confirming that the record drawings show these devices in the correct location.

.2 Locating and demonstrating the accessibility and setting of all hydronic balancing valves, and confirming that the record drawings show these devices in the correct location.

.3 Locating and demonstrating the accessibility and setting of all air flow balancing dampers, and confirming that the record drawings show these devices in the correct location.

.4 Locating and demonstrating proper operation of fire dampers, randomly selected by the Department representative, and confirming that the record drawings show these devices in the correct location.

.5 Demonstrate noise levels from air handling systems in all modes of operation.

.6 Verifying operation of all systems and components in all sequences, and under varying loads. The commissioning agent will require thorough knowledge of the control system in order to adjust and reset operating ranges in order to force the systems into required demonstration modes.

.7 Verifying all DDC system features.

.8 Verifying all mechanical systems control features.

.9 Verifying correct operation of all refrigeration, and heat generating systems.

.10 Demonstration of all pump systems, including pressure and amperage readings. The commissioning agent must have performance curves available during the demonstration, for comparison of the pressure and amperage readings.

.11 Demonstration of all coils and heat exchange systems, including both side inlet and outlet temperature readings. The commissioning agent must have performance specifications available during the demonstration, for comparison of the temperature readings.

.12 Demonstration of inlet and outlet temperature readings on heat transfer elements, randomly selected by the Department representative. The commissioning agent must have performance specifications available during the demonstration, for comparison of the temperature readings.

.13 Operation of all unit heaters and forced flow heaters.

.14 Operation of all exhaust fan systems.

.15 Fill status and pressure settings on expansion tanks.

.16 Operation of humidification and de-humidification systems.

.17 Operation and sequencing of boilers, including flue gas tests, and all safety devices.

.18 Demonstration of domestic water re-circulation and tempered water control systems.

.19 Demonstrate position and proper sequence for HVAC storage tank level control and alarm floats.

.20 Demonstrate position and proper sequence for firefighting reservoir level control and alarm floats.

.5 Provide written reports on all necessary systems. Do not proceed to the next phase, without written acceptance of this phase, by the Department representative.

3.5 Commissioning Phase Four - Demonstration, Training, Handover and Acceptance

.1 Demonstration to the Departmental Representative shall not commence until Phase Three services are totally completed.

.2 Substantial Performance will not be considered until the successful completion of Phase Four Commissioning.

.3 The process of Demonstration, Training, Handover and Acceptance is a planned process, requiring pre-approval of the plan and stages, and a signed statement of Acceptance by the Departmental Representative at the completion of each stage of the process.

.4 As the project moves close to the final stages, a formal dialogue will be established by the Departmental Representative and the Contractor, in order to schedule times, dates and required personal for systems and equipment commissioning, demonstration and training. No Commissioning, Demonstration, or Training session shall occur at the same time as any other Commissioning, Demonstration, or Training session.

.5 The Departmental Representative will attend on the site on a scheduled basis, to inspect and review the installation. The Contractor shall arrange for all necessary and specified personal and equipment specialists to be in attendance for purposes of demonstrating and training.

.6 Obtain a signed statement from the Departmental Representative certifying that the demonstration and instruction have been given to his satisfaction.

.7 Obtain a list of all persons attending commissioning, demonstration, or training sessions, including their signatures and job title.

.8 If systems are deemed complete and acceptable by the Department Representative and the building operator, the Departmental Representative will signify acceptance by signing a formal handover receipt relating to the subject system or equipment. If systems are not deemed complete and acceptable by the Department Representative, the Contractor will re-schedule the session for a future time. The costs of the Departmental Representative and building operator's attendance at this or other subsequent sessions will be charged to the Contractor.

.9 The Departmental Representative will issue lists of required submissions, receipts and acceptance forms, for execution by the contractor. Refer to sample forms for Handover and Acceptance included in this Section.

.10 The services to be provided by the commissioning agent and other contractors in this phase include, but are not limited to the following:

.1 Training in the normal, abnormal and emergency operation of all systems provided under this Division.

.2 Training in the programming, normal, abnormal and emergency operation of the control system.

.3 Review and instruction in the normal maintenance and operation of the fire protection systems. This training is to include thorough review of the procedures for adjustment and testing of devices, and the procedures to be followed when there is an activation of automatic systems or trouble annunciation.

.4 Review of all necessary maintenance procedures of all systems provided under this Division.

.5 Provision of a documented maintenance program covering all systems provided or modified under this contract.

.6 Review of all documents and reports created during Phases One, Two, and Three of the Commissioning process.

.7 Final certification letters from the commissioning agent, balancing contractor, controls contractors, and the Division 21 22 23 25 contractors, that all systems are installed and operating, providing the intended service to the building.

3.6 Commissioning Phase 5 Seasonal Verification

.1 Contractor and commissioning agent to allow for additional field reviews to verify seasonal performance within the warranty period.

SECTION 23 07 13 – DUCT INSULATION

1. GENERAL

1.1 Work Included

.1 Duct thermal insulation on new ducts.

.2 Duct acoustic insulation on new ducts.

.3 Adhesives, tie wires, tapes.

.4 Recovering.

1.2 Quality Assurance

.1 All workers engaged in the application of insulation shall be journeymen, or indentured apprentices working under a journeyman who is on the site. Trades Qualification certificates must be submitted prior to commencing work and must be on site for inspection.

.2 The British Columbia Insulation Contractors Association (BCICA) Standards Manual for Mechanical Insulation, latest edition, together with authorized additions and amendments, shall be used as a reference standard and shall form part of this project specification. The Contractor responsible for mechanical installation work shall keep a copy of the above manual available for reference.

.3 The Departmental Representative may open, cut or remove sections of insulation in order to examine the installation. Make all repairs necessary that may result from this examination.

.4 Furnish the Departmental Representative with a Quality BCICA Assurance Certificate for the mechanical insulation work at Substantial Performance of the Work in accordance with the BCICA Quality Assurance Certificate Program (QACP).

.5 To qualify for the QAC Program, workmanship must conform to the latest QAC Standards as published in the BCICA Quality Standards for Mechanical Insulation (Commercial and Institutional Buildings) Manual (QSMIM).

.6 Only materials that conform to the standards listed in the QSMIM and accepted by BCICA may be used in the QAC Program.

.7 Materials must be installed by tradespersons with a Red Seal or TQ designation in the Heat and Frost trade, and/or registered apprentices / helpers supervised by qualified journeypersons.

.8 Inspection as required under the QAC Program is to be performed by an independent inspector specifically “designated” by BCICA for the purpose of inspecting QAC Program.

1.3 Job Conditions

.1 Deliver material to job site in original unbroken factory packaging, labelled with manufacturer's density and thickness.

.2 Perform work at ambient and equipment temperatures as recommended by the adhesive manufacturer. Make good separation of joints or cracking of insulation due to thermal movement or poor workmanship.

1.4 Alternatives

.1 Alternative insulations are subject to approval. Alternatives shall provide the thermal resistance within 10% of specified at normal conditions as material specified.

1.5 Definitions

.1 Supply air duct includes all discharge duct connected to air handlers, furnaces, fan coils, heat pumps, rooftop units.

1.6 Submittals - Prior to Construction

.1 Trades Qualification certificates.

.2 Insulation shop drawings, including but not limited to:

.1 Insulation Material

.2 Insulation Values

.3 MSDS Information

1.7 Acceptable Insulation Contractors

.1 Contractor must be a member of the British Columbia Insulation Contractors Association.

2. PRODUCTS

2.1 General

.1 Adhesives, Insulation, Coatings, Sealers and Recovering Jackets: Composite fire and smoke hazard ratings shall not exceed 25 for flame spread and 50 for smoke developed. Adhesives, coatings and sealers shall be waterproof.

.2 Recovering Jackets ULC listed treated cotton fabric.

.3 Pre-covered, preformed insulation complete with foil or Kraft all-purpose jacket.

2.2 Materials

.1 Exposed Rectangular Ducts: Rigid fibrous glass insulation, "K" value at 24 deg. C maximum 0.035 w/m deg. C (0.24 btu/in/sq. ft. /deg. F/hr) with factory applied reinforced aluminum foil vapour barrier.

.2 Exposed Round Ducts: Flexible fibrous glass insulation, "K" value at 24 deg. C maximum 0.038 w/m deg. C (0.26 btu/in/sq. ft. /deg. F/hr) with factory applied reinforced aluminum foil vapour barrier.

.3 Concealed Round Ducts and Concealed Rectangular Ducts: Flexible fibrous glass insulation, "K" value at 24 deg. C maximum 0.038 w/m deg. C (0.26 btu/in/sq. ft. /deg. F/hr) with factory applied reinforced aluminum foil vapour barrier.

.4 Acoustic Lining: Fiberglass insulation with "K" value at 24^{o}C maximum 0.035 w/m deg. C (0.26 btu/in/sq. ft. /deg. F/hr) absolute roughness of exposed surface not to exceed 0.033 mm coated to prevent fibre erosion at air velocities up to 2.0 m/s, 24 kg/m3 minimum density. All substrate material to be non-darkened, contrasting colour from liner layer.

3. EXECUTION

3.1 Preparation

.1 Do not install covering before ductwork and equipment has been tested and approved.

.2 Ensure surface is clean and dry prior to installation. Ensure insulation is dry before and during application. Finish with systems at operating conditions.

3.2 Installation - General

.1 Insulate exhaust ductwork within 1,500 mm of insulated surface penetration.

.2 Insulate all supply duct unless it is exposed in the area it serves.

.3 Insulate all unheated outdoor air, combustion air, and ventilation air inlet ducting.

.4 In non-fire rated surfaces, ensure insulation is continuous through inside walls. Pack around ducts with fireproof self-supporting insulation material properly sealed.

.5 Finish insulation neatly at hangers, supports and other protrusions.

.6 Locate insulation or cover seams in least visible locations.

.7 Unless otherwise noted do not provide external insulation on supply, return or exhaust duct exposed in the area it serves. Provide acoustic liner where indicated.

.8 Where existing insulated ductwork has been capped, provide equivalent insulation at the capped location. Ensure that new and existing insulation is continuous and that the vapour barrier is intact.

.9 Insulation thickness shall not be compressed or altered in any way.

3.3 Rectangular Ducts - Concealed

.1 Secure Insulation to ductwork using one of the following methods:

.1 Flare Staples installed on 50 mm centres. Cover staples with 75 mm wide foil face tape to maintain vapour barrier.

.2 Polypropylene twine or 16 gauge annealed tie wire, spiral wound or half hitched at 400 mm centres

.2 For ducts 600 mm and larger, also use insulation pins on 300 mm centres. Pins shall be secured by capacitor welder. The use of adhesive pins is not permitted.

.3 It is not permitted to use only adhesives to secure insulation.

.4 Secure and seal all seams and joints with 75 mm foil face tape.

.5 Ensure that the vapour barrier is complete and intact. Seal all openings.

3.4 Round Ducts - Concealed

.1 Secure Insulation to ductwork using one of the following methods:

.1 Flare Staples installed on 50 mm centres. Cover staples with 75 mm wide foil face tape to maintain vapour barrier.

.2 Polypropylene twine or 16 gauge annealed tie wire, spiral wound or half hitched at 400 mm centres

.2 It is not permitted to use only adhesives to secure insulation.

.3 Secure and seal all seams and joints with 75 mm foil face tape.

.4 Ensure that the vapour barrier is complete and intact. Seal all openings.

3.5 Ducts - Exposed

.1 Generally comply with the requirements of concealed ducts except modify to allow application of canvas recovering.

.2 Recovering to be smooth and ready for painting. Painting is specified in other Divisions.

3.6 Acoustic Lining

.1 Apply to interior of ducts where shown.

.2 Secure insulation to ductwork with insulation pins on 400 mm centres. Pins secured by adhesive or capacitor welder. Ensure pin welds do not damage duct zinc coating protection. Cut off excess fastener length and cover with brush coat of sealer.

.3 Provide vapour barrier located on the warm side for outside air intakes.

.4 Seal exposed edges with heavy coat of sealing material.

.5 Ducts with equivalent acoustic insulation do not require external thermal insulation.

.6 Use 25 mm thick insulation unless otherwise noted.

3.7 Insulation Thickness Schedule

.1	Ducts and System	Thickness mm
.1	Combustion Air Duct	25
.2	Outside Air Intake Ducts	25
.3	Supply Air Ducts Warm Space	25
.4	Exhaust Air Ducts	25
.5	Return Air Ducts Warm Space	Not Required

1. GENERAL

1.1 Work Included

.1 Piping insulation on new and renovated pipes.

.2 Equipment insulation on new and renovated equipment.

.3 Adhesives, tie wires, tapes.

.4 Recovering.

1.2 Quality Assurance

.1 All workers engaged in the application of insulation shall be journeymen, or indentured apprentices working under a journeyman who is on the site. Trades Qualification certificates must be submitted prior to commencing work and must be on site for inspection.

.2 The British Columbia Insulation Contractors Association (BCICA) Standards Manual for Mechanical Insulation, latest edition, together with authorized additions and amendments, shall be used as a reference standard and shall form part of this project specification. The Contractor responsible for mechanical installation work shall keep a copy of the above manual available for reference.

.3 Furnish the Departmental Representative with a Quality BCICA Assurance Certificate for the mechanical insulation work at Substantial Performance of the Work in accordance with the BCICA Quality Assurance Certificate Program (QACP).

.4 To qualify for the QAC Program, workmanship must conform to the latest QAC Standards as published in the BCICA Quality Standards for Mechanical Insulation (Commercial and Institutional Buildings) Manual (QSMIM).

.5 Only materials that conform to the standards listed in the QSMIM and accepted by BCICA may be used in the QAC Program.

.6 Materials must be installed by tradespersons with a Red Seal or TQ designation in the Heat and Frost trade, and/or registered apprentices / helpers supervised by qualified journeypersons.

.7 Inspection as required under the QAC Program is to be performed by an independent inspector specifically “designated” by BCICA for the purpose of inspecting QAC Program.

1.3 Job Conditions

.1 Deliver material to job site in original unbroken factory packaging, labelled with manufacturer's density and thickness.

.2 Perform work at ambient and equipment temperatures as recommended by the adhesive manufacturer. Make good separation of joints or cracking of insulation due to thermal movement or poor workmanship.

1.4 Alternatives

.1 Alternative insulations are subject to approval. Alternative shall provide the thermal resistance within 10% of specified at normal conditions as material specified.

1.5 Definitions

.1 Heating piping: All supply and return piping in hydronic service, carrying heating water at temperatures over 35°C (95°F), and all supply and return piping serving heat recovery equipment such as coils, no matter what temperature.

1.6 Submittals - Prior to Construction

.1 Trades Qualification certificates.

.2 Insulation shop drawings, including but not limited to:

.1 Insulation Material

.2 Insulation Values

.3 MSDS Information

2. PRODUCTS

2.1 General

.1 Adhesives, Insulation, Coatings, Sealers and Recovering Jackets: Composite fire and smoke hazard ratings shall not exceed 25 for flame spread and 50 for smoke developed. Adhesives, coatings and sealers shall be waterproof.

.2 PVC Recovering for all piping.

.3 Mechanical Protection Jackets Equipment Interior: Preformed close crimped 26 gauge aluminum.

2.2 Materials – Pipe General

.1 Hot Water Piping: Fine fibrous glass insulation with factory applied general purpose jacket, moulded to conform to piping, "K" value at 24 degrees Celsius maximum 0.035 w/m deg. C, (0.24 btu/in/sq. ft./deg. F/hr).

.2 Vents (Concealed): Flexible fibrous glass insulation, "K" value at 24 degrees Celsius maximum 0.038 w/m deg. C (0.26 btu/in/sq. ft./deg. F/hr).

2.3 Materials – Hot Equipment

.1 Rigid fibrous glass insulation, "K" value at 24 degrees Celsius maximum, 0.035 w/m deg. C (0.24 btu/in/sq. ft./deg. F/hr).

2.4 Refrigeration Line Insulation

.1 Foam cell insulation used indoors or in confined locations shall have a fire spread rating of 25 and a smoke spread rating of 50.

.2 Plastic of closed cell structure, "K" value at 75 degrees F maximum 0.28 btu*in/sq. ft./deg. F/hr), maximum water vapour transmission rating of 0.1 perms.

3. EXECUTION

3.1 Preparation

.1 Do not install covering before piping and equipment has been tested and approved.

.2 Ensure surface is clean and dry prior to installation. Ensure insulation is dry before and during application. Finish with systems at operating conditions.

3.2 Installation

.1 Finish insulation in a workmanlike fashion, in accordance with published trade guidelines. Insulation finish must be tidy and without creases. Cut edges must be straight and either parallel or perpendicular to piping. Do not modify PVC or other recovering fittings for any purpose other than that intended by the manufacturer. Replace abraded or discoloured insulation sections, do not patch. Do not leave exposed fibreglass.

.2 Insulation on piping that penetrates non rated walls is to be continuous through the sleeve or penetration. Insulation on piping that penetrates rated walls must be dis-continuous at the rated surface, and not compromise the rating of the penetration.

.3 In penetrations or sleeves, pack around pipes with fireproof self-supporting insulation material, properly sealed.

.4 Finish insulation neatly at hangers, supports and other protrusions.

.5 Locate insulation or cover seams in least visible locations.

.6 Provide PVC recovering on exposed insulation throughout, including equipment rooms.

.7 Do not install and seal vapour proof insulation if ambient air has high humidity.

.8 Where existing insulated piping services have been capped, provide equivalent insulation at the capped location. Ensure that new and existing insulation is continuous and that the vapour barrier is intact.

.9 Insulation thickness shall not be compressed or altered in any way.

3.3 Domestic Water and Non-Specified Piping - Hot and Cold,

.1 Do not insulate valves, unions, flanges, strainers, flexible connections and expansion joints, unless otherwise specified.

.2 Cover elbows, tees and similar fittings with equivalent thickness of insulation material.

.3 Exposed and concealed fittings: Apply pre-formed PVC fitting covers over insulation material before applying recovering. Provide butt end PVC fittings on exposed pipe and fittings

.4 Exposed piping: Provide PVC recovering on all exposed piping including mechanical rooms.

.5 Concealed fittings: Apply glass fabric wrap material around loose batt insulation. Terminate insulation neatly.

3.4 Heating Water and Glycol Piping

.1 Do not insulate valves, unions, flanges, strainers, flexible connections and expansion joints, unless otherwise specified.

.2 Cover elbows, tees and similar fittings with equivalent thickness of insulation material.

.3 Exposed and concealed fittings: Apply pre-formed PVC fitting covers over insulation material before applying recovering. Provide butt end PVC fittings on exposed pipe and fittings.

.4 Concealed fittings: Apply glass fabric wrap material around loose batt insulation. Terminate insulation neatly.

.5 Exposed piping: Provide PVC recovering on all exposed piping including mechanical rooms

.6 Do not insulate within radiation enclosures.

3.5 Plumbing Vents

.1 Insulate vent piping within 1,500 mm of insulated surface penetration.

.2 Adhere flexible insulation with adhesive applied in 150 mm wide strips on 400 mm centres. Provide polypropylene twine, spiral wound or half hitched at 400 mm centres for securing insulation until adhesive sets. Butt insulation and seal joints and breaks with 100 mm lap of scrim foil tape adhered over joint.

3.6 Refrigerant Piping

.1 Cover fittings and valves with equivalent thickness of insulation material.

.2 Apply with edges tightly butted.

.3 Seal joints with vapour barrier tape or sealer.

.4 Provide Aluminum jacketing over insulation installed outdoors.

3.7 Insulation Thickness – Above Ground Piping

Pipe System		Pipe size mm	Thickness mm
.1	Domestic Cold Water	All Sizes	25
.2	Domestic Hot Water	All Sizes	25
.3	Re-circulated hot water	All Sizes	25
.4	Plumbing Vents	All Sizes	25
.5	Hot water heating	up to 50mm	25
.6	Hot water heating	64mm and larger	38
.7	Hot Equipment	All Sizes	50
.8	Refrigerant Suction	All Sizes	13

1. GENERAL

1.1 Work Included

.1 Chemical treatment of glycol heating water systems.

.2 Chemical pot feeder and accessories.

.3 Chemical feed pump and control system.

.4 WHMIS Documentation.

.5 Disinfection of domestic water mains.

1.2 Quality Assurance

.1 Provide chemical treatment, chemicals and equipment by an agency that specializes in this type of work. Agency shall take full responsibility for providing suitable working systems.

.2 Notify the Departmental Representative prior to commencing treatment, testing or cleaning operations.

.3 Confirm all chemicals used are applied and disposed of in compliance with all guidelines, codes, regulations and requirements of Federal, Provincial, and local governments and local sewage and storm water disposal utilities.

1.3 Submittals – Prior to Construction

.1 Submit technical information, including proposed chemicals, quantities, and calculations, procedures and equipment to be supplied. Provide written operating instructions and system schematics.

.2 Provide Material Safety Data Sheets with all chemicals. Provide one complete set posted on site when material is delivered to site. Provide complete sets for the Maintenance Manuals.

.3 Do not proceed on treatment until tests on utility water are submitted. No progress claims for any category of work specified under Division 23 will be approved until acceptable reports are submitted and approved.

.4 Provide qualifications and licenses of technicians undertaking chemical work, or handling chemicals.

1.4 Submittals – Prior to Substantial Performance

.1 Provide written report containing log and procedure of system cleaning giving times, dates, problems encountered and condition of water.

.2 Submit written report containing results of tests and list of chemicals added.

.3 Provide the required number of visits to check treatment, take samples and adjust and upgrade proper addition of treatment.

1.5 Acceptable Manufacturers

.1 Companies whose products are approved in principle, but subject to requirements of drawings and specifications are:

.1 Enercon, Chem-Aqua, IPAC Chemicals, Dearborne.

2. PRODUCTS

2.1 Cleaners

.1 System Cleaner: Alkaline compound which in solution removes grease and petroleum products.

2.2 Chemical Safety Materials

.1 Provide wall mounted file folder holder to contain all safety and operating instructions for all chemicals provided.

.2 Provide clear typewritten instructions, separate from the normal WHMIS or manufacturer details, clearly and concisely, describing the emergency procedures to be followed if chemicals are spilled on the floor, or on a worker. These instructions are to be on brilliant red or other suitable coloured paper, plastic coated and wall hung in a suitable location in the boiler room or mechanical room where chemicals are handled and stored.

2.3 Hydronic Treatment - Closed systems - High Temperature

.1 Precipitation and scaling:

.1 Phosphonate where indicated by high concentrations of dissolved calcium compounds and high iron oxide concentration.

.2 Dispersants where indicated by high un-dissolved calcium compounds and other mineral concentrations.

.3 Surfactants where internal metals properties require filming protection or where chemical interventions are destructive or non-effective.

.4 Acid to raise saturation concentration.

.5 Chemical to contain multiple active chemicals as required for treatment of target precipitating material determined by test.

.2 Corrosion:

.1 Chromates not approved.

.2 Molybdate based or filming compounds, or oxygen scavenging compounds.

.3 Test strip.

.1 Coupons for monitoring and confirming effectiveness of chemical treatment program.

.4 Test Submittals: Tests identifying water chemistry, hardness, concentration of calcium carbonate, calcium phosphate, magnesium silicate, iron oxide, total dissolved solids, pH, alkalinity, etc.

.5 Program Submittals: Proposed chemicals and program for treatment, expected consumption and frequency, monitoring and testing program, disposal methods, calculation of blow-off rate. Provide calculations and data to support recommendations.

.6 Enercon .

2.4 Glycol Systems

.1 Refer to Section 15705, Glycol Systems for materials.

.2 Test Submittals: Water tests identifying water chemistry, pH, alkalinity, etc.

.3 Program Submittals: Proposed chemical and program for treatment, expected consumption and frequency, monitoring and testing program, disposal methods. Provide calculations and data to support recommendations.

.4 Provide additional inhibitors or other products where required by the premixed inhibited glycol percentage.

.5 Enercon.

2.5 Equipment

.1 Pot Feeder: 7.5 litre capacity cast iron or welded steel with quick opening cap.

2.6 Test Kits

.1 Provide test kits as required to determine proper systems treatment and not limited to the following:

.1 Boiler Water Treatment Test Kit: To determine proper treatment and blow down.

.2 Closed System Test Kit: To determine proper concentration of closed system treatment.

.2 Test kits are to be exactly identical in sophistication and technical content to the kits used by the chemical equipment supplier.

3. EXECUTION

3.1 General

.1 Provide sufficient material to adequately treat systems for period of the contract.

.2 Provide services required to obtain samples of utility water. Perform tests to provide full chemical analysis.

.3 Do not proceed on treatment until tests on utility water and existing water are submitted.

.4 Perform tests and analysis at time of shop drawing submittal and at time of Substantial Completion.

.5 If necessary, provide temporary water meters to determine capacity in each system.

.6 Notify sewage treatment utility when anticipating disposal of chemical into utility system.

.7 Obtain and submit all permits from regulatory agencies and utilities.

.8 Do not dispose chemicals in storm drain system.

.9 Do not dispose chemicals in sanitary sewer disposal system, without written permission from utility.

3.2 Pot Feeder

.1 Provide new pot feeders on each system.

.2 Install isolating and drain valves and necessary piping.

.3 Install around globe valve downstream of circulating pumps unless otherwise shown on drawings.

.4 Pot feeders are to be installed complete with small diameter piping extensions as required, in order to position the feeder no more than 1,200 mm from floor.

3.3 Disinfection

.1 Commence disinfection procedures at the completion of water service piping.

.2 Close main water service valve at the property line. Introduce chlorine in concentrations necessary and as recommended by the material supplier.

.3 Perform tests to determine residual chlorine concentration at levels necessary to provide disinfection service.

.4 After a minimum of two days of contact, or as directed by the Department representative, flush systems thoroughly, and provide tests to determine chlorine concentrations have been lowered to safe levels.

.5 All disinfection procedures to be coordinated and approved by the water utility.

3.4 Heat Storage Tank Cleaning

.1 The scope of Section 15055 does not include cleaning and removal of construction debris, dirt and dust from the HVAC water storage tank.

.2 Include services for draining and washing of the HVAC water storage tank.

.3 If waste water, chemicals or materials from the cleaning operation are deposited in the tank by Division 15 during the cleaning, the responsibility for cleaning and neutralizing will rest with Division 15.

.4 Utilization of the HVAC circulation pumps for this cleaning is allowed subject to other terms of this specification.

3.5 Systems Cleaning

.1 Remove strainer screens during cleaning. Protect or remove control devices during cleaning. Terminal control valves shall be in open position during cleaning.

.2 System pumps may be used for cleaning provided pumps are dismantled, inspected, worn parts repaired and new gaskets and seals installed as necessary.

.3 Inspect piping and tanks, clean sludge and flush low points with clean water after cleaning process is completed. Include disassembly of components as required.

.4 Thoroughly flush all water piping, so that it is free from all scale, sediment, etc. as soon as possible after the system is filled.

.5 Remove or bypass control valves and balancing valves during flushing. Do not flush through coils, heat pumps or other terminal devices.

3.6 Hydronic Treatment - Closed systems - High Temperature

.1 Concentration of Nitrate based treatment to be determined by the Chemical Treatment Specialist on site at the time installation.

.2 Closed system treatment introduced through pot feeder when required or indicated by test.

.3 Test existing water and provide written report.

.4 Submit report of existing domestic water conditions to building operator and Departmental Representative. Include chemical analysis stating effect of time, past treatment history or external events such as leaks and make up, or unanticipated chemical reactions.

.5 If water from an alternative source is deemed to be required, this will be considered as an extra to the contract.

.6 Develop and provide program and materials for maintaining or adjusting chemical treatment to control and remove target minerals and compounds.

.7 After receiving approval of the building operator Departmental Representative, adjust chemical concentration as required to attain specified levels.

3.7 Glycol Systems

.1 Closed system treatment introduced through hand pump and glycol batch tank, when required or indicated by test.

.2 Test solution for specific gravity (freeze protection) and water chemistry, and provide written report.

.3 Submit report of existing domestic water conditions, chemistry and freeze protection to building operator and Departmental Representative. Include chemical analysis stating effect of time, past treatment history or external events such as leaks and make up, or unanticipated chemical reactions.

.4 If water from an alternative source is deemed to be required, this will be considered as an extra to the contract.

.5 Develop and provide program and materials for maintaining or adjusting chemical treatment to control and remove target minerals and compounds.

.6 After receiving approval of the building operator and Departmental Representative, adjust chemical concentration as required to attain specified levels.

1. GENERAL

1.1 Work Included

.1 Manual and automatic air vents.
.2 Air separators.
.3 Relief valves.
.4 Combination valves and fittings.
.5 Sight flow indicators - water.
.6 Side stream filter and accessories.

1.2 Quality Assurance

.1 Comply with Provincial Regulations and have CSA approval.

1.3 Submittals - Prior to Construction

.1 Provide shop drawings and schedules of manufactured products for review and inclusion in Operating and Maintenance Manuals.

1.4 Acceptable Manufacturers

.1 Manufacturers of air separators whose products are approved in principle, but subject to requirements of drawings and specifications are:
.1 Sarco.

2. PRODUCTS

2.1 General

.1 Unless otherwise noted, all hydronic components shall be suitable for a minimum working pressure of 862 kPa, (125 psi)

2.2 Manual Air Vents

.1 Manufactured brass body, soldered or brazed construction, threaded connection. Pressure and temperature rated for service.

2.3 Automatic Air Vents

.1 Provide automatic washer type, all brass with hydroscopic fibre discs, vent ports adjustable cap for manual shut off and integral spring loaded ball check valve to prevent water leakage. Pressure and temperature rated for service.

2.4 Relief Valves

.1 Provide ASME rated direct spring loaded type, lever operated nonadjustable factory set discharge pressure as indicated.

2.5 Sight Flow Indicators – Water

.1 Single glass window, bronze body, ABS impeller.
.2 Suitable for pressure twice that of working pressure, minimum 860 kPa (125 psig).
.3 Suitable for temperature 90 deg. C (200 deg. F).

2.6 Side Stream Filter

.1 Body: Heavy duty, type 304 stainless steel, cast brass nickel plated head, removable gasketed top, drain valve, 19 mm diameter inlet and outlet threaded fittings.

.2 Filter: Multiple paper cartridge, disposable, 5 micron, flow rate 1.20 litres per second (20 usgpm), minimum flow.

.3 Equal to Amtek model ST-3.

3. EXECUTION

3.1 Air Vents

.1 Provide manual type at system high points.

.2 Use automatic float type at heating units and system high points not readily accessible for servicing.

.3 Use automatic washer type for convection type heating units.

.4 Where large air quantities can accumulate, provide enlarged air collection standpipe.

.5 For automatic air vents at high level, or in ceiling spaces or concealed locations, provide vent tubing to glycol fill tank.

.6 Provide ball valve, 12 mm diameter minimum under each manual or automatic vent. Shut off valve is to allow isolation, removal and service of fitting.

3.2 Relief Valves

.1 Provide relief valves at pressure tanks, low pressure side of reducing valves, heating converters, expansion tanks and where indicated.

.2 Pipe relief valve to nearest floor drain.

.3 System relief valve capacity shall equal make up pressure reducing valve capacity. Equipment relief valve capacity shall exceed input rating of connected equipment.

.4 Where one line vents several relief valves, cross sectional area shall equal sum of individual vent areas.

3.3 Side Stream Filter

.1 Install new filter across hydronic primary or secondary piping. Refer to drawings.

.2 Provide isolation valves on inlet and outlet, and drain valve to allow filter maintenance with system in operation.

.3 Provide sight glass indicator on discharge piping.

.4 Extend piping from connection to a point within 1,200 mm from the floor, to allow service from the floor without a ladder.

1. GENERAL

1.1 Work Included

.1 Expansion tanks.

.2 Glycol storage mixing tank.

.3 Structural supports and earthquake restraints.

.4 Testing.

1.2 Standards

.1 Construct pressure tanks to ASME Code for Unfired Pressure Vessels.

.2 Comply with Provincial Government Regulations.

1.3 Submittals - Prior to Construction

.1 Submit capacity, dimensions, material, lining, fittings, piping schematics, supports, operating weight, finish.

1.4 Permits and Inspections

.1 Obtain inspection certificates for pressure vessels from Provincial Authorities.

.2 Give all necessary notices, obtain all necessary permits, and pay all fees in order that the work may be carried out.

.3 Furnish any certificates necessary and evidence that the work installed complies with regulations of all authorities having jurisdiction before final certificates are issued.

1.5 Acceptable Manufacturers

.1 Manufacturers of expansion tanks whose products are approved in principle, but subject to requirements of drawings and specifications are:

.1 Amtrol, Flexcon, Wessels.

.2 Manufacturers of glycol storage and mixing tanks whose products are approved in principle, but subject to requirements of drawings and specifications are:

.1 Axiom.

2. PRODUCTS

2.1 Expansion Tanks - Bladder Type

.1 Closed type, welded steel, rated for working pressures of 862 kPa, (125 psi), cleaned, prime coated and supplied with steel support saddles.

.2 Construct tank with necessary tappings for installation of accessories.

.3 Full acceptance bladder size, butyl rubber bladder material.

.4 Provide quick connect air inlet of automotive tire valve type and tank drain.

.5 Precharge shall be 83 kPa (12 psi)

.6 Drain valve.

.7 Provide pressure relief valve and automatic cold water fill assembly, complete with pressure reducing valve, reduced pressure double check back pressure valve, with test cocks, strainer, water meter, vacuum breaker, and valved bypass.

2.2 Glycol Mixing Tank (Automatic)

.1 Closed type, 208 liter (55 US gal.) tank with pressure control, adjustable pressure regulating valve, pressurization pump, pressure gauge, check valve and union connection.

.2 Pressurization pump with thermal cut-out capable of supplying 0.06 l/s at 345kPa.

.3 Low fluid level contact for connection to BMS.

3. EXECUTION

3.1 General

.1 Support tanks inside building from building structure, as indicated on drawings.

.2 Locate tanks as indicated on the drawings.

.3 Secure all floor, wall and ceiling mounted tanks to withstand lateral and vertical movement due to earthquake.

3.2 Expansion Tanks – Bladder or Diaphragm Type

.1 Submit calculations on required pressure for bladder type tank, and confirm that the air charge is preset and correct prior to requesting approval to open water valves.

.2 Complete and verify the pre-charge prior to opening tank valves to the system.

.3 Obtain permission from the Departmental Representative or the Commissioning Agent prior to opening the tank valves to the system.

.4 After receiving permission to open the valves, follow manufacturers recommendations for tank charging and commissioning. Submit report on final pressure.

.5 Failure to follow the above procedure will result in the tank being disconnected from the system and drained so that the precharge can be adjusted. Once the precharge is adjusted, the tank will then be reconnected to the system.

.6 Set pressure relief valve as indicated in schedules.

.7 Set pressure reducing valve on make-up water line or glycol hydronic pressurization tank as directed by Commissioning Agent.

.8 Provide a pressure and temperature relief valve for each expansion tank, located between the isolation valve and the tank, size equal to the expansion tank connection, set pressure equal to boiler relief valves.

3.3 Glycol Mixing Tank

.1 Connect transfer pump discharge to glycol return line. Provide gate valve and check valve.

.2 Provide valved and capped tee connection for drain purposes.

.3 Mount hydrometer on side of tank.

.4 Provide glycol solution as specified.

3.4 Capacities

.1 Refer to tank schedule.

1. GENERAL

1.1 Work Included

.1 Ductwork and plenums.

.2 Fasteners.

.3 Sealants.

.4 Flexible ducts

1.2 Definitions

.1 Duct sizes are inside clear dimensions. For acoustically lined or internally insulated ducts, maintain sizes inside ducts.

.2 Low Pressure: Static pressure in ducts less than 0.50 kPa (2" wg) and velocities less than 10 m/s (2,000 fpm).

1.3 Quality Assurance

.1 Ductwork and methods shall meet the requirements of:

.1 British Columbia Building Code.

.2 NFPA 90A Air Conditioning and Ventilation Systems.

.3 All other local codes and requirements.

.2 Fabricate in accordance with ASHRAE and SMACNA manuals.

1.4 Job Conditions

.1 Store ductwork on site or in warehouse in dry, heated locations. Cover all opening ductwork with polyethylene sheets and seal with tape.

2. PRODUCTS

2.1 Materials

.1 Ducts: Galvanized steel lock forming quality, having galvanized coating of 0.38 kg/m2 on both sides.

.2 Fasteners: Use sheet metal screws, rivets and bolts.

.3 Sealant: Water resistant, fire resistive, compatible with mating materials,.

3. EXECUTION

3.1 Fabrication

.1 Unless otherwise indicated, branch ductwork serving a single diffuser or grille shall be sized equal to the nominal grille size or the diffuser neck size.

.2 Complete metal ducts within themselves with no single partition between ducts. Where width of duct exceeds 300 mm, cross break for rigidity. Open corners are not acceptable.

.3 Lap metal ducts in the direction of air flow. Ensure the interior is smooth.

.4 Construct tees, bends and elbows with radius of not less than 1.5 times the width of the duct on centre line. Where this is not possible, and where rectangular elbows are used, provide approved type of air foil turning vanes. Where acoustical lining is provided, provide turning vanes of perforated metal type.

.5 Increase duct sizes gradually, not exceeding 15 degrees divergence.

.6 Rigidly construct metal ducts with joints mechanically tight, substantially air tight, braced and stiffened so as not to breathe, rattle, vibrate or sag.

.7 Ducts subject to noise transfer or vibration are to be reinforced to prevent duct vibration and sound transmission. Provide cold rolled steel angle bar, not sheet metal break angle, bolted or riveted to the duct in parallel or cross fashion to completely eliminate duct vibrations and sound transmissions.

.8 Provide easements where low pressure ductwork conflicts with piping or structure, with easements not exceeding 10% of the duct area. Where easements are not required, split ductwork into two ducts maintaining original duct area.

.9 Provide necessary baffling in mixed air plenums to ensure good mixed air temperature with variations of not more than plus or minus 3□C under all operating conditions.

3.2 Installation

.1 Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pitot tube openings where required for testing of systems, complete with metal can and spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring. Provide sealing grommet flush plug for holes.

.2 Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

.3 Supply, return and exhaust ducts shall be sealed with approved sealant. Sealant shall be applied to all joints and connections of all descriptions in such a manner that no air may enter or leave the ductwork through a joint or connection. The Departmental Representative must be satisfied that no joint or connection will leak. If necessary, the ductwork shall be pressurized with the specified equipment to demonstrate that there are no leaks. Tape seal only joints are not approved.

.4 In concealed spaces where conditions will not permit metal ducts, diffusers or troffer boots may be connected to low pressure ducts with flexible duct maximum length 1,000 mm. Hold in place with strap or clamp.

.5 At each point where ducts pass through partitions, seal joints around duct with non-combustible material.

.6 Do not install new or renovated ductwork in a position that would affect the spray pattern of new or existing sprinklers heads. If such a configuration is required, notify the Departmental Representative and await instructions. Failure to notify the Departmental Representative in advance of installation of the duct will leave the costs to rectify the situation solely as the responsibility of the contractor.

3.3 Flexible Ducts

.1 General HVAC Supply and Return: Length shall be maximum 300 mm, with maximum 15º offset from duct axis. Do not use flexible ductwork in place of elbows. Support as necessary to prevent sagging. Fasten at each end with plastic strapping and a minimum of three screws.

.2 Do not install flexible ductwork on exposed ductwork.

3.4 Duct Gauges - General

			gauge	mm
.1	Rectangular Ducts			
	Maximum Width			
	.1	Up to 300 mm	26	0.55
	.2	300 mm to 750 mm	24	0.70
	.3	760 mm to 1,400 mm	22	0.85
	.4	1,400 and over	20	1.01

.2	Rectangular Ducts		gauge
	Maximum Width		
	.1	Up to 12 inches	26
	.2	13 inches to 30 inches	24
	.3	31 inches to 55 inches	22
	.4	56 inches and over	20

3.5 Exposed Ductwork

.1 Install ducts substantially straight and level. All fittings and branch ducts to be installed with tight, well fitted joints.

.2 All joints to be properly sealed. Sealer to be carefully applied to limit poor appearance of improperly applied sealer.

.3 Align duct with building lines and structure.

.4 All exposed duct to be prepared and suitable for painting.

1. GENERAL

1.1 Work Included

.1 Duct access doors.

.2 Fire dampers.

.3 Balancing dampers.

.4 Back draft dampers.

.5 Flexible connections.

1.2 Quality Assurance

.1 Fire dampers shall be UL listed and constructed in accordance with ULC Standard S112 "Fire Dampers".

.2 Fusible links on fire dampers shall be constructed to ULC Standard S505.

.3 Demonstrate resetting of fire dampers to authorities having jurisdiction, and to Departmental Representative's representative.

.4 Accessories shall meet the requirements of NFPA 90A, Air Conditioning and Ventilating Systems.

.5 Fabricate in accordance with ASHRAE Handbooks and SMACNA Duct Manuals.

1.3 Job Conditions

.1 Store duct accessories on site or in warehouse in dry, heated locations. Cover all openings with polyethylene sheets seal with tape.

1.4 Submittals - Prior to Construction

.1 Submit shop drawings for:

.1 Fire dampers (all types).

.2 Balancing dampers (all types).

.3 Flexible connections.

.4 Access doors.

.5 Automatic dampers (each identified unit).

1.5 Acceptable Manufacturers

.1 Manufacturers of access doors whose products are approved in principle, but subject to requirements of drawings and specifications are:

.1 Acudor, Milcor, Titus, Canadian Advanced Air, Air-O-Metal, Maxam.

.2 Manufacturers of fire dampers whose products are approved in principle, but subject to requirements of drawings and specifications are:

.1 Maxam, Titus, Ruskin, Canadian Advanced Air.

.3 Manufacturers of backdraft dampers whose products are approved in principle, but subject to requirements of drawings and specifications are:

.1 Air-O-Lite, Penn, Westvent, Tamco, Ruskin.

.4 Manufacturers of automatic dampers whose products are approved in principle, but subject to requirements of drawings and specifications are:

.1 Tamco, Ruskin.

2. PRODUCTS

2.1 Duct Mounted Access Doors

.1 Rigid and close fitting doors of galvanized steel with sealing gaskets and suitable quick fastening locking devices. Install minimum 25 mm thick insulation with suitable sheet metal cover frame for insulated duct work.

.2 Fabricate with two butt hinges with one sash lock, or two sash locks, for sizes up to 250 mm; two hinges and two compression latches without outside handles for sizes up to 600 mm; with additional hinges for larger sizes.

2.2 Fire Dampers

.1 Galvanized steel or prime coated black steel, weighted or spring loaded to close and lock in closed position when released by fusible link.

.2 Fire dampers in low pressure duct work may be multi blade offset butterfly or curtain type.

.3 Curtain fire dampers shall have blades retained in a recess, so that free area of connecting duct work is not reduced.

.4 Fire dampers shall be dynamic type designed and listed to close with air flow.

.5 Fusible links shall be set for 30 Celsius degrees above unit high limit setting, or 100 degrees Celsius, whichever is greater.

.6 Fire dampers on air outlet round throats shall be double flap steel construction, bolted assembly complete with support plate, equal to Canadian Advanced Air Model 0721.

2.3 Gasketed Air Control Dampers – Manual

.1 Single blade damper of galvanized steel minimum 18 gauge, and provide with quadrants and lock screw.

.2 Fully flanged seat, 100% of blade perimeter, 20 gauge galvanized, secured and sealed to duct.

.3 Compressible neoprene or non-combustible felt seals on flange seat to ensure tight shut off configuration.

.4 Adjustable and lockable quadrant lock on exterior of duct.

.5 Refer to detail in this section.

2.4 Balancing Dampers

.1 Multi blade damper: Galvanized steel minimum 16 gauge, provide with quadrants or adjustment rods and lock screw.

.2 Single blade damper: Galvanized steel minimum 18 gauge, provide with quadrants and lock screw.

.3 Fabricate splitter dampers of double thickness sheet metal to streamline shape, properly stiffened to avoid vibration. Size on basis of straight air volume proportioning.

.4 Provide single blade dampers for duct sizes to maximum 250 mm x 760 mm.

.5 Provide multi blade dampers of opposed blade pattern with maximum blade sizes 300 mm to 1,800 mm. Assemble centre and edge crimped blades in prime coated or galvanized channel frame with approved type hardware.

2.5 Backdraft Dampers

.1 Multi blade, parallel action gravity counterbalanced back draft dampers with blades in a maximum of 150 mm width, having felt or flexible vinyl sealing edges, linked together in a rattle free manner, and with adjustment devices to permit setting for varying differential static pressures.

.2 Back draft dampers for exhaust, discharge or relief louvres shall be factory supplied as an integral accessory. Louvre dampers shall be fitted with fully counter balanced unless otherwise noted. Refer to Section 15870.

.3 Back draft dampers for relief-exhaust or other large fans shall be factory supplied as an integral accessory. Dampers shall be fitted with fully counter balanced arms and weights.

2.6 Flexible Connections

.1 Neoprene coated, flameproof fabric, approximately 50 mm wide, tightly crimped into metal edging strip and attach to ducting and equipment by screws or bolts at 150 mm centres.

2.7 Automatic Dampers

.1 Automatic dampers shall be in 16 gauge galvanized steel or extruded aluminum multiple blade mounted in 12 gauge, steel or extruded aluminum flanged frame.

.2 Individual blades shall not exceed 150 mm in width or 1,200 mm in length.

.3 Provide interlocking edges and compressible seals, oil impregnated bronze or nylon bearings with additional thrust bearings for vertical blades.

.4 Prime coat steel dampers.

.5 Dampers for outdoor air, exhaust or relief air service shall have insulated blades.

.6 Air flow with the damper in the closed position shall not exceed 50 litres per second for each square meter of cross sectional area at a differential pressure of 250 Pa.

.7 Opposed Blade Dampers: Use for shut off service, modulating service without companion dampers, throttling services.

.8 Parallel Blade Dampers: Use for mixing or relief service, variable position service with companion dampers.

.9 Refer to Section 15900, Controls for operator and control.

3. EXECUTION

3.1 Access Doors - Duct Mounted

.1 Provide adequately sized access doors for inspection and cleaning before and after filters, coils, fans, and automatic dampers, at fire dampers and elsewhere as indicated. Review locations prior to fabrication.

.2 Provide 100 mm x 100 mm quick opening access doors for inspection at balancing dampers.

.3 Access doors are to be secured to ducts with pop rivets or other means that do not result in sharp screw points or metal barbs within the duct at the door perimeter.

3.2 Fire Dampers

.1 Confirm rating of devices with ratings of surfaces or separations.

.2 Provide fire dampers at locations shown, where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction.

.3 Fire dampers shall be complete with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

.4 Provide fire stop flaps on air outlets penetrating fire rated membranes or surfaces.

.5 Perform the fire damper drop tests with the Balancing Agent. Remove the fusible links and demonstrate that damper can close freely and without obstruction.

.6 If any dampers fail perform all repairs and replacements required to ensure that all fire dampers are functional.

3.3 Balancing Dampers

.1 During the construction process, before duct systems are constructed, review the systems with the balancing and commissioning agents and the commissioning authority. Provide balancing dampers at locations instructed by the balancing and commissioning agents.

.2 Provide balancing dampers for proper air balancing, whether shown or required, at points on supply, return and exhaust systems, where branches are taken from larger ducts.

.3 Provide a butterfly balancing damper on each branch duct leading to air supply outlets or inlets. This is in addition to a grille mounted balancing damper if such a device is specified. The branch mounted supply damper is to be within 3 metres of the outlet, but no closer than 1 metre, measured along the duct run. If the required location is behind an inaccessible ceiling or wall, adjust the location to allow easy access, or provide an acceptable access door, after review with the Department representative.

.4 Use splitter dampers only where indicated.

3.4 Back Draft Dampers

.1 Install horizontal, gravity balanced back draft dampers on exhaust fan roof curbs, gooseneck roof discharge, roof hood discharge, exhaust duct penetration of roof, or where as shown or noted.

.2 Install vertical, gravity balanced back draft dampers on exhaust duct penetration of wall, behind relief or exhaust grille, or where as shown or noted.

3.5 Flexible Connections

.1 Provide flexible connections on inlet and outlet duct connections of fan coils, fans, heat recovery ventilators or other equipment likely to be affected by, or to cause vibration or noise to be transmitted through duct work.

.2 Provide flexible connection between supply and return ducts.

3.6 Automatic Dampers

.1 Opposed Blade Dampers: Use for shut off service, modulating service without companion dampers, throttling services.

.2 Parallel Blade Dampers: Use for mixing or relief service, variable position service with companion dampers.

.3 Refer to Section 15900, Controls for operator and control.

1. GENERAL

1.1 Work Included

.1 Cabinet exhaust fans.

1.2 Quality Assurance

.1 Conform to AMCA Bulletins regarding construction and testing. Fans shall bear AMCA certified rating seal.

.2 Equipment shall meet the requirements of:

.1 British Columbia Building Code.

.2 Canadian Standards Association.

.3 All other local codes and requirements.

.3 Polyphase, squirrel cage, single speed NEMA/EEMAC Design A or B induction motors, between 746 watts (1 hp) and 149.2 kw (200 hp), whether in packaged equipment or not, shall comply with the current requirements of the British Columbia Energy Efficiency Standards Regulation, and specifically, CSA C390-93 Energy Efficiency Test Methods for Three Phase Induction Motors.

1.3 Submittals - Prior to Construction

.1 Shop drawings must be submitted and reviewed by the Departmental Representative prior to the contractor ordering or shipping any subject equipment. Payments will not be processed for equipment not properly documented and reviewed under the terms of submittal.

.2 Submit certified shop drawings for the following:

.1 Fan curves and sound data, with fan and system operating point plotted on curves.

.2 Fan details, isolation and details.

.3 Cabinet construction, gauge, access doors, fasteners.

.4 Power wiring diagrams and electrical characteristics.

.5 Control wiring diagrams and interfacing details.

.6 Maintenance requirements.

1.4 Job Conditions

.1 Do not operate fans for any purpose, temporary or permanent until ductwork is clean, filters in place, bearings lubricated and fan has been run under close supervision.

.2 Alternatives Equivalent fan selections shall not decrease motor power, increase noise level, increase tip speed by more than 10% or increase inlet air velocity by more than 20% from that specified.

.3 Refer to Section 15010, Acceptable Materials and Equipment.

1.5 Acceptable Manufacturers

.1 Manufacturers of interior cabinet fans (centrifugal) whose products are approved in principle, but subject to requirements of drawings and specifications are:

.1 Acme, Greenheck, Nutone, Penn, Twin City, Jenn Air, Lau, Broan, Carnes, ILG, Loren Cook.

2. PRODUCTS

2.1 General

.1 Statically and dynamically balance fans so no objectionable vibration or noise is transmitted to occupied areas of the building.

.2 Provide balanced variable sheaves for motors 11 kw (15 hp) and under, and fixed sheaves for over 15 kw.

.3 Fans shall be capable of accommodating static pressure variations of +10% with no objectionable operating characteristics.

.4 Unless otherwise noted, include all motors and drive combinations with electrical characteristics as detailed elsewhere.

.5 Rate drive as recommended by manufacturer, but minimum 1.5 times power rating of the motor. Submit calculations and technical data with shop drawings, to support drive selection.

.6 Provide all necessary specialized tools and equipment required to perform speed adjustments on ECM, PSC or other motor types.

2.2 Cabinet Fans

.1 Resiliently mount multi-blade direct driven fan and motor.

.2 Cabinet shall be heavy gauge metal with galvanized or baked enamel finish. Provide junction box for wiring. Provide brushed aluminum or baked enamel grille or duct connection on inlet, and duct connection flange on outlet.

.3 Motors complete with internal thermal protection.

.4 Accessories:

.1 External or internal pre-wired receptacle disconnect fitting.

.2 Single blade, rattle free, back draft flap with felt lined blade edges.

.3 Variable speed motor and controller where indicated.

3. EXECUTION

3.1 Installation

.1 Where inlet or outlet is exposed, provide safety screen.

.2 Provide belt guards on belt driven fans.

.3 Supply and install sheaves as necessary for final air balancing.

.4 Set roof mounted fans on curbs 200 mm minimum above roof. Provide acoustic insulation on duct to below roof line and on fan inlet plenum and drip pan for collecting condensation. Curbs are specified under other Divisions of this specification, unless otherwise noted.

.5 Provide Time Delay Off, Variable Speed Control, Local Control and other switches or motor controls noted on Division 15 schedules or in other Division 15 sections for installation by other trades.

3.2 Performance

.1 Refer to schedules.

1. GENERAL

1.1 Work Included

.1 Diffusers.

.2 Grilles.

1.2 Quality Assurance

.1 Air flow tests and sound level measurement shall be made in accordance with applicable Air Diffusion Council equipment test codes and ASHRAE Standards.

.2 Unit ratings shall be approved by the Air Diffusion Council.

.3 Manufacturers shall certify catalogued performance and ensure correct application of air outlet types.

1.3 Job Conditions

.1 Review the requirements of outlets as to size, finish and type of mounting prior to submitting shop drawings and schedules of outlets.

.2 Positions indicated are approximate only. Check locations of outlets, and make necessary adjustments in position to conform with Architectural features, symmetry and lighting arrangement.

1.4 Submittals - Prior to Construction

.1 Physical: For each type of air outlet, louvre, grille, register etc., submit manufacturer certified data on dimensions, mounting method, accessories, dampers, materials, finish, etc.

.2 Performance: For each type of air outlet, louvre, grille, register etc., submit manufacturer certified data on air flow, sound, pressure loss, velocity.

.3 Colour chips and samples for powder coated louvres, outlets, fittings and accessories.

1.5 Acceptable Manufacturers

.1 Manufacturers whose products are approved in principle, but subject to requirements of drawings and specifications are:

.1 Titus Canada, Air Vector, Nailor - Hart, Hart & Cooley, Krueger, Carnes, Price, Tuttle & Bailey.

2. PRODUCTS

2.1 General

.1 Base air outlet application on maximum space noise level of NC 25.

2.2 Square Panel Ceiling Diffusers - Round Neck Type A

.1 Square module, size as required for ceiling suspension system or surface.

.2 One piece, heavy gauge steel centred panel.

.3 Panel assembly to have a spring lock arrangement to allow removal of the panel for damper inspection and service.

.4 Unless otherwise specified, all round neck diffusers shall be fitted with screw driver adjustable, arc segment dampers, in addition to any specified duct mounted butterfly dampers.

.5 Colour: Refer to schedules.

2.3 Grid Ceiling Grilles Type E

.1 Square module, size as required for ceiling suspension system or surface.

.2 Pressed aluminum frame, complete with fastening system for frame and core.

.3 Core of 13 mm wide aluminum strip interconnected to form 13 mm square openings, edged as required for mounting in specified frame.

.4 Colour: Refer to schedules.

2.4 Wall Grilles - Return or Exhaust Type G

.1 Heavy gauge steel frame, screw fastening.

.2 Heavy gauge steel bars in horizontal dimension, 5 mm wide, 11 mm spacing, 0 degree deflection.

.3 Grille bars supported by heavy gauge flanges secured to the grille frame.

.4 Grilles to be one piece.

.5 Colour: Refer to Schedules.

2.5 Duct or Wall Grilles – Supply Type J & Type X

.1 Steel frame, screw fastening.

.2 Double or Single deflection steel vanes in horizontal and vertical dimension, 20 mm wide.

.3 Adjustable vanes supported by heavy gauge pins, nylon or composition bushings to make vanes tight and rattle free. Outside bars in vertical dimension.

.4 Grilles to be one piece.

.5 Colour: Refer to Schedules.

2.6 Door Grilles Type K

.1 Heavy gauge steel flange frame, back flange frame, screw fastening.

.2 Core: Heavy gauge steel, inverted vee or chevron section bars.

.3 Coordinate with door type and thickness.

.4 Colour: Refer to schedules.

3. EXECUTION

3.1 General

.1 Paint ductwork visible behind air outlets, flat black.

.2 Provide fire rated material, either blanket or rigid board, with rating equal to ceiling or wall system, behind outlets piercing fire rated membranes.

.3 Size air outlets as indicated on drawings.

.4 Refer to air outlet schedule for requirements.

1. GENERAL

1.1 Work Included

.1 Electric heating coils.

.2 Accessories.

1.2 Alternatives

.1 Number of stages, air pressure drops, and such features as clean ability, same or opposite end connections, support etc. approved alternative coils must be the same as type specified.

1.3 Quality Assurance

.1 Coils shall be the product of manufacturer regularly engaged in production of coils who issues complete catalogue data on such products.

.2 Coils shall be CSA approved and labelled.

1.4 Submittals - Prior to Construction

.1 Submissions to include certified data on air pressure loss, air velocity, heat transfer, electrical characteristics, sizes, dimensions, weights.

.2 Confirm all dimensions for coils on site prior to submission of coil shop drawings.

1.5 Acceptable Manufacturers

.1 Manufacturers whose products are approved in principle, but subject to requirements of drawings and specifications are:

.1 Thermolec, Neptronic.

2. PRODUCTS

2.1 Electric Heating Coils

.1 Provide SCR controlled, nichrome electric coils. Internal controls shall be prewired. Provide all necessary contactors, relays, sensors, etc.

.2 Provide a 0-10V input for BMS coil modulation

.3 Provide High limit.

.4 Provide all required air proving temperature limits and safety controls.

.5 Refer to Division 25 for Controls.

3. EXECUTION

3.1 Installation

.1 Support coil sections on steel channel or double angle frames and secure to casings.

.2 Arrange galvanized steel casings for bolting to other section, ductwork or unit casings.

.3 Provide airtight seal between coil and duct or unit cabinets.

.4 Coordinate necessary power and control connections to coils.

.5 Ensure coils are removable for service and cleaning.

.6 Provide Access Doors both upstream and downstream of coils.

.7 Refer to Section 15900 for Controls.

3.2 Performance

.1 Refer to coil schedule.

1. GENERAL

1.1 Work Included

.1 Heat Exchangers – Air to Air

.2 Operating controls.

1.2 Quality Assurance

.1 Unit and major components shall be a product of a manufacturer regularly engaged in the production of such equipment.

.2 Equipment shall be factory built and tested and conform to ARI Certified.

.3 The heat recovery unit shall be UL listed.

.4 Fans shall conform to AMCA Bulletins regarding construction and testing, and shall bear the AMCA certified rating seal.

1.3 Acceptable Manufacturers

.1 Manufacturers of air handling units whose products are approved in principle, but subject to requirements of drawings and specifications are:

.1 Renew Aire, Losnay, Venmar.

1.4 Submittals - Prior to Construction

.1 Shop drawings must be submitted and reviewed by the Departmental Representative prior to the contractor ordering or shipping any subject equipment. Payments will not be processed for equipment not properly documented and reviewed under the terms of submittal.

.2 Submit certified shop drawings for the following:

.1 Fan curves and sound data.

.2 Core efficiency and air delivery performance data.

.3 Core materials, pressure drop, accessories.

.4 Vibration isolation details.

.5 Filter frame and media details, dimensions and efficiency.

.6 Cabinet construction, gauge, access doors, fasteners.

.7 Dimensions and weights.

.8 Power wiring diagrams and electrical characteristics.

.9 Control wiring diagrams and interfacing details.

.10 Maintenance requirements.

.11 Installation and hoisting instructions.

1.5 Alternatives

.1 Size, test efficiency, initial and final resistance of alternate manufacturer's filters shall be the same as the type specified.

.2 Requests for approval as an alternative manufacturer must be accompanied by a scale drawing of the proposed equipment in the space available, fan performance, power and sound data, in the form of fan curves (tabulated data will not be accepted), core arrangement and performance, full physical characteristics including weight, sizes, construction details etc.

2. PRODUCTS

2.1 Type

.1 Unitary design suitable for low pressure operation in configurations shown on the drawings.

.2 Defrost operation shall consist of a dampered bypass and shall not result in an imbalance between outside air and exhaust air.

.3 Self-contained, factory assembled and prewired, consisting of cabinet and frame, supply fan, return fan, controls, air filter.

2.2 Construction

.1 Cabinet shall be heavy gauge steel with galvanized or baked enamel finish, easily removed access doors or panels with quick fasteners, reinforced where required.

2.3 Fans

.1 Fans shall be forward curved type with multiblade wheel statically and dynamically balanced.

.2 Supply and return fans shall be spring isolated.

.3 Provide all necessary specialized tools and equipment required to perform speed adjustments on ECM, PSC or other motor types.

2.4 Filters

.1 Media: Washable fiber.

.2 Arrangement: Flat or angle filter section to limit filter velocity. Provide access doors.

2.5 Core

.1 Aluminum cross flow design, minimum 65% efficient in heating mode.

3. EXECUTION

3.1 General

.1 Install units as per manufacturer's recommendation.

.2 Provide proper adaptors, piping, duct connections, and control interfacing.

3.2 Filters

.1 Provide Maintenance Information Schedule: all filters provided, with complete information for each air handling unit, listing filter type, specification, model number, thickness, dimensions, etc., suitable for inclusion in maintenance manuals. Refer to Section 23 01 00, Documentation, Manuals and Record Drawings.

.2 Construct and install filters to prevent passage of unfiltered air. Provide felt, rubber or neoprene gaskets.

.3 Do not operate fan systems connected to filter banks until filters, temporary or permanent, are in place. Replace filters used during construction.

.4 Replace filters at Substantial Completion.

.5 Supply 100% spare refills at Substantial Completion.

3.3 Washing

.1 Provide services and materials to thoroughly clean the existing heat recovery unit entirely, from the outdoor air, return air mixing chamber, to the discharge of the fan chamber.

.2 Mixed Air Chamber: Pressure spray wash with detergent. Vacuum clean all surfaces and components. Replace filter media.

.3 Filter Chamber: Pressure spray wash with detergent. Vacuum clean all surfaces and components. Replace filter media. Replace filter frame gasket and seal material.

.4 Fan Chamber: Apply degreasing chemical to all fan components including inside the scroll, fan blades, fan side plates, fan shaft, supports and accessories. Pressure spray wash with detergent. Vacuum clean all surfaces and components.

3.4 Performance

.1 Refer to schedules and drawings for configuration and performance.

1. GENERAL

1.1 Work Included

.1 Outdoor Evaporator/Condensing Units
.2 Indoor Fan Coil Units
.3 Refrigerant Piping
.4 Refrigeration Specialties
.5 Controls

1.2 Quality Assurance

.1 Meet the requirements of CSA, CGA Provincial and Municipal Codes and be CSA listed.
.2 Comply with standard CAN/CSA C746-93 Performance Standard for Rating Large Air Conditioners and Heat Pumps. Submit certification letter or other confirmation with shop drawings.
.3 Test and rate cooling system to ARI Standard 210.
.4 Fans shall confirm to AMCA Bulletins regarding construction and testing.
.5 Filter media shall be UL listed.
.6 Comply with applicable codes, laws and regulations. Conform to CSA - B52, Code for Mechanical Refrigeration; and CSA-B31.5, Code for Refrigeration Piping.
.7 Technicians shall be certified under Ministry of Environment regulations for working with and handling CFC and CFHC refrigerants.
.8 Polyphase, squirrel cage, single speed NEMA/EEMAC Design A or B induction motors, between 746 watts (1 hp) and 149.2 kw (200 hp), whether in packaged equipment or not, shall comply with the current requirements of the British Columbia Energy Efficiency Standards Regulation, and specifically, CSA C390-93 Energy Efficiency Test Methods for Three Phase Induction Motors.

1.3 Submittals - Prior to Construction

.1 Shop drawings must be submitted and reviewed by the Departmental Representative prior to the contractor ordering or shipping any subject equipment. Payments will not be processed for equipment not properly documented and reviewed under the terms of submittal.
.2 Submit certified shop drawings for the following:
    .1 Heating, cooling and air delivery performance data.
    .2 Fan performance curves and sound data.
    .3 Fan details, isolation and details.
    .4 Filter frame and media details, dimensions and efficiency.
    .5 Coil materials, pressure drop, accessories.
    .6 Compressor details, isolation and accessories.
    .7 Refrigeration specialties and accessories.
    .8 Cabinet construction, gauge, access doors, fasteners.
    .9 Condenser guards.
    .10 Dimensions and weights.
    .11 Power wiring diagrams and electrical characteristics.
    .12 Control wiring diagrams and interfacing details.
    .13 Maintenance requirements.

.14 Installation instructions.

.15 Field piping layout drawings with pipe sizes, refrigerant flows, pressure drops in solenoid valves, driers, shutoff hand valves, pipe and fittings on liquid lines, and pressure drop or change in saturation temperature of suction lines. Shop drawings shall be endorsed by equipment manufacturer.

.16 Ministry of Environment qualification and registration number for technicians working with and handling CFC and CFHC refrigerants.

1.4 Alternatives

.1 Requests for approval as an alternative manufacturer must be accompanied by a scale drawing of the proposed equipment in the space available, fan performance, power and sound data, in the form of fan curves (tabulated data will not be accepted), coil arrangement and performance, full physical characteristics including weight, sizes, construction details etc.

.2 Size, NBS test efficiency, initial and final resistance of alternate manufacturer's filters, shall be same as types specified.

.3 Number of tube rows, air pressure drops and such features as clean ability, drain ability, same or opposite end connections, support and venting of alternative manufacturer, shall be same as type specified.

1.5 Acceptable Manufacturers

.1 Manufacturers whose products are approved in principle, but subject to requirements of drawings and specifications are:

.1 Mitsubishi, Daikin.

1.6 Warrantee

.1 Provide five year warranty on compressor.

2. MATERIALS

2.1 General

.1 Provide lockable weatherproof disconnect switches on outdoor units.

2.2 Refrigerant Piping and Accessories

.1 Piping shall pre charged flexible piping kits, supplied by the manufacturer, configured in accordance with ASME and provincial government standards.

.2 Shutoff valve shall be refrigeration grade; angle, globe or ball type.

.3 Provide valved refrigerant charging connection on liquid line from receiver.

.4 Provide service valves on suction and discharge of compressors.

.5 Provide pressure gauge taps where required.

.6 Provide combination filter/drier sized for full capacity of system. Drier shall have replaceable cores.

.7 Provide combination moisture and liquid indicator located in the liquid line. Indicators shall be full line size, double lens type, and have seal caps.

.8 Silver brazed joints using copper phosphorous alloy, with melting point between 1100°F and 1500°F, using current quality control procedures.

2.3 Indoor Unit

.1 Self - contained, factory assembled and pre-wired, consisting of cabinet and frame, supply fan, coil, controls, air filter and holding frame.

.2 Cabinet: Heavy gauge steel or plastic easily removed access doors or panels with quick fasteners, reinforced where required. Insulate units with 25 mm thick neoprene coated fibrous glass acoustic insulation.

.3 Fan: Multi-speed direct drive, centrifugal, forward curved, statically and dynamically balanced.

.4 Provide all necessary specialized tools and equipment required to perform speed adjustments on ECM, PSC or other motor types.

.5 ARI certified coils of seamless copper tubing, force fitted to aluminum fins. Enclose coils in coil section with headers and U - bends fully contained within the casing

.6 Drain pan. Heavy gauge galvanized steel drip pan and drain connection for each coil section, extending 75 mm from face of coil leaving side.

.7 Provide factory supplied disconnect switch. The disconnect switch shall be in approved case mounted externally on the unit or in such a manner that access can be gained by quick release fasteners or hinged access panels. No other electrical conductors or control devices shall be exposed when gaining access to the main disconnects.

.8 Provide thermostat for use with IO System. A DDC sensor will be provided for room temperature feed back to the DDC.

2.4 Outdoor Unit

.1 Self - contained, factory assembled and pre-wired, consisting of cabinet and frame, fan, coil, controls.

.2 Cabinet: Heavy gauge steel with baked enamel finish, easily removed access doors or panels with quick fasteners, reinforced where required.

.3 Fan: Direct drive axial fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor.

.4 ARI certified coils of seamless copper tubing, force fitted to aluminum fins. Enclose coils in coil section with headers and U - bends fully contained within the casing.

.5 Drain pan. Heavy gauge galvanized steel drip pan and drain connection.

.6 Provide factory supplied disconnect switch. The disconnect switch shall be in approved case mounted externally on the unit or in such a manner that access can be gained by quick release fasteners or hinged access panels. No other electrical conductors or control devices shall be exposed when gaining access to the main disconnects.

2.5 Refrigerant Compressor

.1 Hermetic compressor, 3,600 rpm maximum with the following accessories:

- .1 Spring mounted
- .2 High and low pressure safety controls
- .3 Motor overload protection
- .4 Crankcase heater
- .5 Service valves
- .6 Filter dryer

.2 Solid state time out system to prevent rapid compressor cycling.

.3 Low ambient kit to allow compressor operation to minus 25 degrees Celsius in heating mode and plus 5 degrees Celsius in cooling mode.

.4 Capable of simultaneous heating and electric heat defrost operation.

2.6 Insulation

.1 Insulate refrigeration lines throughout. At hanger locations, provide 150 mm long curved metal plate to protect insulation.

.2 Refer to Section 23 07 13, Piping and Equipment Insulation.

2.7 Controls

.1 Provide necessary refrigeration controls as specified or required, including relays and control devices.

.2 Provide for proper operation of safety controls and automatic controls provided under this Division.

.3 Microprocessor remote panel control panel, hard wired into system:

.1 Liquid crystal display screen

.2 24 hour on-off timer

.3 Heating cooling set point control

.4 Fan speed control

.5 Space and air flow temperature display

.6 Each fan coil to be provided with IO Interface for DDC integration with the following points

.1 On Off (Digital Input)

.2 Set Point (0-10V Analog Input)

.3 Mode of Operation (0-10V Analog Input)

.4 Fan Speed (0-10V Analog Input)

.7 Status Outputs

.1 Error Digital Output

.2 Compressor ON/OFF

.3 Mode of Operation (Heating or Cooling)

2.8 Outdoor Unit Coil Protection Guards

.1 Steel frame of 20 mm square, hollow structural steel tube, welded construction, 20 gauge expanded metal mesh, 15 mm openings maximum, welded to frame.

.2 Frames to be drilled and bolted to rooftop unit frame to entirely cover all condensing coils. Each frame to be secured with no less than 6 sheet metal screws.

.3 Provide multiple sections if necessary.

2.9 Outdoor Unit Bases

.1 Provide roof pans and galvanized steel channel to install condensing unit / heat pump 300mm above the house keeping pad.

3. EXECUTION

3.1 Refrigerant Piping

.1 Size piping for minimum pressure drop in system. Pipe sizing shall be in accordance with manufacturer's requirements.

.2 Arrange piping runs and equipment locations to comply with manufacturer's maximum elevation difference and piping length between outdoor and indoor unit.

.3 Arrange piping to return oil to compressor. Provide traps in piping systems if required. Keep horizontal dimensions of traps as small as possible.

.4 Attach hangers and supports as required. Provide one hanger 500 mm minimum from each change of direction.

.5 Arrange piping loops in suction lines to prevent liquid refrigerant from draining into compressor during shutdown.

.6 Provide flexible connections where required.

3.2 Indoor Units

.1 Suspend units from structure. Utilizing vibration isolation hangers.

.2 Provide flexible duct connections.

.3 Pipe condensate to drain.

3.3 Outdoor Units

.1 Mount units on housekeeping pad on structural base as noted on drawings.

.2 Secure outdoor unit to base with hold down lag screws or bolts. Adjust lock nuts to maintain clearance required by neoprene pads and mounting base.

.3 Position condensing unit no closer than 1.8 metres from gas vent discharge.

3.4 Testing, Dehydration, Charging and Start-Up

.1 At completion of the installation, pressurize system and check for refrigerant leaks. Repair leaks and retest. Dehydrate system and charge with refrigerant. Start up system, and check out operation.

.2 Utilize services of certified refrigeration technicians for start - up. Include completed and signed check lists in operating and maintenance manuals.

.3 If installation is completed in winter season, pump down refrigerant and repeat procedure at start of next cooling season.

.4 Provide manufactures start up and test documentation.

3.5 Outdoor Unit Coil Protection Guards

.1 Provide guard screens on all new outdoor units.

.2 Confirm dimensions and required quantity by site survey.

3.6 Performance

.1 Refer to outdoor unit schedule.

.2 Refer to indoor unit schedule.

1. GENERAL

1.1 Work Included

.1 Electronic and electric control system for mechanical systems.

.2 Control devices, components, wiring and material.

.3 Automatic control valves.

.4 All relays, devices, components, wiring, conduit, etc., for line or low voltage interlocking.

.5 Operators for new dampers and valves.

.6 Software and programming for new and existing systems.

.7 Wiring and testing of equipment control panels not factory mounted and wired.

.8 Modifications and renovations to existing systems.

.9 Check out and commissioning of new and existing control systems.

.10 Training and instructions to Departmental Representative for new and existing systems.

.11 Remove all existing wiring, material and equipment not being reused. Do not abandon in place.

1.2 Quality Assurance

.1 Work specified in this Section shall be done by qualified technicians, experienced and skilled in the tasks of installing and checking out the components, wiring and systems installed.

.2 Adhere to all applicable electrical codes and regulations.

.3 Obtain electrical permit.

.4 For non-CSA equipment, submit to Inspection Authorities and obtain approval prior to installation of equipment on site.

1.3 Submittals - Prior to Construction

.1 No work on control systems is authorized, nor will progress payments be considered until all control systems submissions have been provided and accepted.

.2 For the systems and components provided under this Division, provide complete documentation including but not limited to wiring diagrams, installation and maintenance instructions, verification and check-out procedures, performance range, voltage and current characteristics, etc.

.3 Provide fully integrated diagrams and shop drawings for all systems and components, including those supplied under other Sections or Divisions of the specification.

.4 Controller and panel shop drawings are to include the model number of the control chips and other components included in the equipment.

.5 Controller configuration, positioning and location to be coordinated and confirmed with Departmental Representatives prior to installation. Provide plan showing all main panels, controllers and controls cabinet locations to Departmental Representative for approval.

.6 Provide full schematic drawing of mechanical systems with all control points and devices clearly marked and labelled. The Departmental Representative will provide electronic copies of mechanical systems schematic for this purpose.

.7 Provide full list of all points and control systems devices, reconciled with the points list included in the specification.

.8 Provide written Sequence of Operation for every system under the scope of this Contract. The sequence must be written with wording differing from the Sequence of Operations below, but with the same intent.

.9 Provide pre-commissioning report on all existing control points. Identify all problems that were discovered, including at least one recommended solution with costs.

1.4 Submittals - Prior to Substantial Performance

.1 Provide trend logs demonstrating that the boiler systems operate smoothly. Coordinate with the boiler manufacturer's start up technician and provide assistance as required to complete the start up to the satisfaction of the Departmental Representative.

.2 Once the systems has been commissioned and all components are operational, provide trend logs for all systems.

.3 Provide hand written "end to end" checks of all control points.

.4 Provide post construct "record" shop drawings for inclusion in maintenance manual. Include handwritten end to end checks for all points.

1.5 General

.1 The scope of the work specified in this Division includes but is not limited to:

.1 All sensors, actuators, relays, contactors, power supplies, conduit, wiring, tubing, and other field devices, control valves etc.

.2 All required wiring and conduit from field input/output devices, to the BAS panel terminal strip and the control modules locations and termination of same.

.3 All required 120 volt AC wiring and connections for control systems, operators and components.

.4 Wiring from all control modules back to the BAS panel terminal strip.

.5 Supply, installation and mounting of all controls equipment and components.

.6 Verification, calibration and continuity checks of all wiring and components installed by this Division.

.7 Request and witness tests, for installation certification conducted by the Departmental Representative on each sensor and actuator point installed.

.8 Comply with all the requirements stated elsewhere in the specification for shop drawings, approvals, documentation and record drawings. This requirement applies specifically to physical location layout drawings and detail drawings.

.9 Coordinate the location and mount the supplied metal enclosure. Connect all conduit, and terminate all wiring to a removable termination strip. Provide wiring, tagging, and panel point layout sheets on inside panel door.

.10 Standardized tagging to be used to identify all points on project.

1.6 Coordination Division of Responsibility

.1 Provide coordination services between the Departmental Representatives, Commissioning Authority, the Contractor, the Specialty Engineer, the Commissioning Agent, and others as necessary.

.2 Cooperate and attend as required to complete the installation and commissioning procedures as specified in this Section and in other Sections of the Specification.

.3 Cooperate and assist the Commissioning Agent in the verification and commissioning of all systems and components.

1.7 Verification and Acceptance

.1 Refer to Section 23 05 93.3 Commissioning.

.2 Complete all pre-testing and verification of points, and systems installed under this Section using qualified and experienced personnel.

1.8 Description of Control System

.1 System display and interface to be full colour graphics type.

.2 The HVAC system is defined by a points list which identifies each input or output. Review the point sheet which identifies panel numbers, point description, input output number, field device and wiring detail reference, etc.

.3 For specific definition of each sensor and actuator, its installation and connection to SAP, the contractor shall refer to the detailed point sheets included, and wiring details for that device.

.4 Point sheets identify each specific device, sensor or operator and certain connection details or requirements.

.5 When the project is completed this documentation is to be updated by these contractors to record drawing condition.

1.9 Definitions and Abbreviations

.1 The following are abbreviations used throughout the section defining computerized control systems specified herein or defined on plans.

.1	DDC	Direct Digital Control
.2	BAS	Building Automation System
.3	SAP	Stand Alone Panel
.4	DI	Digital Input
.5	DO	Digital Output
.6	AI	Analog Input
.7	AO	Analog Output
.8	HVAC	Heating, Ventilating, Air Conditioning
.9	MCC	Motor Control Centre
.10	R	Relay
.11	WTS	Water Temperature Sensor
.12	RTS	Room Temperature Sensor
.13	DTS	Duct Temperature Sensor
.14	SAT	Supply Air Temperature Sensor
.15	MAT	Mixed Air Temperature Sensor
.16	RAT	Return Air Temperature Sensor
.17	OAT	Outdoor Air Temperature Sensor
.18	CT	Current Transformer
.19	OPR	Damper or Valve Operator
.20	DMP	Damper Operator

1.10 Software and Documentation

.1 Software: Update the existing software with new control points and graphics as required for the new systems.

.2 During the first year warranty period, the controls system supplier shall maintain duplicate software back-up copies of the most current software and programs. The control system supplier shall be capable of uploading the back-up programs by, at the request of the Departmental Representative.

.3 Provide fully operational and unrestricted copies of HVAC control system software and documentation to the Departmental Representative, for the unconditional operational and maintenance use by the building operator.

.4 Provide copies of the software and documentation to the Departmental Representative for use by the building operator to monitor the system.

.5 Provide training, documentation and software necessary to allow the Departmental Representative to access the control system through the Departmental Representative owned personal computers.

1.11 Alternative Components

.1 Submission for alternative components will be reviewed by the Departmental Representative, subject to the following:

.1 Complete and acceptable submissions for alternates must be received ten days prior to the closing of sub trade tenders.

.2 Submissions must include precise and complete detail for wiring, electrical ratings, and accessory requirements.

1.12 Maintenance Data and Service

.1 Refer to Section 23 05 00 Documentation, Manuals and Record Drawings.

.2 Provide for complete service of controls systems, including call backs, for one year running concurrent with guarantee.

.3 Verify system operation throughout the one year maintenance period to ensure stable and acceptable operation in all operating conditions.

1.13 Guarantee

.1 Provide a written guarantee, signed and issued in the name of the building operator stating that the controls system, materials, devices and software are guaranteed against faulty material and workmanship for a period of one year from the date of Substantial Performance.

1.14 Trade Co-operation

.1 The control subcontractor shall oversee the operation, installation and adjustment of all devices and components that are directly or indirectly controlled or affected by the systems installed under this Division.

.2 Provide wiring diagrams, instructions, supervision, and attendance services to other trades as necessary to complete the installation, testing and adjustment of the systems installed under this Division.

1.15 Acceptable Manufacturers

.1 Control system contractors that are approved in principle, but subject to requirements of drawings and specifications are:

.1 Johnson Controls

.2 Valve, valve actuator and damper actuator manufacturers that are approved in principle, but subject to requirements of drawings and specifications are:

.1 Belimo

2. PRODUCTS

2.1 Field Devices

.1 All sensors and controllers shall be of commercial grade. Provide full details of all sensors and controllers proposed, including their range and accuracy.

.2 The sensors shall conform to the following table:

Description	Accuracy	Range
Duct air temperature	+/- 0.2 degrees C	0 to 40 degrees C
Space temperature	+/- 0.2 degrees C	0 to 50 degrees C
Outside air temperature	+/- 0.2 degrees C	-40 to 40 degrees C
Water temperature	+/- 0.2 degrees	0 to 120 degrees C
Current sensors		+/- 2% of full scale

.3 Provide data on accuracy, range, output signal characteristics, repeatability, linearity, dead band as applicable. Include data on hysteresis and defined curve/calibration points for any products for pre-tender approval as an equal to those specified.

.4 Due to limitations, which alternate sensors impose on the software system, i.e. ranging etc. the number of alternates has been limited in each sensor/device category. All field devices shall be as indicated, with manufacturer and model numbers noted.

.1 Duct temperature sensors

.1 Greystone TE 200 B 7E2

.2 Delta DTS 410

.2 Room temperature sensors

.1 Greystone TE200 AE7

.2 RTS 401-1

.3 Hot water sensors

.1 Greystone TE 200 C7B2

.2 Delta WTR 420

.4 Current transducers

.1 Delta CUR 450

.2 Greystone C 5150

.5 Freeze stat

.1 Ranco 016-264

.2 Johnson Controls A70HA1

.6 Solid state relays

.1 Grayhill 70S2-04-6-12-S

.2 Electromatic RS 104240-10-0

.3 Wespac KS210

.4 Potter & Brumfield EOTZ series

.7 Status relay

.1 Omron 25D-22423 T-US

.8 Large damper operators

.1 Belimo AF 24 SR

.2 Johnson M130 GGA

.9 Large valve operators: modulating (38mm nominal or more)

.1 Johnson M130 GGA

.10 Small valve operators: non-modulating (less than 38mm)

.1 Honeywell V8043A

.2 Erie 773B series

.11 Small valve operators: modulating non-spring, (38mm nominal or less)

.1 Belimo NM 24 SR

2.2 Main Control Panel (Stand Alone Panel)

.1 Controllers shall be fully free programmable and shall not be limited to predetermined sequences.

.2 Panel I/O configuration to be 24 universal inputs, capable of accepting 0-5 vdc, 402 ma, thermistor or dry contact signals. 24 universal outputs, type digital or analogue, software selectable. Outputs to source 10 vdc @ 20 ma.

.3 Panel to incorporate I/O expansion slots to allow expansion in groups of 8 or 16 universal inputs or outputs.

.4 Panel to have communication ports for a local PC, a LAN port for connection to the building LAN and internet.

.5 Panel to have visual status indicators on inputs and outputs, user access, CPU operation, and network communication.

.6 Panel to UL916 Listed and FCC rated Class A.

2.3 Controller

.1 Controllers shall be fully free programmable and shall not be limited to predetermined sequences.

.2 Panel I/O configuration to be 11 universal inputs, capable of accepting 0-5 vdc, 4-20 ma, thermistor or dry contact signals. 8 universal outputs, type digital or analog, software selectable. Outputs to source 10 vdc @ 20 ma or 8 digital triac outputs capable of switching 24 vac @ 0 amps maximum.

.3 Panel to have 2 communication ports for connection to Intelli-Stat sensors, and Intelli-Zone network. Panel may be optionally configured for connection to RS232 network.

.4 Panel to UL916 Listed and FCC rated Class A.

2.4 Temperature Sensors – General

.1 Sensors shall be thermistor or RTD type with a high resistance versus temperature change to ensure good resolution and accuracy.

.2 Sensors to be compatible with input requirements of BAS system.

.3 The sensor shall give an end to end accuracy of not less than +/-0.2^{o}C.

.4 The sensor shall connect to the controller by means of a two wire cable.

2.5 Temperature Sensors – Space

.1 Electronic wall mounted sensors compatible with controllers and input requirements for BAS system.

.2 Sensors to be tamper proof where specified. Refer to the points list

.3 If identified on points lists, sensors shall be complete with 4 programmable buttons on the faceplate that can be programmed for auxiliary control.

2.6 Temperature Sensors - Air Stream

.1 Electronic duct mounted sensors with remote sensing elements as required, and to be compatible with input requirements for BAS systems.

.2 Plenum sensors to be averaging type.

2.7 Temperature Sensors – Pipe

.1 Electronic pipe immersion well sensors with remote sensing elements as required, and to be compatible with input requirements for BAS systems.

.2 Conductor length to be suitable for application.

.3 Provide compatible brass immersion well, 19 mm NPT.

2.8 Low Limit Temperature Sensors – Coil Protection

.1 Vapour tension element. Operation temperature range from –60°C to 10°C.

.2 Threaded fittings for mating to 12 mm conduit.

.3 Capable of providing input to the control system.

2.9 Motor Current Sensors

.1 Sensors shall vary or interrupt voltage with sensing motor current draw.

.2 Provide analogue or digital as identified on points list.

2.10 Operators – Dampers

.1 Electronic gear driven modulating damper operators with spring return to "fail-safe" in normally open or normally closed position as required.

.2 Full range modulating operators to be compatible with torque and mounting requirements of air stream dampers or air handling units.

.3 The actuator drive speed shall be variable and the actuator travel shall be continuously adjustable to prevent damage due to over torqueing. It shall be possible to recalibrate the damper actuator for clockwise or counter-clockwise damper operation.

.4 The operator shall be capable of reporting the position of the damper using end switch feedback.

.5 Refer to Section 23 33 00 Air Duct Accessories for dampers.

2.11 Operators – Valves

.1 Electronic gear driven operator.

Heating coil coil	modulating	spring return
Unit heater heating coil	two position	spring return

.2 Full range modulating operators to be compatible with torque and mounting requirements of controlled valve.

.3 Provide analogue or digital as identified on points list.

.4 Valves shall "fail-safe" spring return to normal position.

2.12 Valves Automatic - Three Way

.1 Provide valves in accordance with general valve specification. Provide position indicators on valves and pilot positioner on sequenced valves.

.2 Ball Valve: Forged bronze body, delrin seat and seals, chrome plated ball, forged steel pin, screwed ends, 1,200 kPa (175 psig) WOG.

.1 Up to 38 mm: use mixing valve or diverter valve.

.2 50 mm and over: use globe body valve.

.3 Ball valves used for modulating services shall be characterized type.

.4 Valves shall "fail-safe" spring return to normal position.

.5 Provide Combination Tappings for Instrumentation on each piping connection. Refer to Division 23

.6 Submit valve Cv rating in all configurations.

2.13 Transformers

.1 Transformers required for DDC Panels shall be 120 volt/24 volt, 50 or 100 volt amp capacity and shall contain an integral circuit breaker. Provide mounting box to accommodate transformer, accessories, etc.

2.14 Wiring and Methods

.1 Conduit general: EMT conduit, Steel fittings.

.2 Conduit flexible; liquid tight, coated flexible, maximum length 500 mm, cast or liquid tight fittings. Application only from junction box and EMT conduit to equipment requiring flexible connection for vibration isolation or service access.

.3 Conductor:

.1 Line voltage power or switched power wiring - No. 12 gauge copper wire minimum.

Line voltage control wiring - No. 14 gauge copper wire, length not to exceed 50 metres, No. 12 gauge copper wire, lengths exceeding 50 metres.

Low voltage No. 18 gauge, twisted, stranded wire as directed by applicable electrical codes and requirements. Shielded cable where required or specified.

Low voltage No. 22 gauge, twisted stranded pair. Shielded cable where required or specified.

MSTP Network Cable shall be no. 24 twisted, shielded, stranded, low capacitance cable.

.4 Device and Wiring Boxes

.1 Heavy gauge aluminum or steel, front access hinged cover, screwed fastening, no gasket unless required by installation environment.

.2 Comply with BC Electrical Code and all other applicable codes. Rating suitable for installation environment.

.3 Provide inside separation walls and dividers to separate low voltage wiring from line voltage wiring.

.4 Size as required, minimum as shown on detail sheets.

.5 Provide FS style boxes in Public areas.

2.15 Device and Wiring Boxes

.1 Heavy gauge aluminum or steel, front access hinged cover, screwed fastening, no gasket unless required by installation environment.

.2 Comply with BC Electrical Code and all other applicable codes. Rating suitable for installation environment.

.3 Provide inside separation walls and dividers to separate low voltage wiring from line voltage wiring.

.4 Size as required, minimum as shown on detail sheets.

2.16 Control Panels

.1 Provide heavy gauge, surface mount steel panels with gasketted and hinged access door to house control equipment. Enamelled finish.

.2 Provide terminal strip connection for external wiring, transformers, override timers, clocks, night setback thermostats etc.

.3 Provide engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.

.4 Mount panels in equipment room near equipment served, on vibration free walls.

2.17 Identifier Labels and Plates

.1 All components, cables, wires, devices, valves, and accessories shall be identified by label or tag. The label or tag shall include the device identification, point name, plus a functional description.

.2 Labels - General: Engraved plastic, two colours, white background with black contrasting letters. Plates shall be minimum 20 mm high, letters shall be minimum 3 mm wide, 12 mm high.

.3 Labels - Emergency: Engraved plastic, two colours, red background with white contrasting letters. Plates shall be minimum 40 mm high, letters shall be minimum 12 mm wide, 20 mm high.

.4 Labels - Warning: Engraved plastic, two colours, amber background with black contrasting letters. Plates shall be minimum 40 mm high, letters shall be minimum 12 mm wide, 20 mm high.

.5 Tagging - Conductors: Thomas & Betts E-Z-Coder wire marking system, or heat shrink label, or equivalent system.

.6 Provide labels for the following systems:

.1 Standard: All control panels and devices: Refer to Part One of this Section and Section 23 05 00 Common Work Results for HVAC.

3. EXECUTION

3.1 General

.1 Check and verify location of sensors and thermostats and other control devices with plans and room details before installation.

.2 Supply approved accurate and complete shop drawings and wiring diagrams to complete the installation.

.3 Do not install top entry wiring connections to control panel enclosures where there is a risk of sprinkler operation of other source of water ingress.

.4 Provide minimum 2m of spare wire in control enclosures for each point.

.5 Ensure that the wiring and device location, installation and labelling, is correct, and operation is in compliance with specifications. Submit a written report.

.6 The installation shall conform both to manufacturer's recommended procedures, and all applicable codes and regulations, and to the approval of authorities having jurisdiction.

.7 All equipment installed shall be mechanically stable and as necessary, fixed to wall or floor. Anti-vibration mounts to be provided, if required, for the proper isolation of the equipment.

.8 Equipment shall be installed so as to allow for ease of maintenance access. Equipment shall be installed such that it does not interfere in any way with access to adjacent equipment and personnel traffic in the surrounding areas.

.9 Mount and wire equipment control panels intended to be installed as part of packages or systems specified under this Division.

.10 Tune controllers to ensure systems do not hunt. Verify system operation throughout the one year maintenance period to ensure stable and acceptable operation in all operating conditions.

3.2 Identification and Labels

.1 Permanently identify all components, cables, wires, devices, valves, and accessories provided under this Section in accordance with specifications.

.2 All concealed equipment is to be noted by tagging the appropriate wall or ceiling panel with a colour coded dot.

.3 All field wiring shall be tagged at both ends.

.4 Each terminal or termination point shall have a designation unique for each wire.

3.3 Interlocking

.1 Three phase motor control starters or contactors are specified under other Divisions. This Division will provide interlocking or enabling relays on the 24 volt coils on the starters, or horsepower rated relays on single phase motors. Refer to equipment schedules.

.2 Interlocking is to be done through the BAS program, not by relay or auxiliary contacts on motor starters.

.3 Allow for installation and programming of specified number of relays for control of new fans. Connect to appropriate controller or main panel. Refer to points list.

3.4 Installation of Sensors – General

.1 Sensors shall be rigidly mounted and mountings shall be adequate for the environment within which the sensor operates.

.2 Supply and install approved temperature wells of the appropriate size and type for sensing water temperatures.

.3 All temperature, humidity, pressure, and flow sensors shall have their locations pre-approved by the Departmental Representative prior to installation.

.4 Fasten capillaries with clips to prevent abrasion and damage.

.5 Provide grommets where capillary penetrates the ductwork.

.6 Mount all sensing elements where stratification is minimal so accurate air temperature measurement is achieved.

.7 On air systems sample the duct temperatures to determine the best possible location for the sensors to eliminate stratification effects.

.8 Select the location to ensure proper space temperature is sensed and building, room and solar effects are minimized.

.9 All immersion temperature sensors shall have heat conductive compound added to the immersion wells.

3.5 Space Sensors and Thermostats

.1 Mount 1,500 mm above floor, or at the same level as lighting controls.

.2 Sensors located on outdoor or cold walls are to be provided with an approved insulating sub-base.

.3 Conduit and mounting boxes for sensors are to be sealed and plugged with expanding foam spray material to prevent convective air currents in the conduit or wall from affecting the sensor.

.4 Sensors are not to be located near or above heat producing equipment or fixtures.

.5 Sensors connected to a control panel by network wiring shall not be connected on the same sub network as any other piece of equipment other than sensors of the same type.

3.6 Low Limit Temperature Sensors – Coil Protection

.1 The vapour tension element shall be installed in a serpentine pattern across the complete coil face. For large coil areas use two sensors in series. Install on the upstream side of cooling coils and the downstream side of heating coils.

3.7 Wiring

.1 Flexible conduit with maximum length of 500 mm is allowed only from junction box and EMT conduit to equipment requiring flexible connection for vibration isolation or service access. BX sheathed cable is not approved.

.2 All control wiring not concealed in walls, shall be run in conduit. This includes mechanical and service rooms, and ceiling spaces. Conduit and wiring shall conform to the standards specified under Division 16.

.3 Conductors not installed in conduit shall be adequately secured with tie wraps or other approved methods, secured to building structure or walls. Wiring shall not be secured to other systems, conduit, piping or ductwork etc. Routing of exposed cable will be parallel with building lines, provided with 90 degree change of direction, tensioned to prevent sagging, and maintain clearance above ceilings by securement to structure or walls.

.4 Conduit and wiring accessories are not to be secured or mounted on equipment, except where terminations are to be completed. Circuitry from unit to unit is to be branched from a conductor run positioned remote from the equipment, allowing adjustment or removal of the equipment without the need to disrupt the conduit. Conduit shall not hinder access to, or opening of, access panels or doors and service positions. Flexible conduit shall be used where devices are mounted on doors or other moving components, including spring isolated elements.

.5 Any exposed conduits or cables shall be run parallel to or at right angles to building lines and in a neat manner.

.6 Wiring between controller and end devices in gas fired appliances equipped with electronic ignition, shall be shielded type cable. Cable to be 18 gauge, 10 conductor minimum, or more as required for additional components. Shield to be grounded at controller end and isolated at rooftop end.

.7 The Departmental Representative may reject work, wiring and installations not done in a fashion demonstrating care and workmanship to an acceptable level.

.8 Provide power circuit, 120 volts, single phase, for any control equipment requiring same. Power circuit to be run with materials and methods in compliance with standards specified under Division 16.

.9 Lace or clip groups of power or control conductors in panels, pull boxes and termination points.

.10 All grounding conductors are to be copper. All ground conductors to have green insulation jacket.

.11 Data cabling verification required at both ends shall be completed by the controls agent.

.12 The controls agent is responsible for the continuity of all controls wiring, even if the wiring was installed by others.

.13 All control and power wiring shall conform to the following ratings based on construction type as well as whether or not the ceiling space is used as a return air plenum:

.1 Non-combustible construction, plenum ceiling: FT6 rated wiring

3.8 Control Panel Wiring and Installation

.1 All wiring shall be clearly tagged at terminations.

.2 All equipment located inside the panel shall be securely fastened to the panel.

.3 Panels shall be mounted with the clearance and provision for mounting an additional future panel adjacent. Conduit entry into the SAP shall be from the top or bottom to allow for future panel additions on each side.

.4 Terminate all conductors on the terminal strips supplied with the enclosure.

.5 For new wiring, provide minimum 2m of spare wire in control enclosures for each point.

.6 If any wire splicing is required, it shall be completed in new terminal strips.

.7 All data cabling requires verification at both ends by same party.

.8 Refer to detail.

3.9 Calibration and Verification

.1 Refer to Section 23 05 93.3 Commissioning, Section 23 05 00, Documentation, Balancing and Record Drawings.

.2 For systems and components supplied or installed under this Section, check, adjust and calibrate each device and individual wiring sections, to the satisfaction of the Departmental Representative.

.3 Every point shall be checked end to end to ensure accuracy and integrity of systems.

.4 Provide signed and dated reports certifying that all systems have been tested and adjusted to specified or instructed conditions.

.5 Provide record copies of all set points, tests and adjustments for all devices and schedules.

3.10 Controllers

.1 Confirm location and positioning of all controllers and panels with Departmental Representative prior to installation. Submit plan.

.2 Mount devices as required near equipment served.

.3 Controllers are to be installed in compliance with the specifications and as shown on detail sheets.

.4 Unless otherwise specified, neither controllers nor any other device is to be mounted on equipment served. Devices are to be mounted on structure, walls or field fabricated brackets near equipment served in such a manner that equipment can be removed for service without dismounting the controller, sensor or device. Only wiring and conduit from the controller to the controlled device need be disconnected.

.5 Install controllers complete with accessories. Provide 120 volt AC connection, and transformers as required for each controller. Alternating current power source is to be taken from the control panel of equipment served, or from a dedicated 120 volt AC source provided from a local electrical panel.

.6 This Division is responsible for determining the nature of the requirement, providing necessary breakers and local panel, providing conduit and wire and other accessories from the panel to the point of use. All wiring and accessories to be in compliance with the standards of Division 16.

3.11 Electric Heater

.1 Provide relays on each indicated heater to control operation.

3.12 Trend Logs

.1 Once the systems has been commissioned and all components are operational, provide trend logs over a minimum period of two days for all rooms, zones, primary systems, terminal systems and any other systems required to confirm correct BMS operation.

.2 All points must be trended using a colour display format, complete with legend. Use a multi-trend system to display set points and measured parameters for individual systems on the same page. Trends shall be recombined and resubmitted if the format is deemed to not be acceptable by the Departmental Representative.

.3 Identify and explain any discrepancies or undesired systems responses.

.4 Be prepared to alter programming, tune control loops, adjust damper linkages, verify sensor calibration, adjust dead bands etc.

.5 Coordinate with boiler start-up technician to provide trend logs showing that boilers operate consistently and are able to maintain set points without hunting.

.6 Repeat the above process until trend logs show that systems operation is acceptable and within tolerances.

3.13 Points List

.1 Refer to points list at the end of this section in Specification 25 90 0q

1. GENERAL

1.1 Graphics

.1 Existing graphics shall be updated to include new points and systems.

.2 Current Sensor Display: Any electric motor required by the points list to display running amps, shall also have on the display, whether graphics or screen text, the rated full load amps of the motor.

.3 All set points, valves and measurements listed in the control sequences must be user adjustable from the graphical user interface.

1.1 Breakout Price #1 Item 5.4 Bus Passenger Processing Area HVAC Control Upgrade

.1 The existing system consists of a common outside air plenum for existing heat pumps HP-1, HP-2 and HP-3.

.2 Each heat pump is provided with a custom built economizer. Outside air is drawn into each heat pump using the mixed air dampers.

.3 The Bus Passenger Processing Area is currently set to run on a schedule for 5am to 10pm daily. This schedule shall be disabled.

.4 The new occupancy sensor shall be used to determine occupancy.

.5 During occupied mode, the programming shall remain as is.

.6 During unoccupied modes, the mixed air dampers shall close to 100% recirculation. The space temperature set point shall be maintained at 18 deg. C (adjustable) in heating and 25 deg. C (adjustable) in cooling.

1.2 Breakout Price #1 Item 5.5 Public Washroom Control Upgrade

.1 The existing system consists of a furnace F-3 and exhaust fan EF-20. The furnace acts as a make up air unit for exhaust fan EF-20 and provides heating and cooling to the washrooms.

.2 Two new occupancy sensors will be installed and used to control F-3 and EF-20. One sensor in Men's NO102 and one sensor in Women's NO103.

.3 If either occupancy sensor detects occupancy, EF-20 and F-3 shall run as per original programming. The fans will continue to run while the space is occupied and for 30 minutes (adjustable) after the space changes to unoccupied.

.4 When the space is unoccupied, the space temperature set points shall be maintained at 18 deg. C (adjustable) in heating and 25 deg. C (adjustable) in cooling.

1.3 Breakout Price #1 Item 5.7 PIL Booths Standby Ventilation Energy

.1 The existing system consists of a common outside air plenum for existing heat pumps HP-1, HP-2 and HP-3.

.2 Each heat pump is provided with a custom-built economizer. Outside air is drawn into each heat pump using the mixed air dampers.

.3 HP-2 is used to ventilate the PIL booths with 100% outside air. During heating, ventilation air tempered using the heat pump as 1st stage and subsequent stages 2 to 6 by the electric duct heater EHD-2.

.4 During heating, the existing duct heater is used to control the preheat temperature to 15 deg. C and the heat pump heats the air.

.5 A second duct heater was provided to trim heat in the space.

.6 Space conditioning of the PIL Booths is provided by an air source heat pump.

.7 The existing system creates temperature swings during both heating and cooling.

.8 Existing programing will remain the same with the following changes.

.9 HP-2 will function only if one of the four PIL occupancy sensors detects occupancy.

.10 During unoccupied mode, space temperature will be maintained at 18 deg. C (adjustable) in heating and 25 deg. C (adjustable) in cooling. The existing air source heat pump will maintain these conditions.

.11 During occupied mode, space temperature will be maintained at 21 deg. C (adjustable) in heating and 24 deg. C (adjustable) in cooling. The existing air source heat pump will maintain these conditions when any one of the four PIL occupancy sensors detects occupancy, space temperature will be maintained by the air source heat pump and HP-2 will be used to provide ventilation air and pressurization.

.12 It should be noted that temperature swings during cooling mode are expected.

.13 The existing electric duct heater EDH-2 will be replaced with a fully modulating duct heater with SCR control.

.14 On a call for ventilation/pressurization from one of the four PIL Booth occupancy sensors the system will be sequenced as follows for heating:

.1 HP-2 Supply fan will start.

.2 The supply air temperature sensor will monitor supply air from HP-2.

.3 HP-2 minimum entering air temperature is 11.7 deg. C. The lift that HP-2 will provides will cause the supply air temperature to be above the heating set point. Essentially in heating this eliminates the use of HP-2 to temper the air.

.15 If outside air temperature is less than 18 deg. C, EDH-2 will be used to temper ventilation and pressurization air to the PIL Booths.

.16 The supply air temperature sensor will be used to modulate the EDH-2 SCR controller to meet the set point of 20 deg. C.

.17 If the outside air temperature is between 18 deg. C and 26 deg. C, the supply air from HP-2 will not be tempered. Both EDH-2 and the HP-2 compressor shall be off.

.18 If the outside air temperature is above 26C, the heat pump will be switched to cooling and the compressor will run.

.19 The existing duct heaters in the PIL Booths (EDH-6, 7, 8 and 9) will remain but will not be used unless the existing heat pump space temperature cannot be maintained by the air source heat pump.

.20 The maximum air temperature for HP-2 is 30 deg. C. If the outside air temperature is above 30 deg. C, HP-2 will be shut off and the PIL Booths ventilation cooling load will be addressed using the air source heat pumps. Space temperature may become uncomfortable on warm days.

1.4 Breakout Price #1 Item 5.9 Reduce Admin. Building Ventilation

.1 The existing system consists of a common outside air plenum for existing heat pumps HP-22, HP-23, HP-25, HP-26, HP-27, HP-28, HP-29 and HP-30.

.2 Each heat pump is provided with a custom built economizer. Outside air is drawn into each heat pump using the mixed air dampers. Only HP-22, HP-23, HP-26, HP-27, HP-29 economizer control will be affected.

.3 The building contains a common relief air system. Relief air flows back to Mechanical Room NA217. As the economizers open, air is relieved through the relief air louvre in NA217. This system has been disabled.

.4 Existing controls sequence shall remain as is with the following changes.

.5 For Item 5.9, a user adjustable Occupancy Schedule shall be implemented as noted:

TAG	DECRIPTION	HOURS OF OPERATION	MODE
HP22	Admin 2nd Floor Chief Office	M-F 8am to 4pm	Occupied
		All other hours	Unoccupied
HP23	Admin 2nd Floor Offices	M-F 8am to 4pm	Occupied
		All other hours	Unoccupied
HP26	Admin 1st Floor Immigration	M-F 8am to 9pm	Occupied Demand Controlled Ventilation
		All other hours	Occupied Demand Controlled Ventilation
HP-27	Admin 1st Floor	M-F 8am to 9pm	Occupied Demand Controlled Ventilation
		All other hours	Occupied Demand Controlled Ventilation
HP-29	Admin 2nd Floor Food Inspection and conference room	M-F 8am to 4pm	Occupied Full Ventilation
		All other hours	Unoccupied

.6 The occupied mode will be defined as per existing control sequence. Minimum outside air values will remain unchanged, economizer controls will remain unchanged unless overridden as noted above.

.7 During occupied demand controlled ventilation mode, mixed air dampers shall be adjusted maintain CO2 levels at or below 1100ppm. The DDC system will monitor all CO2 sensors for spaces served by a common heat pump. The space with the highest CO2 reading shall be used to control the mixed air dampers. (Applicable to HP-26 and HP-27 refer to points list.

.8 During unoccupied mode, each economizer will be closed to 100% recirculation air. Fans will only cycle on a call for heating or cooling. The unoccupied temperature will be controlled to maintain the space between 19 deg. C and 20 deg. C.

1.5 Breakout Price #1 Item 5.10 Replace Vestibule Electric Unit Heater Thermostat

.1 Provide new heating only digital display thermostat and lockable cover.

1.6 Breakout Price #1 Item 5.11 Install Programmable Thermostat in PWGSC Container

.1 Provide new 7-day programmable heating and cooling thermostat.

.2 Program thermostat with the following schedule

TAG	DECRIPTION	HOURS OF OPERATION	MODE
N/A	HVAC System for PWSG Container	M-F 6:30am to 3:30pm	Occupied
		All other hours	Unoccupied

.3 The following set points shall be used to program the thermostat.

.1 Occupied heating set point: 21 deg. C

.2 Unoccupied heating set point 16 deg. C

.3 Occupied cooling set point: 24 deg. C

.4 Unoccupied cooling set point 28 deg. C

1.7 Split System HVAC Control (Multi Head System)

.1 General operating sequences are as follows:

.1 During occupied periods, fans will run continuously. Heating or cooling will be provided as demanded by individual zones, by manipulation of coil control valves on each unit.

.2 During unoccupied hours, fans cycle on demand of unoccupied period set point for heating only. Cooling demands will go unheeded.

.2 Install factory control accessories.

.3 Each fan coil is provided with a thermostat and I/O interface for DDC integration.

.4 An additional room sensor will be required for room temperature feedback to the DDC system for monitoring.

.5 Install control panels in ceiling space or as located on plans. Provide access for service.

.6 Provide auxiliary relays controlled by BAS heat cool sensor and control, to activate cooling control circuits in cooling units. Cooling set points through BAS to be set no lower than 23 degrees C.

.7 When outside air temperature is 18 deg. C (adjustable), the system shall be switched into cooling.

.8 When outside air temperature is 17 deg. C or below (adjustable), the system shall be switched into heating.

.9 The thermostat set points shall be set as follows:

.1 Heating set point shall be initially set to 21 deg. C.

.2 Cooling set point shall be initially set to 24 deg. C.

.10 Room temperature will be monitored by the DDC room temperature sensor alarm operator if temperature exceeds cooling set point by 1 deg. C or is below heating set point by 1 deg. C.

.11 Fans shall run on an adjustable schedule initially set to start at Monday to Friday on at 7:00am and off at 5:00pm.

.12 During unoccupied hours, the system will only run to maintain setback temperatures as follows:

.1 Heating unoccupied set point 18 deg. C (Adjustable)

.2 Cooling unoccupied set point 28 deg. C (Adjustable)

.13 In the event that the compressors lock out from low ambient temperature or heating set point cannot be met, backup heating will be provided by the perimeter baseboard systems. These systems will be controlled by the thermostat provided with the fan coils.

1.8 HRV-1 Control

.1 General operating sequences:

.1 During occupied periods, fans will run continuously.

.2 During unoccupied hours, fans will be off.

.2 HRV1-HC-1 shall modulate to maintain the supply air temperature at 21 deg. C during both heating as determined by the air source heat pump mode of operation.

.3 Monitor the outside air entering temperature at the inlet to the HRV. Ensure the temperature remains above minimum to prevent frost. Initially set to 0 deg. C (Adjust as required based on HRV manufacturers recommendations.)

.4 Provide additional room sensor (over and above the thermostat provided with the fan coil) for room temperature feedback to the DDC system for monitoring.

.5 Install control panels in ceiling space or as located on plans. Provide access for service.

.6 When outside air temperature is 18 deg. C (adjustable), The system shall be switched into cooling.

.7 When outside air temperature is 17 deg. C or below (adjustable), the system shall be switched into heating.

.8 The thermostat set points shall be set as follows:

.1 Heating set point shall be initially set to 21 deg. C.

.2 Cooling set point shall be initially set to 24 deg. C.

.9 Room temperature will be monitored by the DDC room temperature sensor alarm operator if temperature exceeds cooling set point by 1 deg. C or more or is below heating set point by 1 deg. C or more.

.10 Fans shall run on an adjustable schedule initially set as follows:

.1 Monday to Friday on at 7:00am and off at 5:00pm.

.11 During unoccupied hours, the system will only run to maintain setback temperatures as follows:

.1 Heating unoccupied set point 18 deg. C (adjustable)

.2 Cooling unoccupied set point 28 deg. C (adjustable)

.12 Coil Freeze Protection

.1 Monitor the heating water return temperature from HRV-HC-1. If the return temperature deviates more than 22 deg. C from the heating water set point alarm operator.

1.9 Exhaust Fan Control F2

.1 F-2 is controlled by a wall switch and relay timer installed by Division 16.

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 General requirements that are common to National Master Specification (NMS) sections found in Division 26 - Electrical, 27 - Communications and 28 - Electronic Safety and Security.

.2 Alternate prices

1. Refer to bid documents for an alternate price numbers, descriptions and format.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1-15, Canadian Electrical Code, Part 1 (23th Edition), Safety Standard for Electrical Installations.

.2 CSA C22.2 No. 248.

.3 CAN3-C235-83(R2000), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC)

.1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.

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

.1 Material Safety Data Sheets (MSDS).

1.3 DESIGN REQUIREMENTS

.1 The intent of the drawings and specifications is to include all labour, products and services necessary for complete work, tested and ready for operation.

.2 The drawings and specifications are complementary, and what is required by any one shall be as binding as if required by all.

.3 It shall be the responsibility of the Contractor to supply and install all material necessary to complete the work.

.4 Field verification of scale dimensions on drawings is directed, since actual locations, distances and levels will be governed by actual field conditions.

.5 If discrepancies or omissions in the drawings or specifications are found, or if intent or meaning is not clear, advise the Departmental Representative for clarification before submitting tender.

.6 Responsibility to determine which Division provides various products and work rests with the Contractor. Additional compensation will not be considered because of differences in interpretation of specifications.

.7 Divisions 26, 27 and 28 specifications shall form part of the contract documents and shall be read, interpreted and coordinated with all other Divisions. Division 00 (Procurement and Contracting Requirements), Division 01 (General Requirements) and Division 02 (Existing Conditions) and Amendments and Supplements thereto form a part of this Division and contain items related to the electrical work. In the event that work is not done, the General Contractor has the right to order the Sub-Contractor or Mechanical Sub-Contractor to perform the work at no charge to the Owner.

.8 The drawings and specifications form an integral part of the Contract Documents. Neither the drawings nor the specifications shall be used alone. Work omitted from the drawings but mentioned or reasonably implied in the Specifications, or vice versa, shall be considered as properly and sufficiently specified and shall be provided. Misinterpretation of any requirement of either plans or specifications shall not relieve this Contractor of this responsibility of properly completing his trade to the approval of the Architect and Departmental Representative.

.9 Operating voltages: to CAN3-C235.

.10 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.11 Language operating requirements: provide identification nameplates and labels for control items in English.

.12 Use one nameplate or label for English language (where applicable).

1.4 SUBMITTALS

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

.2 Product Data: submit WHMIS MSDS in accordance with Section 01 60 00 - Sustainable Requirements: Construction.

.3 Submit for review updated single line electrical diagram under plexiglass (450mm X 610mm), to be located in the Canadian main electrical room.

.1 Electrical distribution system (single line diagram).

.4 Shop drawings:

.1 Submit drawings stamped and signed by the general and electrical contractors licensed in corresponding jurisdiction.

.2 Submit number of copies as outlined in Division 00 and 01.

.3 Show details, dimensions, construction, size, arrangement, operating clearances, performance characteristics and capacities of products and parts of the work.

.4 Manufacture of products shall conform to reviewed shop drawings.

.5 Where applicable include wiring, single line and schematic diagrams.

.6 Include wiring drawings or diagrams showing interconnection with work of other Divisions.

.7 Keep one complete set of shop drawings at job site during construction.

.8 If changes are required, notify Departmental Representative of these changes before they are made.

.9 Provide three (3) colour charts with all luminaire shop drawings requiring factory colours.

.10 The architect will provide RAL numbers for custom colour luminaires.

.11 Each shop drawing shall be stamped and signed by the Electrical Contractor to indicate that the drawing has been checked for conformance with all requirements of the drawings and specifications, that the equipment has been coordinated with other equipment to which it is attached or connected, and that all dimensions have been verified to ensure the proper installation of equipment within the available space without interference with the work of other trades. Ensure that mechanical and structural co-ordination is complete before submitting drawings for review. Shop drawings submitted to the Consultant for review that are not checked and submitted in accordance with the preceding requirements will be rejected for resubmittal.

.12 Submit samples as required where specified.

.5 Quality Control: in accordance with Section 01 40 00 - Quality Control.

.1 Provide CSA certified equipment and material.

.2 Where CSA certified equipment and material is not available, submit such equipment and material to authority having jurisdiction or inspection authorities for special approval before delivery to site.

.3 Submit test results of installed electrical systems and instrumentation.

.4 Permits and fees: in accordance with General Conditions of contract.

.5 Submit, upon completion of Work, load balance report as described in PART 3 - Load Balance.

.6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.

.6 Immediately upon notice of contract award, submit to the Departmental Representative, for review, a further break down of the tendered price under the following headings:

.1 Site set-up, permits, etc.

.2 Distribution equipment – Material

.3 Distribution equipment – Labour

.4 Site work – Material

.5 Site work - Labour

.6 Luminaires and accessories – Material

.7 Luminaires and accessories – Labour

.8 Lighting control systems – Material

.9 Lighting control systems - Labour

.10 Fire alarm system – Material

.11 Fire alarm system – Labour

.12 Intruder alarm system – Material

.13 Intruder alarm system - Labour

.14 Lighting, equipment and receptacles rough-in - Material

.15 Lighting, equipment and receptacles rough-in - Labour

.16 Miscellaneous equipment – Material

.17 Miscellaneous equipment - Labour

.19 Close out, As-builts, testing, maintenance manuals, training

Submit progressive breakdown under these headings with each progress claim.

Progress claims submitted to the Consultant for review that are not submitted in accordance with the preceding requirements will be rejected for resubmittal.

.7 Within 15 days of award of contract, a schedule must be submitted by the Contractor to the Architect, Owner and Departmental Representative showing projected ordering and delivery dates of all products to meet required construction schedule.

.8 Project Record Drawings:

.1 Before commencing work, obtain two sets white prints of all drawings pertinent to the work. Keep drawings on site and, daily or weekly as necessary, record in coloured pencil all changes, alterations, or additions in runs of conduit, numbers and location of panels, luminaires and devices that may occur during progress of the work. .

2. At the conclusion of the job, obtain one set of updated drawings from the Engineer. Copy as built information and forward the marked up drawings to the Engineer for updating of the original documents. Refer to Division 1 for more information.

.9 Maintenance Manuals:

.1 Before requesting final certificate, submit 3 copies of the maintenance manual as specified in Division 1 and as further called for in this Specification.

.2 Include in the manuals information based on the following requirements:

.1 Sturdy hard cover expandable post binder(s) Maximum 4” (100mm) in size. Provide multiple volumes as required.

.2 Final Maintenance Manuals shall include:

.1 Name of Project

.2 Type of Manual (I.e., Maintenance Manual for Electrical Systems)

.3 Listing (Company names, addresses, and telephone numbers) of Consultant, Electrical Consulting Engineer General Contractor, Electrical Contractor, including his Subcontractors (i.e., Communication Systems Contractor, Testing Agency. etc.).

.4 Index Page

.5 List all equipment, systems and special references such as conduit colour coding schedule, applicable Test Reports, Certificates, etc. The Index shall be arranged in the same order as the Specifications

.6 Provide, between each piece of equipment system, divider pages complete with plastic tabs with large numbers corresponding to the Index listing

.7 Guarantees and Warranties

.8 Include all applicable guarantee and warranty information.

.9 Test Reports and System Demonstration

.10 Include copies of all applicable Test Reports (refer to Section 16010 Testing and Adjusting) and manufacturers' letters verifying test completion.

.11 Include a copy of Final Certificates from Electrical Inspection Department.

.12 All schedules included in the Specifications (Motor Schedules, lighting Fixture Schedules, Panel Schedules, Equipment Schedules. etc.) shall be updated to reflect all changes made during tender and construction periods.

.13 In addition to the hard copies of Maintenance Manuals provide electronic versions of Manuals on Compact Discs as described in Division 1.

.3 Provide manual and seminar with Owner forces to ensure proper operation of building prior to Substantial Performance.

.4 In addition to test data submitted as part of the maintenance manuals, submit test results of equipment and cables to the Departmental Representative as tests are completed.

1.5 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

.2 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices in accordance with authorities having jurisdiction as per the conditions of Provincial Act respecting manpower vocational training and qualification.

.3 Site Meetings:

.1 In accordance with Section 01 32 16 - Construction Progress Schedule - Bar (GANTT) Charts.

.4 Health and Safety Requirements: do construction occupational health and safety in accordance Work Safe Standards.

.5 Comply with all laws, ordinances, rules, regulations, codes and orders of all authorities having jurisdiction relating to this work.

.6 Complete installation to comply with all rules of the current edition of the Canadian Electrical Code, its latest amendments, local municipal codes and the current edition of the British Columbia Building Code.

.7 Comply with C.S.A. Electrical Bulletins in force at time of tender submission.

.8 Quality of work specified and/or shown on the drawings shall not be reduced by the foregoing requirements.

.9 Submit to the Electrical Inspection Department having jurisdiction necessary number of drawings and specifications for examination and approval prior to commencement of work.

.10 Pay associated fees and obtain all permits, licenses, etc. required for the work.

.11 Inspection:

.1 Furnish a Certificate of Acceptance from Inspection Department on completion of work.

.2 Incorporate a copy of the Certificate of Acceptance in the operating and maintenance manuals.

.12 Standard of Workmanship:

.1 Execute all work in a competent manner and to present an acceptable appearance when completed.

.2 Employ a competent supervisor and all necessary licensed tradesmen to complete the work in the required time.

.3 Arrange and install products to fit properly into designated building spaces.

.4 Unless otherwise specified or shown, install products in accordance with recommendations and ratings of manufacturers.

.5 Schedule work with all other contractors in order to maintain job progress schedule and to avoid conflicts in the installation of work by various trades.

.13 Tests:

.1 The installation shall be free of opens and grounds. On completion, measure insulation resistances and comply with Table 24 of Canadian Electrical Code.

.2 Test all wiring and connections for continuity and grounds before equipment is energized.

.3 Provide current readings for each feeder under normal load for system balancing.

.4 Before energizing system, check all connections and set and calibrate all relays and instruments for proper operation, obtain necessary clearances, approval and instructions from utility company.

.5 Carry out all tests and furnish all equipment required to demonstrate safe and proper completion of the work, without cost to Owner.

.6 Check load balance on all feeders and make necessary adjustments to provide a "balanced" load.

.14 Guarantees:

.1 Guarantee all work for one year, following final acceptance for each building. This guarantee shall include all problems caused by improper installation or equipment failure.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Material Delivery Schedule: provide Owner's Representative with schedule within 2 weeks after award of Contract.

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

.3 Use all means necessary to protect the products of this Division before, during and after installation and to protect products and installed work of all other trades.

.4 Immediately make good any damage by repair or replacement at no additional cost to the Owner and to the approval of the Architect.

.5 Remove dirt, rubbish, grease, etc. from all equipment surfaces.

1.7 SYSTEM STARTUP

.1 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

1.8 SEISMIC

.1 Provide a complete system of structural support and bracing to all electrical equipment to comply with Part 4, Structural Design, of the B.C. Building Code.

.2 This Contractor shall submit to the Electrical Engineer signed and sealed letters of assurance and letter of compliance by a certified professional recognized in the field of seismic design.

.3 All electrical equipment shall be braced or anchored to resist a lateral force acting in any direction using the following criteria.

.1 Fixed equipment on structure - horizontal force factor = 0.9

.2 Suspended equipment - horizontal force factor = 4.4

.4 Zonal velocity ratio (horizontal ground velocity) shall be determined from the applicable section of the supplement to the National Building Code.

.5 Where drilling of the structure is required for anchorage requirements, the drilling shall be subject to the approval of the structural engineer.

.6 Provide all required seismic bracing, supports, bolts, washers, nuts, etc. for conduits and conduit supports, cable tray and cable tray supports, teck cable, etc.

.7 Provide a system to secure all recessed luminaires independently from the suspended ceiling system. Luminaires shall be supported directly and laterally from the building structure above, using No. 12 gauge wire minimum.

.8 Seismic T-bar clips (Caddy, AGI and similar products) are not approved for this project.

.9 Provide shop drawings of all seismic support and bracing.

1.9 CHANGES TO THE CONTRACT

.1 Notwithstanding other provisions of the contract, this contractor shall supply detailed information for the valuation of all changes to the contract. Such information shall include, but not necessarily be limited to the following:

.1 Labour hours per unit of material or equipment to be added, deleted, or altered.

.2 Units of material or equipment to be added or deleted.

.3 Cost to the contractor per unit of material, equipment and labour, broken down by category of labour and type of material or equipment.

.4 Extensions of the above to arrive at total costs.

.5 Other miscellaneous and identifiable charges such as conveyance, restocking, overhead, profit, etc.

.6 Break down of subcontractors' work as required by this section.

.7 Lot pricing is not acceptable.

Part 2 Products

2.1 MATERIALS AND EQUIPMENT

.1 Provide material and equipment in accordance with Section 01 60 00 – Material and Equipment.

.2 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from authority having jurisdiction or inspection authorities before delivery to site and submit such approval as described in PART 1 - Submittals.

.3 Selected products are specified and/or shown on the drawings, and identified by manufacturer's name, type and catalogue number.

.4 Equivalent products may be considered if sufficient information is submitted at least 5 working days before tender closure, to enable the Departmental Representative to determine acceptability of such products. **Submittals by fax will not be accepted**.

.5 Review of Products:

.1 Immediately after notification of award of contract, review with the Departmental Representative a list of products proposed.

.2 After approval of product list, no subsequent changes will be permitted except as specified hereafter.

.6 Substitution of Products:

.1 After approval of the list of products, no substitution of any item either specified, preapproved or approved during tender will be permitted without written approval of the Departmental Representative.

.2 To receive approval, proposed substitutions must equal or exceed the quality, finish and performance of those specified and/or shown, and must not exceed the space requirements allotted on the drawings.

.3 Provide documentary proof of date of original order, equality, difference in price (if any) and delivery dates in the form of certified quotations from suppliers of both specified items proposed substitutions to the Departmental Representative.

.4 Include costs for any associated work to accommodate such substitutions, including engineer's or architect's time and revisions to the work of other divisions (if applicable).

.7 Unless otherwise specifically called for in the Specifications, uniformity of manufacture shall be maintained for similar products throughout the work.

2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.

.2 Control wiring and conduit: in accordance with Section 26 05 34 - Control Devices except for wiring and connections below 50 V which are related to control systems specified in mechanical sections and as shown on mechanical drawings.

2.3 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of authority having jurisdiction or inspection authorities.

2.4 WIRING TERMINATIONS

.1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors as shown on the Drawings.

2.5 EQUIPMENT

.1 Identify electrical equipment with nameplates as follows:

.1 Nameplates: lamicoid 3mm thick plastic engraving, black face, white core, lettering accurately aligned and engraved into core mechanically attached with self-tapping screws.

.2 Sizes as follows:

NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

.2 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.3 Disconnects, starters and contactors: indicate equipment being controlled, circuit number and voltage.

.4 Terminal cabinets and pull boxes: indicate system and voltage.

.5 Clearly mark all exposed conduit, pull boxes, junction boxes, etc., to indicate the nature of service.

.6 Labels for distribution centres, panels and motor control centres shall include equipment designation, rating (i.e. 225 A-120/208V-3PH-4W), where the equipment is being fed from, (i.e. MDC).

.7 Provide adhesive labels to identify the following:

.1 Receptacle circuit numbers
.2 Voice/data jack identification

.8 Utilize permanent felt pen markers to identify all junction boxes in ceiling space as to system (e.g. Fire Alarm, Intruder Alarm etc.) or if power wiring, circuit numbers contained therein.

.9 Labels for cleaning receptacles are to be blue with “cleaning receptacle – cct#”

2.6 CONDUIT IDENTIFICATION

.1 Colour code all conduits.

.2 Located coding on all conduits and cables exposed after completion of building and in suspended removable ceilings.

.3 Use plastic tape or paint for coding at all points where conduit or cable enters walls, ceiling, or floor, and at maximum 15 meter intervals.

.4 Use 25mm wide prime colour:

	Prime Colour
Up to 250V	Yellow
Above 250V	Black
Telephone	Green
Communication Systems	Green
Fire Alarm	Red
Security Systems	Blue
Sound System	Orange
CCTV	Light blue
Cable TV	Light green

2.7 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

2.8 PRODUCT FINISHES

.1 Finish all cabinets, panelboards, switchboards, equipment cabinets, cable trays, etc. in ANSI 61 grey enamel unless otherwise specified.

.2 Apply primer on all items which are to be finished on the job.

.3 Touch up all damaged painted finishes with matching lacquer, or, if required by the Architect or Departmental Representative, completely repaint or replace damaged surface.

Part 3 Execution

3.1 INSTALLATION

.1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

.2 Examine the site of work and become familiar with all features and characteristics affecting this work before submitting tender.

.3 No additional compensation will be given for extra work due to existing conditions which such examination should have disclosed.

.4 Report to the Departmental Representative any unsatisfactory conditions which may adversely affect the proper completion of this work.

.5 Co-ordination with Other Divisions:

.1 Examine the drawings and all divisions of the specifications. Before commencing work, obtain a ruling from the Departmental Representative if any conflict exists, otherwise no additional compensation will be made for any necessary adjustments.

.2 Install anchors, bolts, pipe sleeves, hangar inserts, etc. in ample time to prevent delays.

.3 Lay out the work and equipment with due regard to architectural, structural and mechanical features. Architectural and structural drawings take precedence over electrical drawings regarding locations of wall, doors and equipment.

.4 Do not cut structural members without approval of the Structural Engineer and without prior consultation with the Electrical Departmental Representative.

.5 Examine previously constructed work and notify the Departmental Representative of any conditions which prejudice the proper completion of this work. Commencement of this work without such notification shall constitute acceptance of other work.

.6 Confirm responsibility with other FortisBC and Telus.

.6 Utility charges will be paid directly by the Owner.

.7 Separation of Services:

.1 Maintain separation between electrical wiring system and building piping, ductwork, etc. so that wiring system is isolated (except at approved connections to such systems) to prevent galvanic corrosion.

.2 In particular, contact between dissimilar metals, such as copper and aluminum, in damp or wet locations is not permitted.

.3 Do not support wiring from pipes, ductwork, etc. hangers for suspended ceilings may be used for the support of wiring only when approval is obtained from ceiling installer, and approved clips or hangers are used.

3.2 TEMPORARY LIGHTING & POWER

.1 Provide grounded extension cords and temporary lights required for electrical work.

.2 Temporary power service, temporary lighting and power distribution systems will be provided under Division 1.

3.3 NAMEPLATES AND LABELS

.1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

.2 Clearly mark all exposed conduit, pull boxes, junction boxes, etc., to indicate the nature of service.

.3 Provide neatly typed circuit directories on panelboards to indicate the area (room number) or equipment controlled by each branch circuit.

3.4 INSTRUCTIONS TO OWNER'S PERSONNEL

1. Instruct Owner's personnel in operation and maintenance of electrical equipment and systems.

2. Pay all costs for such instruction, including any costs related to instruction by manufacturer's representatives.

3. Instruct and demonstrate to the Owner's representative. The opening and maintenance procedures for all electrical systems using the assistance of the specialist sub-trades and manufacturer's representatives for instruction and include all such coasts in the tender. Systems to be demonstrated shall include, but not be limited to, the following:

    1. Operation of circuit breakers, meters, etc.
    2. Motor control controllers and associated components
    3. Routing and Installation of main feeders
    4. Fire alarm systems
    5. Labeling and identification schemes
    6. Sound systems
    7. Communication systems
    8. Use of Maintenance Manuals
    9. Intruder alarm systems

4. Arrange an acceptable time with the owner and submit a program of instruction and demonstration of the consultant's approval. Assume that the Owner's representative is not familiar with any of the special equipment and/or systems installed.

5. Submit to the Consultant, at the time of Substantial Performance inspection, a complete list of systems starting for each system:

    1. Date instructions were given to the Owner's Staff.
    2. Duration of instruction.
    3. Name of persons instructed.
    4. Other parties present.
    5. Signature of the Owner's staff stating that they properly understood the system installation, operation, and maintenance equipments and identifying any systems or equipment which were not demonstrated to their satisfaction and which must be re-demonstrated

3.5 RENOVATIONS IN EXISTING BUILDINGS

.1 Remove all existing luminaires, panels, feeders, outlet boxes, switches, receptacles, etc. not required for the renovated layout shown. All equipment removed and not reused shall become the property of the Owner. Unless otherwise noted, all equipment installed in renovated areas shall be new. All wiring shall be installed concealed.

.2 Supply and install new breakers where required in existing panels to pick up additional circuits indicated on the drawings. Existing breakers may be reused in existing panels wherever possible.

.3 All existing luminaires that are relocated shall be removed, checked, serviced, cleaned prior to reinstallation.

.4 In areas undergoing upgrading requiring removal and replacement of wall covering, remove existing devices and extend circuitry, provide extension rings and reinstall devices as required.

.5 Examine the site and existing conditions prior to tendering on this work and make due allowance for these conditions in the tender. Confirm all locations and routings of any existing services, which might be affected by this installation and allow in the tender for such additional work.

.6 Indication on the drawings of existing conduit, outlets and other electrical apparatus is based on casual field observations and records of past contracts. As such, this information represents the best data available but is not guaranteed to be full or accurate. Verify that filed measurements and circuiting diagrams are as indicated on Drawings and that abandoned wiring and equipment serve only abandoned facilities. Report discrepancies to Consultant before disturbing existing installation.

.7 Submission of a tender of this work shall indicate that the Contractor has made a thorough examination of the site and has accepted the existing conditions.

.8 Where alterations and/or additions to existing equipment or apparatus are required to be made by these documents. Ensure that all changes are made in accordance with the current edition of the Canadian Electrical Code, Part 2, obtain re-certification, and include re-certification costs in the tender.

.9 Permit no interruptions to the electric power, fire alarm, telephone, or other similar systems in the existing building during normal working hours. Advise the Owner in writing of any intended interruptions outside of these normal hours, including the time and duration of outage. Obtain permission from Owner at least 7 days before partially or completely disabling any of the systems. The Owner may cancel such permission in emergencies at the last minute without penalty or extra cost. Minimize duration of outage.

.10 Assume full responsibility for any disruption to existing services and systems. Provide all necessary material and equipment and provide all labor at no extra cost for any temporary connections to be required to maintain services during work in the existing buildings. Include the removal of such temporary connections at completion of the work in the tender price.

.11 All surplus electrical equipment, devices, and light fixtures shall be considered Owner's property. Determine from the Owner which material he wishes to keep and transport and store such items at a location, on site, as directed by the Owner. All other surplus materials such as conduit, wiring, devices, etc. shall be removed from the site. Request a signed receipt for surplus material turned over to the Owner and provide a copy of same to the Consultant.

3.2 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete.

.1 Sleeves through concrete: schedule 40 steel pipe or plastic, sized for free passage of conduit, and protruding 2" (50 mm).

.2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

.3 Install cables, conduits and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.

3.3 LOCATION OF OUTLETS

.1 Electrical drawings are, unless otherwise indicated, drawn to scale. Where exact dimensions and details are required, refer to Architectural and Structural drawings.

.2 Outlet and equipment locations shown on the drawings are approximate. Locations may be revised to suit construction and equipment arrangements without additional cost to the Owner, provided that no additional labour or material is required and installation has not been completed.

.3 No extra charge for materials and labour shall be added to the Contract for outlets moved within 15 feet from the location shown on the plans prior to rough-in.

.4 Maintain luminaire locations wherever possible. Notify the Departmental Representative of conflicts with other services.

.5 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.

.6 Do not install outlets back-to-back in wall; allow minimum 6" (150 mm) horizontal clearance between boxes.

.7 Locate light switches on latch side of doors, refer to the architectural drawings and site confirm door swings.

.8 Locate disconnect devices in mechanical and elevator machine rooms on latch side of door.

3.4 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 heights noted on the drawings.

3.5 CO-ORDINATION OF PROTECTIVE DEVICES

.1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.6 FIELD QUALITY CONTROL

.1 Load Balance:

.1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

.2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

.3 Provide upon completion of work, load balance report as directed in PART 1 - Submittals: phase and neutral currents on panelboards and dry-core transformers operating under

normal load, as well as hour and date on which each load was measured, and voltage at time of test.

.2 Conduct following tests in accordance with Section 01 40 00 - Quality Control:

.1 Circuits originating from branch distribution panels.

.2 Lighting and its control.

.3 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.

.4 Systems: fire alarm system.

.3 Substantial Completion:

.1 Prior to requesting substantial completion inspection for each building, the following items must be complete:

.1 Fire alarm verification certificate and technician's test report must be submitted.

.2 Emergency lighting system must be operational and tested by electrical contractor.

.3 All exit lights must be installed and be operational and tested.

.4 Provide Certificate of Acceptance from Electrical Inspection Department.

.5 Project Record drawings must be submitted to Departmental Representative for review.

.6 Maintenance manuals must be submitted to Departmental Representative for review.

.7 All outlets must have coverplates installed.

.8 All electrical equipment not located in service rooms must have covers and/or doors installed complete.

.9 Any devices not installed must have the wiring made safe and terminated in an outlet box complete with cover.

.10 Provide grounding test results as per specifications.

.11 Continuity of fire separations at electrical penetrations must be complete.

.12 Provide B1/B2 and C-B Schedules to verify the entire installation meets British Columbia Building Code seismic requirements.

.13 Provide written confirmation of the following items:

.1 Cleaning and testing of systems are completed.
.2 Control functions have been calibrated and tested.
.3 Requirements of the instructions to the Owner have been completed.
.4 Fire stopping has been completed.
.5 A receipt from the Owner for maintenance material.
.6 A receipt from the Owner for material turned over.

If any of the above items have not been completed at the time of substantial completion inspection and the letter of "Assurance of Professional Field Review and Compliance" cannot be issued, any costs for subsequent inspections will be charged to the electrical contractor.

3.7 CLEANING

.1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for wire and box connectors.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CAN/CSA-C22.2No.18-98, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.

.2 CSA C22.2No.65-93 (R1999), Wire Connectors.

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)

.1 EEMAC 1Y-2, 1961 Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

1.3 WASTE MANAGEMENT AND DISPOSAL

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

.2 Collect and separate for disposal all paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins (where applicable) for recycling in accordance with Waste Management Plan.

.3 Divert unused wiring materials from landfill to an approved metal recycling facility.

Part 2 Products

2.1 MATERIALS

.1 Pressure type wire connectors to: CSA C22.2No.65, with current carrying parts of copper, copper alloy, aluminum and aluminum alloy, sized to fit copper and aluminum conductors as required.

.2 Fixture type splicing connectors to: CSA C22.2No.65, with current carrying parts of copper and copper alloy sized to fit copper conductors 10 AWG or less.

.3 Bushing stud connectors: to EEMAC 1Y-2 to consist of:

.1 Connector body and stud clamp for stranded copper and aluminum conductors.

.2 Clamp for stranded copper conductors.

.3 Clamp for stranded aluminum conductors.

.4 Stud clamp bolts.

.5 Bolts for copper bar.

.6 Sized for conductors and bars as indicated.

.4 Clamps or connectors for armoured cable, aluminum sheathed cable, flexible conduit and non-metallic sheathed cable as required to: CAN/CSA-C22.2No.18.

Part 3 Execution

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:

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

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

1.2 REFERENCES

.1 CSA C22.2 No .0.3-96, Test Methods for Electrical Wires and Cables.

.2 CAN/CSA-C22.2 No. 131-M89 (R1994), Type TECK 90 Cable.

1.3 PRODUCT DATA

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

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

.2 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 BUILDING WIRES

.1 Conductors: stranded for 8 AWG and larger. Wiring shall be min. #12 AWG Copper unless otherwise noted. Where a conductor size is called out on the Drawings for a home run, the same conductor size shall be used for all wiring throughout the entire circuit. Conductors sized #10 and smaller shall be of soft copper. Conductors shall be 90 deg. rated type RW 90 XLPE.

.2 Wiring smaller than #12 gauge, solid or stranded: Shall not be used except for low voltage wiring specified to be executed under this Division. Conductors of #8 gauge and larger shall be stranded soft copper.

.3 Copper conductors: size as indicated, with 600V and 1000V insulation of chemically cross-linked thermosetting polyethylene material rated RW90 and RWU90.

.4 Copper conductors: size as indicated, with thermoplastic insulation type TWU and TWH.

.5 Vibration Isolation: Shall be Flexible "Sealtite" metallic conduits, with "Kellems" grips between the conduit and terminal box. (For motor connections).

2.2 TECK CABLE

.1 Cable: to CAN/CSA-C22.2 No. 131.

.2 Conductors:

.1 Grounding conductor: copper.

.2 Circuit conductors: size as indicated.

.3 Insulation:

.1 Type: ethylene propylene rubber.

.2 Chemically cross-linked thermosetting polyethylene rated type RW90, 600 V.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: interlocking galvanized steel or aluminum.

.6 Overall covering: thermoplastic or polyvinyl chloride material.

.7 Fastenings:

.1 One hole, steel or aluminum straps to secure surface cables 2" (50 mm) and smaller. Two hole steel straps for cables larger than 2" (50 mm).

.2 Threaded rods: ¼" (6 mm) dia. to support suspended channels.

.8 Connectors:

.1 Watertight approved for TECK cable.

2.3 ARMOURED CABLES

.1 Conductors: insulated, copper or aluminum, size as indicated.

.2 Type: AC90 or ACL90 - lead sheath over cable assembly and under armour.

.3 Armour: interlocking type fabricated from galvanized steel or aluminum strip.

Part 3 Execution

3.1 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34.

.2 In wireways and auxiliary gutters in accordance with Section 26 05 37.

.2 All branch circuit wiring must be designed for maximum 3% voltage drop. Unless otherwise noted, maximum lengths for 120V 15A circuits are as follows:

.1 #12 AWG - 80'0"
.2 #10 AWG - 125'0"

.3 Install wiring continuously within raceways, splices will be permitted only at outlets and junction boxes. Sufficient slack wire shall be left at these points to permit proper connection of luminaires, devices, equipment, etc.

3.2 INSTALLATION OF TECK CABLE 0 -1000 V

.1 Install cables.

.1 Group cables wherever possible on channels.

.2 Terminate cables in accordance with Section 26 05 20- Wire and Box Connectors - 0 - 1000 V.

3.3 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible.

.2 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for connectors and terminations.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 26 05 33 - Raceway and Boxes for Electrical Systems.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.2 No.

.2 CSA C22.2 No.41-M1987 (R1999), Grounding and Bonding Equipment.

1.4 PRODUCT DATA

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

1.5 WASTE MANAGEMENT AND DISPOSAL

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

.2 Collect and separate for disposal all paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins (where applicable) for recycling in accordance with Waste Management Plan.

.3 Divert unused metal and wiring materials from landfill to an approved metal recycling facility.

Part 2 Products

2.1 CONNECTORS AND TERMINATIONS

.1 Copper and Aluminum, long barrel or short barrel compression connectors to CSA C22.2 No. as required sized for conductors.

.2 Contact aid for aluminum cables where applicable.

.3 2, 3 and 4 way joint boxes submarine or dry location type in accordance with Section 26 05 33 - Raceway and Boxes for Electrical Systems.

Part 3 Execution

3.1 INSTALLATION

.1 Install stress cones, terminations, and splices in accordance with manufacturer's instructions.

.2 Bond and ground as required to CSA C22.2No.41.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 01 - Common Work Results - Electrical.

1.2 REFERENCES

.1 Canadian Standards Association, (CSA International)

1.3 WASTE MANAGEMENT AND DISPOSAL

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

.2 Collect and separate for disposal all paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins (where applicable) for recycling in accordance with Waste Management Plan.

.3 Divert unused metal and wiring materials from landfill to an approved metal recycling facility.

.4 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 EQUIPMENT

.1 Clamps for grounding of conductor: size as required to electrically conductive

.2 Grounding conductors: bare stranded copper, soft annealed, size as required.

.3 Insulated grounding conductors: green, type AWG.

.4 Ground bus: copper, size as required, complete with insulated supports, fastenings, connectors.

.5 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:

- .1 Grounding and bonding bushings.
- .2 Protective type clamps.
- .3 Bolted type conductor connectors.
- .4 Thermit welded type conductor connectors.
- .5 Bonding jumpers, straps.
- .6 Pressure wire connectors.

Part 3 Execution

3.1 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 All connections which are located below ground level shall be made by an exothermic welding process as made by Cadweld or Burndy or by compression type ground grid connections as made by Thomas and Betts. If compression type connectors are used, a joint compound shall be used as recommended by the manufacturer.

.5 Use mechanical connectors for grounding connections to equipment provided with lugs.

.6 Soldered joints not permitted.

.7 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

.9 Provide a 1" PVC conduit from telephone termination locations to main building ground. Connect telephone terminal boards with a #6 AWG copper ground conductor.

.10 Connect building structural steel and metal siding to ground by welding copper to steel.

.11 Bond single conductor, metallic armoured cables to cabinet at supply end, and load end.

3.2 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, switchgear, frames of motors, starters, control panels, building steel work, distribution panels.

3.3 GROUNDING BUS

.1 Install copper grounding bus mounted on insulated supports on wall of electrical room.

.2 Ground items of electrical equipment in electrical room to ground bus with individual bare stranded copper connections size 2/0AWG.

3.4 COMMUNICATION SYSTEMS

.1 Install grounding connections for telephone, fire alarm systems as follows:

.1 Telephones: make telephone grounding system in accordance with telephone company's requirements.

.2 Fire alarm system as indicated.

3.5 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 01 - Common Work Results - Electrical.

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Engineer and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 None

1.2 WASTE MANAGEMENT AND DISPOSAL

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

.2 Collect and separate for disposal all paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins (where applicable) for recycling in accordance with Waste Management Plan.

.3 Divert unused metal and wiring materials from landfill to an approved metal recycling facility.

.4 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 SUPPORT CHANNELS

.1 U shape, size $1^{5}/_{8}$" x $1^{5}/_{8}$" (41 x 41 mm), $^{1}/_{8}$" (2.5 mm) thick, surface mounted or suspended or set in poured concrete walls and ceilings.

Part 3 Execution

3.1 INSTALLATION

.1 Secure equipment to masonry, tile and plaster surfaces with lead anchors or nylon shields.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.

.5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.6 Fasten exposed conduit or cables to building construction or support system using straps.

- .1 One-hole steel straps to secure surface conduits and cables 2" (50 mm) and smaller.
- .2 Two-hole steel straps for conduits and cables larger than 2" (50 mm).
- .3 Beam clamps to secure conduit to exposed steel work.

.7 Suspended support systems.

.1 Support individual cable or conduit runs with ¼" (6 mm) dia threaded rods and spring clips.

.2 Support 2 or more cables or conduits on channels supported by ¼" (6 mm) dia threaded rod hangers where direct fastening to building construction is impractical.

.8 For surface mounting of two or more conduits use channels at 5 ft. (1.5 m) on centre spacing.

.9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.11 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Engineer.

.13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

Part 1 General

1.1 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data for cabinets in accordance with Section 01 33 00 - Submittal Procedures.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

.2 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 SPLITTERS

.1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.

.2 Main and branch lugs and/or Connection bars to match required size and number of incoming and outgoing conductors as indicated.

.3 At least three spare terminals on each set of lugs in splitters less than 400 A.

2.2 JUNCTION AND PULL BOXES

.1 Welded steel construction with screw-on flat covers for surface mounting.

.2 Covers with 1" (25 mm) minimum extension all around, for flush-mounted pull and junction boxes.

2.3 CABINETS

.1 Type E: sheet steel, hinged door and return flange overlapping sides, handle and catch, for surface mounting.

Part 3 Execution

3.1 SPLITTER INSTALLATION

.1 Install splitters and mount plumb, true and square to the building lines.

.2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Mount cabinets with top not higher than 6' 6" (2 m) above finished floor.

.3 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 100 ft. (30 m) of conduit run between pull boxes.

3.3 IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results - Electrical.

.2 Install size 2 identification labels indicating system name, voltage and phase.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 CSA C22.1-2002, Canadian Electrical Code, Part 1.

Part 2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 Outlet Boxes: Shall be manufactured of code gauge galvanized steel unless specified otherwise and shall be sized for the number of wires entering box as required by the Electric Code.

.3 Blank cover plates for boxes without wiring devices.

.4 347 V outlet boxes for 347 V switching devices.

2.2 SHEET STEEL OUTLET BOXES

.1 Electro-galvanized steel single and multi gang flush device boxes for flush installation, minimum size 102mm (4”) square, 54mm (2 1/8”) deep, complete with single and two-gang plaster ring as required or as indicated. 4" (102 mm) square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.

.2 Surface mounted outlet boxes shall be FS series, cast Aluminum, minimum 48mm (1 7/8”) deep. Provide cast cover plates.

2.3 MASONRY BOXES

.1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.

2.4 CONCRETE BOXES

.1 Electro-glavanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.5 CONDUIT BOXES

.1 Cast FS or FD aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of switches or receptacles.

2.6 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 1 ¼" (32 mm) and pull boxes for larger conduits.

Part 3 Execution

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

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

.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within ¼" (6 mm) of opening.

.4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.

.5 Mount single gang receptacles and switch boxes with their greatest dimension in the vertical direction unless otherwise noted.

.6 Appropriate mounting hardware must be provided so all equipment is secured to deter theft and to meet current seismic restraint requirements, without interfering with proper operation. All equipment installation shall meet all industry and Canadian safety codes.

.7 Outlet/junction boxes in ceiling spaces shall be installed a minimum of 1m from walls.

.8 Electrical outlet boxes flush mounted in mechanical grid ceilings shall be anchored to the ceiling grid using manufactured brackets similar to CADDY.

.9 Where devices are shown above fixed millwork, mount outlets 6” above counter or backsplash. Coordinate with millwork installer and ensure that outlets do not conflict with backsplash

.10 Install weatherproof receptacles flush with wall face.

.11 Outlet boxes in walls and partitions shall not be mounted back-to-back; separate them by 150mm (6”) minimum. Outlet boxes in party walls in adjoining suites must not be mounted in the same stud space.

.12 Mount single gang receptacles and switch boxes with their greatest dimension in the vertical direction.

.13 Install pull boxes in the locations shown on the Drawings and as further required by the Canadian Electrical Code. Boxes shall be located in inconspicuous spaces.

.14 Install pull boxes in conduit runs where required to facilitate the pulling in of cable, and locate in inconspicuous accessible spaces.

.15 Mount disconnect switches adjacent to motor or equipment it serves.

.16 Motor starters shall be mounted where shown on the plans. Provide necessary control wiring and interlocks between units as detailed on the plans. Check that overload devices are rated or set at a maximum value in accordance with table D12 of the Canadian Electrical Code. Replace or adjust devices where necessary. Coordinate with Division 15 for exact locations and requirements.

.17 Provide flexible connections to mechanical equipment for vibration isolation. Connections to equipment roof mounted or in other damp or wet locations shall be liquid tight.

.18 Electrical outlet boxes flush mounted in mechanical grid ceilings shall be anchored to the ceiling grid using manufactured brackets similar to CADDY

.19 Provide “header” behind all such boxes for additional support.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)

- .1 CAN/CSA C22.2 No. 18-98, Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware.
- .2 CSA C22.2 No. 45-M1981 (R1992), Rigid Metal Conduit.
- .3 CSA C22.2 No. 56-1977 (R1999), Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .4 CSA C22.2 No. 83-M1985 (R1999), Electrical Metallic Tubing.
- .5 CSA C22.2 No. 211.2-M1984 (R1999), Rigid PVC (Unplasticized) Conduit.
- .6 CAN/CSA C22.2 No. 227.3-M91 (R1999), Flexible Nonmetallic Tubing.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Place materials defined as hazardous or toxic waste in designated containers.

.2 Ensure emptied containers are sealed and stored safely for disposal away from children.

.3 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

Part 2 Products

2.1 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel or hot dipped galvanized steel threaded.

.2 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

.3 Rigid pvc conduit: to CSA C22.2 No. 211.2.

.4 Flexible metal conduit: to CSA C22.2 No. 56, aluminum and liquid-tight flexible metal.

2.2 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 2" (50 mm) and smaller. Two hole steel straps for conduits larger than 2" (50 mm).

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits at 5 ft. (1.5 m) oc.

.4 Threaded rods, ¼" (6 mm) dia., to support suspended channels.

2.3 CONDUIT FITTINGS

.1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.

.2 Factory "ells" where 90E bends are required for 1" (25 mm) and larger conduits.

.3 Watertight connectors and couplings for EMT. Set-screws are not acceptable.

2.4 FISH CORD

.1 Polypropylene.

2.5 ROOF JACKS

.1 Provide aluminum roof jacks for all required cables penetrating the roof membrane.

Part 3 Execution

3.1 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass. Exposed conduit located in areas where prone to mechanical injury shall be rigid galvanized steel up to 5 ft.(1.5m) above finished floor.

.2 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.

.3 Use electrical metallic tubing (EMT) unless noted otherwise. Galvanized metallic tubing (EMT): Shall be used in masonry, partitions, ceiling spaces and exposed indoor runs.

.4 PVC conduit: Shall be rigid PVC scepter for underground electrical distribution and panel feeders and branch circuits below slab. DB2 may be used for underground electrical distribution and panel feeders below slab, where permitted by code.

.5 Use flexible metal conduit for connection to motors in dry areas connection to surface or recessed fluorescent fixtures.

.6 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.

.7 Minimum conduit size for lighting and power circuits: ¾" (19 mm).

.8 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.9 Mechanically bend steel conduit over ¾" (19 mm) dia.

.10 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.11 Install fish cord in empty conduits.

.12 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.

.13 Dry conduits out before installing wire.

.14 Internal raceways in the building:

.1 Securely cap or plug all openings in conduit and ducts during the execution of the Work to prevent obstruction entering the openings.

.2 At completion of the installation, the service entry ducts and the conduit system in the building shall be fished to clear all blocks.

.3 Outlet and pull boxes shall be cleaned out and the system left free from water and moisture.

.15 When conduit runs from refrigerated spaces to non-refrigerated spaces, or between refrigerated spaces of different temperatures, provide type EYS or EZS conduit seals as manufactured by Crouse-Hinds or approved equal, unless detailed otherwise.

3.2 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with 5 ft. (1.5 m) clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on suspended or surface channels.

.5 Do not pass conduits through structural members except as indicated.

3.3 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

3.4 CONDUITS IN CAST-IN-PLACE CONCRETE

.1 Locate to suit reinforcing steel. Install in centre one third of slab.

.2 Protect conduits from damage where they stub out of concrete.

.3 Install sleeves where conduits pass through slab or wall.

.4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed. Use cold mastic between sleeve and conduit.

.5 Do not place conduits is slabs in which slab thickness is less than 4 times conduit diameter.

.6 Encase conduits completely in concrete with minimum 1" (25 mm) concrete cover.

.7 Organize conduits in slab to minimize cross-overs.

3.5 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

.2 Waterproof joints (PVC excepted) with heavy coat of bituminous paint.

.3 Provide ground wire in all conduit installed in or below slabs.

.4 Conduit runs must not run below ovens. No exceptions.

3.6 **ROOF JACKS**

1. Install one cable per roof jack. Roof Jack shall not be shared with Mechanical piping or control cabling.

2. Do not bend roof jacks.

3. Seal roof jack with sealant as required.

3.6 CONDUITS IN FIRE SEPARATIONS

.1 Wiring penetrating any horizontal or vertical assembly required to have a fire-resistance rating shall be in accordance with B.C. Building Code 3.1.9.3. Conduits or cables shall be tightly fitted and fire stopped where necessary to maintain fire rating, as follows:

.2 For penetrations through a Fire Separation wall provide a firestop system with a "F" Rating as determined by ULC or cUL as indicated below:

Fire Resistance Rating Of Separation	Required ULC or cUL “F” Rating of Firestopping Assembly
30 minutes	20 minutes
45 minutes	45 minutes
1 hour	45 minutes
1.5 hours	1 hour
2 hours	1.5 hours
3 hours	2 hours
4 hours	3 hours

.3 For combustible penetrations through a Fire Separation provide a firestop system with an “F” Rating as determined by ULC or cUL which is equal to the fire resistance rating of the construction being penetrated. Combustible cables and raceways shall be max. 25 mm diameter.

.4 For penetrations through a Fire Wall or horizontal Fire Separation provide a firestop system with a “FT” Rating as determined by ULC or cUL which is equal to the fire resistance rating of the construction being penetrated.

.5 Install firestop materials in accordance with ULC Fire Resistance Directory or UL Products Certified for Canada (cUL) Directory.

.6 Comply with manufacturer's instructions for installation of through-penetration materials.

.1 Seal all holes or voids made by penetrations to ensure an air and water resistant seal.
.2 Protect materials from damage on surfaces subjected to traffic.

.7 Utilize STI EZ path fire rated communication pathways for penetrations as indicated on the plans.

.8 Provide metal caulk cover guard and box guard for boxes in the shaft walls.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSAC22.2 No.26-R1999, Construction and Test of Wireways, Auxiliary Gutters and Associated Fittings.

1.3 PRODUCT DATA

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

1.4 WASTE MANAGEMENT AND DISPOSAL

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

.2 Collect and separate for disposal all paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins (where applicable) for recycling in accordance with Waste Management Plan.

.3 Divert unused metal and wiring materials from landfill to an approved metal recycling facility.

.4 Fold up metal banding, flatten and place in designated area for recycling

Part 2 Products

2.1 WIREWAYS

.1 Wireways and fittings: to CSA C22No.26.

.2 Sheet steel with hinged cover to give uninterrupted access.

.3 Finish: baked grey enamel.

.4 Elbows, tees, couplings and hanger fittings manufactured as accessories to wireway supplied.

Part 3 Execution

3.1 INSTALLATION

.1 Install wireways and auxiliary gutters.

.2 Keep number of elbows, offsets, connections to minimum.

.3 Install supports, elbows, tees, connectors, fittings.

.4 Install barriers where required.

.5 Install gutter to full length of equipment.

Part 1 General.

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 26 09 25 - Wiring Devices.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings of all luminaires supplied by electrical contractor in accordance with Section 01 33 00 - Submittal Procedures.

Part 2 Products

2.1 LOW VOLTAGE LIGHTING CONTROLS

.1 Components shall be as follows (minimum acceptable standard):

.1 Low voltage lighting control system shall be Greengate Room Controller Series and shall include the following components:

.1 RC3D-PL control panels with receptacle control.
.2 RC-2TLB-ES1-W wall stations
.3 RC-SS1-W dimming wall stations
.4 DSRC-FMOIR daylight sensors
.5 OAC-DT-2000 ceiling occupancy sensors
.6 OAWC-DT wall corner occupancy sensors
.7 OCC-RJ45 input/output devices
.8 SPRC-R-20-120 receptacle switch packs
.9 GGRJ45-G quick connect cables, plenum rated as required

.2 Review of proposals for products other than the “minimum acceptable standard” products listed will be completed during the shop drawing review process.

2.2 LINE VOLTAGE CONTROLS

.1 Refer to Occupancy Sensor Schedule on the Drawings.

Part 3 Execution

3.1 INSTALLATION

.1 Low voltage lighting control wiring shall be installed in conduit utilizing wiring approved by the equipment manufacturer. Flexible armoured cable may be used for drops to equipment mounted on suspended ceilings.

.2 Onsite Functional Testing

.1 Upon completion of the installation of all lighting control devices and lighting control systems, including the work of Others, the Electrical Contractor is to certify that all devices installed are properly placed within the space and that performance adjustments have been made to the devices such that they are properly calibrated. The certification is to

include confirmation that the individual responsible for testing the devices and systems has not been directly involved in the design or construction of the project.

.2 Required testing procedures shall include but not be limited to the following:

.1 Occupancy Sensors: Confirm that occupancy sensors are properly placed in the space and adjustments have been made to ensure that the lights within the space only turn OFF upon vacancy and only turn ON when the space becomes occupied.

.2 Timeclocks and programmable controls: liaise with the Building Owner to confirm the time of day programming requirements and confirm that the schedules comply with the Owner's requirements.

.3 Photocontrols: Confirm that the location of photocontrols are properly situated to suitably control the lighting within the space and that the lighting reacts appropriately when daylight provides sufficient illumination within the space.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for potential and current transformers.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CAN3-C13-M83(R1998), Instrument Transformers.

1.4 PRODUCT DATA

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

.2 Indicate dimensions and connection details.

1.5 WASTE MANAGEMENT AND DISPOSAL

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

.2 Collect and separate for disposal all paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins (where applicable) for recycling in accordance with Waste Management Plan.

.3 Divert unused metal and wiring materials from landfill to an approved metal recycling facility.

.4 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 POTENTIAL TRANSFORMERS

.1 Potential transformers: to CAN3-C13, dry type for indoor use, with following characteristics:

.1 Nominal voltage class: as indicated.
.2 Rated frequency: 60 Hz.
.3 Basic impulse level: kV.
.4 Voltage ratio: as indicated.
.5 Accuracy rating:

.2 Potential transformers equipped with fuse holder and fuses. Fuses: as indicated.

2.2 CURRENT TRANSFORMERS

.1 Current transformers: to CAN3-C13, dry type for indoor use with following characteristics:

.1 Nominal voltage class: as indicated.
.2 Rated frequency: 60 Hz.
.3 Basic impulse level: kV.
.4 Metering accuracy rating:
.5 Relay accuracy rating:
.6 Rated primary and secondary current: as indicated.
.7 Continuous-current rating factor:
.8 Short-time mechanical current rating times primary rating.
.9 Short-time thermal current rating times primary rating.

.2 Positive action automatic short-circuiting device in secondary terminals.

2.3 MOUNTING BRACKETS

.1 Potential transformers with channel type mounting brackets or L type mounting brackets as required.

.2 Fabricate brackets and channels from electrogalvanized code gauge painted steel.

Part 3 Execution

3.1 INSTALLATION

.1 Install instrument transformers and ensure accessibility.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for standard and custom breaker type panelboards.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 06 10 00 - Rough Carpentry - Short Form: Plywood Backboard.

.3 Section 26 05 01 - Common Work Results - Electrical.

.4 Section 26 28 21 - Moulded Case Circuit Breakers.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.2No.29-M1989 (R2000), Panelboards and enclosed Panelboards.

1.4 SHOP DRAWINGS

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

.2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

1.5 WASTE MANAGEMENT AND DISPOSAL

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

.2 Collect and separate for disposal all paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins (where applicable) for recycling in accordance with Waste Management Plan.

.3 Divert unused metal and wiring materials from landfill to an approved metal recycling facility.

Part 2 Products

2.1 PANELBOARDS

.1 Panelboards: to CSA C22.2No.29 and product of one manufacturer.

.1 Install circuit breakers in panelboards before shipment.

.2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

.2 250 V panelboards: bus and breakers rated for 10 kA (symmetrical) interrupting capacity or as indicated.

.3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

.4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated. Provide drip shields for sprinkler-proofing on all surface mounted panels. Ensure that double-tub and triple-tub panels are factory approved for the application.

.5 Two keys for each panelboard and key panelboards alike.

.6 Copper or Aluminum bus with neutral of same ampere rating as mains.

.7 Mains: suitable for bolt-on breakers.

.8 Trim with concealed front bolts and hinges.

.9 Trim and door finish: baked grey enamel.

.10 Panelboards shall be as follows:

.1 120/208 V - Cutler-Hammer Pow-R-Line 1 complete with type BAB breakers (10,000 A.I.C.), to match existing.

2.2 BREAKERS

.1 Breakers: to Section 26 28 21 - Moulded Case Circuit Breakers.

.2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise. Breakers shall be designed for use as switches. Two and three-pole breakers shall be common type with single handle. Handle ties will not be permitted.

.3 Ground fault circuit interrupters where required shall be C.S.A. Class A with 5mA tripping level and shall have push-to-test button on front.

.4 Lock-on devices for 10% of 15 A breakers installed as indicated. Turn over unused lock-on devices to Owner's Representative.

.5 Lock-on devices for fire alarm, emergency, exit and night light circuits.

2.3 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results - Electrical.

.2 Panels are specified as sequence bussed and all branch circuit wiring from these panels shall be such that where a common neutral is used for two or three circuits, these circuits shall be fed from adjacent breakers, so that single-pole breakers may be replaced with 2 or 3 pole breakers should this be required in the future. All circuits shall be balanced.

.3 Nameplate for each panelboard size 4 engraved as indicated.

.4 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.

.5 Complete circuit directory with typewritten schedule showing location (room number) and load of each circuit.

Part 3 Execution

3.1 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Install surface mounted panelboards on plywood backboards in accordance with Section 06 10 00 - Rough Carpentry. Where practical, group panelboards on common backboard.

.3 Mount panelboards to height specified in Section 26 05 01 - Common Work Results - electrical or as indicated.

.4 Connect loads to circuits.

.5 Connect neutral conductors to common neutral bus with respective neutral identified.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Switches, receptacles, wiring devices, cover plates and their installation.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 26 05 01 - Common Work Results - Electrical.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA-C22.2 No.42-99(R2002), General Use Receptacles, Attachment Plugs and Similar Devices.

.2 CSA-C22.2 No.42.1-00, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).

1.4 SHOP DRAWINGS AND PRODUCT DATA

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

1.5 WASTE MANAGEMENT AND DISPOSAL

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

.2 Collect and separate for disposal all paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins (where applicable) for recycling in accordance with Waste Management Plan.

.3 Divert unused metal and wiring materials from landfill to an approved metal recycling facility.

Part 2 Products

2.1 SWITCHES

.1 15 and 20 A, 120 V, single pole and three-way switches to: CSA-C22.2 No.55 and CSA-C22.2 No.111.

.2 Shall be of the AC quiet type, specification grade with totally enclosed framed toggle. All switches shall be supplied with white finish, unless otherwise noted. Switches shall be equal to Hubbell 1200-W series (120V) and 18200-W series (347 V), 15A. Provide 20A switches where indicated. Pilot light switches shall be Hubbell 1200-PL series (lighted handle type).

.3 Manually-operated general purpose ac switches with following features:

Terminal holes approved for No. 10 AWG wire.

Silver alloy contacts.

Urea or melamine moulding for parts subject to carbon tracking.

Suitable for back and side wiring.

.4 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.

.5 Switches of one manufacturer throughout project.

2.2 RECEPTACLES

.1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, to: CSA-C22.2 No.42 with following features:

.1 White urea moulded housing.

.2 Suitable for No. 10 AWG for back and side wiring.

.3 Break-off links for use as split receptacles.

.4 Eight back wired entrances, four side wiring screws.

.5 Triple wipe contacts and riveted grounding contacts.

.2 Shall be specification grade, duplex, 3 wire U ground, "finder face" type, with screw type terminals, double wiping spring bronze contacts. Where weatherproof receptacles are specified, they shall be complete with gasket and spring loaded, twin hinged receptacle covers with built-in gasket. Duplex receptacles shall be equal to Hubbell 5252-WHI, 15A.

.3 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground with following features:

.1 White urea moulded housing.

.2 Suitable for No. 10 AWG for back and side wiring.

.3 Four back wired entrances, 2 side wiring screws.

.4 Ground fault circuit interrupting (GFI) duplex receptacles shall be equal to Hubbell GF-5252-WHI (specification grade). Mount outside GFI receptacles in horizontal position and provide weatherproof polycarbonate covers.

.5 Other receptacles with ampacity and voltage as indicated.

.6 Match devices to plug connectors for all owner supplied equipment. Match cord and plug sets to equipment requirements.

.7 Pendant Cord/Connector Devices: Matching, locking type, plug and connector body of the types and ratings as indicated on the Contract drawings.

.1 Bodies: Nylon with screw-open cable-gripping jaws and provision for attaching external cable grip.

.2 Weatherproofing: Molded black elastomer cover for plug and connector. Covers shall interlock to provide a weatherproof cover around the mated plug and connector.

.3 External Cable Grip: Woven wire mesh type made of high-strength galvanized-steel wire strand and matched to cable diameter and with attachment provision designed for the corresponding connector.

.8 Cord and Plug sets: Match voltage and current ratings and number of conductors to requirements of the equipment being connected.

.1 Cord: Rubber-insulated, stranded copper conductors, with type SOW-A jacket. Grounding cord has green insulation.

.2 Plug: Male configuration with nylon body and integral cable-clamping jaws. Match to cord and to receptacle type intended for connection.

.9 Receptacles of one manufacturer throughout project.

.10 Provide labels for all receptacles, identifying circuit numbers.

2.3 SPECIAL WIRING DEVICES

.1 Special wiring devices:

.1 Pilot lights as indicated, with neon type 0.04 W, 125 V lamp and red jewel flush type.

2.4 COVER PLATES

.1 Cover plates for wiring devices to: CSA-C22.2 No.42.1.

.2 Cover plates from one manufacturer throughout project Bryant, G.E. Hubbell, or Leviton.

.3 Shall be stainless steel in finished areas, stamped metal in others.

.4 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

.5 Stainless steel, 1 mm thick cover plates and thermoplastic white cover plates, thickness 2.5 mm for wiring devices mounted in flush-mounted outlet box.

.6 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

.7 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.

.8 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.

Part 3 Execution

3.1 INSTALLATION

.1 Switches:

.1 Install single throw switches with handle in "UP" position when switch closed.

.2 Install switches in gang type outlet box when more than one switch is required in one location.

.3 Mount toggle switches at height in accordance with Section 26 05 01 - Common Work Results - Electrical unless noted otherwise.

.2 Receptacles:

.1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.

.2 Mount receptacles at height in accordance with Section 26 05 01 - Common Work Results - Electrical unless noted otherwise.

.3 Cover plates:

.1 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.

.2 Install suitable common cover plates where wiring devices are grouped.

.3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Electric heaters, remote line voltage thermostats and their installation.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 26 05 01 - Common Work Results - Electrical.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA-C22.2 No.46-M1988 (R2001) Electric Air-Heaters.

1.4 SHOP DRAWINGS AND PRODUCT DATA

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

1.5 WASTE MANAGEMENT AND DISPOSAL

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

.2 Collect and separate for disposal all paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins (where applicable) for recycling in accordance with Waste Management Plan.

.3 Divert unused metal and wiring materials from landfill to an approved metal recycling facility.

Part 2 Products

2.1 ELECTRIC HEATERS

.1 Baseboard heaters shall be equal to Ouellet OFM series, 208V 1 phase, complete with integral low voltage relays.

.2 Convection heaters shall be equal to Ouellet OPI series 208 volt 1 phase, sloped top, complete with integral low voltage relays.

.3 Force flow heaters shall be equal to Ouellet OAC series 208 volt 1 phase complete with integral low voltage relays.

.4 Electric heaters shall have white finish, unless otherwise noted.

2.2 THERMOSTATS

.1 Remote line voltage thermostats shall be equal to White Rogers 1A65W653.

2.3 ALTERNATES

.1 Preapproved alternate manufacturers are Chromalox, Stelpro and Westcan,

Part 3 Execution

3.1 INSTALLATION

.1 Include all necessary conduits, wiring and thermostats for a complete operating system.

.2 Installation of system equipment shall be in complete accordance with the Canadian Electrical Code and the British Columbia Building Code.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for fused and non-fused disconnect switches.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 35 30 - Health and Safety Requirements.

.3 Section 26 05 00 - Common Work Results - Electrical.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CAN/CSA C22.2 No.4-M89 (R2000), Enclosed Switches.

.2 CSA C22.2 No.39-M89 (R2003), Fuseholder Assemblies.

1.4 SUBMITTALS

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

1.5 WASTE MANAGEMENT AND DISPOSAL

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

.2 Collect and separate for disposal all paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins (where applicable) for recycling in accordance with Waste Management Plan.

Part 2 Products

DISCONNECT SWITCHES

.1 Fusible, non-fusible and horsepower rated disconnect switch in CSA Enclosure, to CAN/CSA C22.2 No.4 size as indicated.

.2 Provision for padlocking in off switch position.

.3 Mechanically interlocked door to prevent opening when handle in ON position.

.4 Fuses: size as indicated.

.5 Fuseholders: to CSA C22.2 No.39 suitable without adaptors, for type and size of fuse indicated.

.6 Quick-make, quick-break action.

.7 ON-OFF switch position indication on switch enclosure cover.

.8 Disconnect switches shall be equal to Cutler-Hammer type 1HD, or type 3HD (weatherproof) where noted. Bryant 30000/40000/60000 series motor starters without overload protection may be used for loads rated 30/40/60 A or less.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - Electrical.

.2 Indicate name of load controlled on size 4 nameplate.

Part 3 Execution

3.1 INSTALLATION

.1 Install disconnect switches complete with fuses if applicable.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American National Standards Institute (ANSI)

.1 ANSI C82.1-97, Electric Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.

.2 ANSI C82.4-92, Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps.

.2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)

.1 ANSI/IEEE C62.41-1991, Surge Voltages in Low-Voltage AC Power Circuits.

.3 American Society for Testing and Materials (ASTM)

.1 ASTM F1137-88(1993), Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.

.4 Federal Communications Commission (FCC)

.1 FCC (CFR47) EM and RF Interference Suppression.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 45 00 - Quality Control.

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings of all luminaires supplied by electrical contractor in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Engineer.

.3 Submit shop drawings of all lamps and ballasts in accordance with Section 013300 submittal procedures.

Part 2 Products

2.1 LUMINAIRES

.1 Due to the changes in catalogue numbers, all numbers indicated must be verified with the luminaire description and confirmed with the vendor prior to ordering. Catalogue numbers are not necessarily complete and may not indicate all options that are detailed in the documents. Options specified must be provided.

.2 Provide custom colours where noted on the drawings.

2.2 FINISHES

.1 Baked enamel finish:

.1 Conditioning of metal before painting:

.1 For corrosion resistance conversion coating to ASTM F1137.

.2 For paint base, conversion coating to ASTM F1137.

.2 Metal surfaces of luminaire housing and reflectors finished with high gloss baked enamel or polyester powder coat to give smooth, uniform appearance, free from pinholes or defects.

.3 Reflector and other inside surfaces finished as follows:

.1 White, minimum reflection factor 85%.

.2 Colour fastness: yellowness factor not above 0.02 and after 250 hours exposure in Atlas fade-ometer not to exceed 0.05.

.3 Film thickness, not less than 0.03 mm average and in no areas less than 0.025 mm.

.4 Gloss not less than 80 units as measured with Gardner 60E gloss meter.

.5 Flexibility: withstand bending over 12 mm mandrel without showing signs of cracking or flaking under 10 times magnification.

.2 Alzak finish:

.1 Aluminium sheet fabricated from special aluminum alloys and chemically brightened, subsequently anodically treated to specifications established by Alcoa, to produce:

.1 Finish for mild commercial service, minimum density of coating 7.8 g/m^2, minimum reflectivity 83% for specular, 80.5% for semi-specular and 75% for diffuse.

.2 Finish for regular industrial service, minimum density of coating 14.8 g/m^2, minimum reflectivity 82% for specular and 73% for diffuse.

.3 Finish for heavy duty service, minimum density of coating 21.8 g/m^2, minimum reflectivity 85% for specular, 65% for diffuse.

.3 Lenses:

.1 Lens thickness: 0.125" minimum.

.2 Material: injection moulded clear prismatic virgin acrylic or deep cell parabolic aluminum.

.3 Treatment: ultraviolet inhibited.

.4 Frame: hinged.

.5 Type: reflector.

.6 Acrylic lighting diffusers shall conform to the latest requirements of the British Columbia Building Code.

2.3 ALTERNATE MANUFACTURERS

.1 Where luminaires are specified by the manufacturer's name and catalog number, other manufacturers, will be acceptable provided that they meet the “minimum acceptable standard” as noted and are acceptable to the Engineer. Review of proposals for products other than the “minimum acceptable standard” product listed will be completed during the shop drawing review process.

Part 3 Execution

3.1 RESPONSIBILITY

.1 Supply and install luminaires, lamps, ballasts, stems, flexible conduit and mounting trims and accessories required for a complete lighting system. Supply all luminaires and lamps except those which are specifically mentioned as being supplied by others.

.2 Provide all supports and wiring required to make the lighting system operational as indicated on the drawings.

3.2 INSTALLATION

.1 Locate and install luminaires as indicated.

.2 Install luminaires accurately in line and level. Co-ordinate this work with other trades at the site to ensure that their work is not held up by the work of this Section and that the luminaires are installed on schedule.

.3 Install luminaires in the standard manner for the type of luminaire and in accordance with the manufacturer's instructions. Secure methods of attachment shall be used throughout or as called for in Luminaire Schedule.

.4 Any luminaires, which are not installed properly, shall be taken down and re-installed without expense to Owner.

.5 Luminaires shall not be mounted above pipes, ducts or equipment. In event of unavoidably tight locations, hangers shall be provided to clear obstructions. Layouts of other trades shall be checked on job and planned co-operatively. Architect's approval shall be obtained before any changes are made to layouts shown.

.6 Recessed luminaires in plaster ceiling shall be supplied complete with plaster trim frame and mounting brackets.

.7 Check the ceiling finishes in all areas where recessed luminaires are being installed to ensure that the luminaires which are ordered for these areas are purchased with suitable ceiling trim for the particular ceiling finish. Luminaires and mountings shall be checked for their electrical and physical characteristics in relation to conditions due to building construction and mechanical equipment. Necessary adjustments shall be made to luminaires or hanging arrangement of shop drawings and before construction if decision on necessary changes is required.

.8 Clean luminaires upon substantial completion. Use methods and materials recommended by the manufacturer. Protect all luminaires after installation.

3.3 LUMINAIRE SUPPORTS

.1 For suspended ceiling installations support luminaires independently of ceiling.

3.4 LUMINAIRE ALIGNMENT

.1 Align luminaires mounted in continuous rows to form straight uninterrupted line.

.2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

3.5 REPLACEMENT

.1 All burned out or otherwise damaged lamps are to be replaced at the time of building acceptance.

.2 Provide new lamps in all incandescent luminaires immediately prior to substantial completion.

3.6 SHOP DRAWINGS

.1 Provide shop drawings for all luminaires, lamps and ballasts.

.2 Provide three (3) copies of the colour chart with shop drawings for luminaires specified with factory colours.

3.7 WARRANTY

.1 Provide a 48 month warranty period for all fluorescent T8 and T5 lamps and ballast.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Code for Preferred Packaging

.2 Canadian Standards Association (CSA)

.1 CSA C22.2 No.141-10, Unit Equipment for Emergency Lighting.

.2 CSA C860- 96, Performance of Internally-Lighted Exit Signs.

.3 National Fire Protection Association (NFPA) requirements

1.2 SUBMITTALS

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

.2 Submit product data sheets for exit lights. Include product characteristics, performance criteria, physical size, limitations and finish.

.3 Manufacturers Instructions: Provide to indicate special handling criteria, installation sequence and cleaning procedures.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

.2 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 EXIT LIGHTS

.1 Exit lights: to CSA C22.2 No.141 and CSA C860, packaged in accordance with the Canadian Code for Preferred Packaging guidelines.

.2 Housing: Two-piece white extruded aluminum combined body/faceplate with a maximum depth of 1-1/4”. The exit shall also include extruded aluminum end caps with white gaskets in order to provide protection to the internal components and eliminate any possible light leaks

.3 Lamps: LED - 2.5W maximum.

.4 Operation: designed for 50,000 hours of continuous operation without relamping.

.5 Each face plate shall come standard with two legend films for pictogram and direction selection.

.6 Downlight: translucent acrylic.

.7 Face plate to remain captive for relamping.

.8 Supply voltage: 120/277/347 V, AC.

.9 Mounting: suitable for universal mounting directly on junction box and c/w knockouts for conduit.

.10 Finish: white.

.11 Exit lights shall be equal to Ready-Lite RA series, pictogram style.

2.2 ALTERNATE MANUFACTURERS

.1 Preapproved alternate manufacturers are Beghelli, Dual-lite, Emergi-lite, Lumacell, Lithonia, Uniglo and StanPro.

Part 3 Execution

3.1 INSTALLATION

.1 Install exit lights.

.2 Connect fixtures to exit light circuits.

.3 Ensure that exit light circuit breaker is locked in on position.

.4 Installation of system equipment shall be in accordance with Canadian Electrical Code.

.5 Demonstrate to the satisfaction of the Engineer that the complete system is left in operating condition.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

.2 Section 26 05 39 - Underfloor Raceways for Electrical Systems.

.3 Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.

.4 Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.

.5 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.2 SYSTEM DESCRIPTION

.1 Empty telecommunications raceways system consists of outlet boxes, cover plates, terminal and distribution cabinets, conduits, cable troughs, pull boxes, sleeves and caps, fish wires and service fittings, for installation of voice/data and audio-visual cabling systems, access control and closed circuit television systems by Others.

1.3 WASTE MANAGEMENT AND DISPOSAL

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

.2 Collect and separate for disposal all paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins (where applicable) for recycling in accordance with Waste Management Plan.

.3 Divert unused metal conduit and wiring materials from landfill to an approved metal recycling facility.

.4 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 MATERIAL

.1 Conduits: EMT and RPVC type, in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

.2 Junction Boxes, Cabinets type E and T: in accordance with Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.

.3 Outlet Boxes, Conduit Boxes and Fittings: in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.

.4 Fish wire: polypropylene type.

Part 3 Execution

3.1 INSTALLATION

.1 Install empty raceway system, including underfloor and overhead distribution systems, fish wire, terminal cabinets, outlet boxes, floor boxes, pull boxes, cover plates, conduit, sleeves and caps, miscellaneous and positioning material to constitute complete system.

.2 Provide raceways in accordance with the voice/data and security company's requirements, and as further indicated on the drawings.

.3 Provide an outlet box at each outlet location as previously noted. Provide 19mm (3/4") conduit to the telecommunications closet/room, unless otherwise indicated.

.4 Pull boxes shall be provided in all conduits less than 1" diameter after every 100 ft. of run and also of shorter intervals as applicable to the requirement of no more than 2 - 90^{o} bends between each pulling point. For conduit runs 1" and larger, the maximum distance between pull boxes shall be 150 ft. Pull boxes shall be sized to suit the voice/data and security companies.

.5 All communication system conduits shall contain a nylon pull string.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 01 - Common Work Results - Electrical.

1.2 SHOP DRAWINGS

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

.2 Include riser diagram, talk paths of complete intercom system.

1.3 CLOSEOUT SUBMITTALS

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

.2 Include description of system operation.

.3 Include parts list using component identification numbers standard to electronics industry.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Deposit packaging materials in appropriate container on site for recycling or reuse.

.2 Avoid using landfill waste disposal procedures when recycling facilities are available.

.3 Collect and separate plastic, paper packaging and corrugated cardboard.

.4 Dispose of corrugated cardboard, polystyrene and plastic packaging material in appropriate on-site bin.

1.5 SYSTEM START-UP

.1 Provide instructions in accordance with Section 26 05 01 - Common Work Results - Electrical.

Part 2 Products

2.1 MATERIALS

.1 Conduits: type and size as indicated, in accordance with Section 26 05 01 - Common Work Results - Electrical.

.2 Communication conductors: in accordance with manufacturer’s recommendations

.3 Components shall be as follows (minimum acceptable standard):

.1 Master station shall be Aiphone JO series c/w 7” colour LCD touchscreen for hands-free communication, wall mounted in 3-gang box, white finish.

.2 Door station shall be Aiphone JO-DV surface mounted, aluminum die cast c/w colour camera, microphone, speaker and call button.

.3 Power supply shall be Aiphone PS-1820UL, 18V DC.

.4 Review of proposals for products other than the “minimum acceptable standard” product listed will be completed during the shop drawing review process.

2.2 INSTALLATION

.1 Install equipment as indicated and in accordance with manufacturer's instructions.

.2 Interconnect system components.

2.3 TESTS

.1 Perform tests in accordance with Section 26 05 01 - Common Work Results - Electrical.

.2 Conduct intelligibility and performance test.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 01 - Common Work Results - Electrical.

1.2 REFERENCE DOCUMENTS

.1 National Fire Protection Association (NFPA)

- .1 NFPA 70, Article 517, National Electric Code.
- .2 NFPA 101, Life Safety Code.

.2 Electronic Industries Association (EIA)

- .1 REC 12749, Power Supplies.
- .2 RS 16051, Sound Systems.

1.3 REFERENCE STANDARDS

.1 Underwriters Laboratories of Canada (ULC)

- .1 CAN/ULC-S302, Installation and Classification of Burglar Alarm Systems for Financial and Commercial Premises, Safes and Vaults.
- .2 CAN/ULC-S303, Local Burglar Alarm Units and Systems.
- .3 CAN/ULC-S304, Intrusion Detection.
- .4 CAN/ULC-S306, Intrusion Detection Units.
- .5 ULC-S318, Power Supplies for Burglar Alarm Systems.
- .6 ORD-C634, Connectors and Switches for Use with Burglar Alarm Systems.

.2 Underwriters' Laboratories (UL)

- .1 UL 603, Standard for Power Supplies For Use With Burglar-Alarm Systems.
- .2 UL 639, The Standard for Intrusion-Detection Units.

1.4 DEFINITIONS

.1 EAC: Electronic Access Control System.

.2 PIR: Passive Infrared Detectors.

1.5 DESIGN PERFORMANCE REQUIREMENTS

.1 Design intrusion detection system using only ULC/UL Listed products.

.2 Design intrusion detection system using ULC/UL Listed Alarm Service Company, company specializing in intrusion detection systems.

1.6 SUBMITTALS

.1 Product Data: Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures.

.1 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit manufacture's literature for each control panel, detection accessory device.

.3 Submit:

.1 Functional description of equipment.

.2 Technical data for all devices.

.3 Device location plans and cable lists.

.4 Devices mounting location detail drawings.

.5 Typical devices connection detail drawings

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

.1 Submit shop drawings to indicate project layout, mounting heights and locations, wiring diagrams, detection device coverage patterns, contact operating gaps.

.2 Submit zone layout drawing indicating number and location of zones and areas covered.

.3 Quality Assurance Submittals: Submit the following in accordance with Section 01 33 00 - Submittal Procedures.

.1 Test Reports: Submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

.2 Certificates: Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.1 Submit UL Product Safety Certificates.

.2 Submit verification Certificate that service company is ULC/UL List alarm service company.

.3 Submit verification Certificate that intrusion alarm system is Certified Alarm System.

.3 Instructions: Submit manufacturer's installation instructions.

.4 Manufacturer's Field Services: Submit copies of manufacturer's field reports.

.4 Maintenance Data: Submit maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

.1 Include:

.1 System configuration and equipment physical layout.

.2 Functional description of equipment.

.3 Instructions of operation of equipment.

.4 Illustrations and diagrams to supplement procedures.

.5 Operation instructions provided by manufacturer.

.6 Cleaning instructions.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Deposit packaging materials in appropriate container on site for recycling or reuse.

.2 Avoid using landfill waste disposal procedures when recycling facilities are available.

.3 Collect and separate plastic, paper packaging and corrugated cardboard.

.4 Dispose of corrugated cardboard, polystyrene and plastic packaging material in appropriate on-site bin.

1.8 WARRANTY

.1 For materials the 12 month warranty period prescribed in subsection GC 32.1 of General Conditions "C".

.2 Manufacturer's Warranty: Submit, for Engineer's acceptance, manufacturer's standard warranty document executed by authorized company official.

Part 2 Products

2.1 MATERIALS

.1 Components shall be as follows (minimum acceptable standard):

.1 Control panel shall be DSC PC 4020, ULC approved, expandable and designed for multiplexed expansion, complete with capacity for 16 supervised surveillance zones and 16 access codes, provision for audible alarm output, transmission of alarm to monitoring agency, 1.5A power supply and 7.0 AH 12V battery.

.2 Remote keypad/annunciator shall be DSC LCD4501 complete with two-line 32 character LCD display, step-by-step prompting, backlit code entry keys, EEPROM memory and provision for direct transfer of program to other keypads in system.

.3 Infrared detectors shall be Optex FX-40 series, rated 9.5 to 16 VDC nominal and shall have normally closed relay output and normally closed tamper contacts. Provide FL-60N long range lens where applicable.

.4 Magnetic door contacts shall be equal to Sentrol 1078W, complete with normally closed contacts, wide gap, designed for recessed mounting.

.5 Interior sirens shall be Ademco Wave 2.

.2 Review of proposals for products other than the “minimum acceptable standard” product listed will be completed during the shop drawing review process.

.3 Connectors and switches: to ORD-C634.

.4 Power supplies: to ULC-S318 or UL 603.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions, product carton installation instructions, and datasheet.

3.2 INSTALLATION

.1 Install panels, intrusion detection system and components in accordance with manufacturer's written installation instructions to locations, heights and surfaces shown on reviewed shop drawings.

.2 Install panels, intrusion detection system and components secure to walls, ceilings or other substrates.

.3 Install required boxes in inconspicuous accessible locations.

.4 Conceal conduit and wiring.

3.3 VERIFICATION

.1 Perform verification inspections and test in the presence of Engineer.

.1 Provide all necessary tools, ladders and equipment.
.2 Ensure appropriate subcontractors, and owner are present for verification.

.2 Visual verification: Objective is to assess quality of installation and assembly and overall appearance to ensure compliance with Contract Documents. Visual inspection to include:

.1 Sturdiness of equipment fastening.
.2 Non-existence of installation related damages.
.3 Compliance of device locations with reviewed shop drawings.
.4 Compatibility of equipment installation with physical environment.
.5 Inclusion of all accessories.
.6 Device and cabling identification.
.7 Application and location of ULC approval decals.

.3 Technical verification: Purpose to ensure that all systems and devices are properly install and free of defects and damage. Technical verification includes:

.1 Measurements of coverage patterns
.2 Connecting joints and equipment fastening.
.3 Compliance with manufacturer's specification, product literature and installation instructions.

.4 Operational verification: Purpose to ensure that devices and systems' performance meet or exceed established functional requirements. Operational verification includes:

.1 Operation of each device individually and within its environment.
.2 Operation of each device in relation with programmable schedule and or/specific functions.

3.4 CLEANING AND ADJUSTING

.1 Remove protective coverings from control panels, detection accessories and components.

.2 Adjust all components for correct function.

.3 Clean housings and system components, free from marks, packing tape, and finger prints, in accordance with manufacturer's written cleaning recommendations.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 01 - Common Work Results - Electrical.

1.2 REFERENCES

.1 Government of Canada

.1 NBC-2006, National Building Code of Canada.

.2 TB OSH Chapter 3-03, 1997-01-28, Treasury Board of Canada, Occupational Safety and Health, Chapter 3-03, Standard for Fire Protection Electronic Data Processing Equipment.

.3 TB OSH Chapter 3-04, 1994-12-22, Treasury Board of Canada, Occupational Safety and Health, Chapter 3-04, Standard for Fire Alarm Systems.

.2 Underwriter's Laboratories of Canada (ULC)

.1 CAN/ULC-S524, Installation of Fire Alarm Systems.

.2 ULC-S525, Audible Signal Appliances for Fire Alarm.

.3 CAN/ULC-S527, Control Units.

.4 CAN/ULC-S528, Manual Pull Stations.

.5 CAN/ULC-S529, Smoke Detectors.

.6 CAN/ULC-S530, Heat Actuated Fire Detectors.

.7 CAN/ULC-S536, Inspection and Testing of Fire Alarm Systems.

.8 CAN/ULC-S537, Verification of Fire Alarm Systems.

1.3 SYSTEM DESCRIPTION

.1 Fully supervised, microprocessor-based, fire alarm system, utilizing digital techniques for data control and digital, and multiplexing techniques for data transmission.

.2 System to carry out fire alarm and protection functions; including receiving alarm signals; initiating general alarm; supervising components and wiring; actuating annunciators and auxiliary functions; initiating trouble signals and signalling to monitoring agency.

.3 Zoned, non-coded single stage.

.4 Operation of system shall not require personnel with special computer skills.

.5 System to include:

.1 Central Command Centre (existing)

.2 Wiring

.3 Manual and automatic initiating devices.

.4 Audible signalling devices.

.5 End-of-line resistors.

1.4 REQUIREMENTS OF REGULATORY AGENCIES

.1 System:

.1 To TB OSH Chapter 3-04.

.2 Subject to Fire Commissioner of Canada (FC) approval.

.3 Subject to FC inspection for final acceptance.

.4 To Canadian Forces Fire Marshal approval.

.2 System components: listed by ULC and comply with applicable provisions of Local/Provincial Building Code, and meet requirements of local authority having jurisdiction.

1.5 SHOP DRAWINGS

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

1.6 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for fire alarm system for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

.2 Include:

.1 Instructions for complete fire alarm system to permit effective operation and maintenance.

.2 Technical data - illustrated parts lists with parts catalogue numbers.

.3 Copy of approved shop drawings with corrections completed and marks removed except review stamps.

.4 List of recommended spare parts for system.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal, and with the Waste Reduction Workplan.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

Part 2 Products

2.1 MATERIALS

.1 Equipment and devices: ULC listed and labelled and supplied by single manufacturer.

.2 Power supply: to CAN/ULC-S524.

.3 Audible signal devices: to ULC-S524.

.4 Visual signal devices: to CAN/ULC-S526.

.5 Control unit: to CAN/ULC-S527.

.6 Manual pull stations: to CAN/ULC-S528.

.7 Thermal detectors: to CAN/ULC-S530.

.8 Smoke detectors: to CAN/ULC-S529.

.9 Smoke alarms: to CAN/ULC-S531.

2.2 SYSTEM OPERATION: SINGLE STAGE - SIGNALS ONLY

.1 Actuation of any alarm initiating device to:

.1 Cause electronic latch to lock-in alarm state at central control unit and remote command centre.

.2 Indicate zone of alarm at central control unit and remote annunciator.

.3 Cause audible signalling devices to sound continuously throughout building and at central control unit.

.4 Transmit signal to fire department via central station.

.2 Acknowledging alarm: indicated at central control unit.

.3 Possible to silence signals by "alarm silence" switch at control unit, after 60s period of operation.

2.3 CONTROL PANEL

.1 The existing fire alarm remote command center is Cerberus Pyrotronics RCC-1 series.

2.4 INITIATING/ INPUT CIRCUITS

.1 Receiving circuits for alarm initiating devices such as manual pull stations, smoke detectors, heat detectors and water flow switches, wired in DCLB configuration to central control unit.

.2 Alarm receiving circuits (active and spare): compatible with smoke detectors and open contact devices.

.3 Actuation of alarm initiating device: cause system to operate as specified in "System Operation".

.4 Receiving circuits for supervisory, N/O devices. Devices: wired in DCLB configuration to central control unit.

.5 Actuation of supervisory initiating device: cause system to operate as specified in "System Operation".

2.5 ALARM OUTPUT CIRCUITS

.1 Alarm output circuit: connected to signals, wired in class B configuration to central control unit.

.1 Signal circuits' operation to follow system programming; capable of sounding bells. Each signal circuit: rated at 2 A, 24 VDC.

2.6 AUXILIARY CIRCUITS

.1 Auxiliary contacts for control functions.

.2 Actual status indication (positive feedback) from controlled device.

.3 Alarm and/or supervisory on system to cause operation of programmed auxiliary output circuits.

.4 Upon resetting system, auxiliary contacts to return to normal or to operate as pre-programmed.

.5 Auxiliary circuits: rated at 2 A, 24 Vdc or 120 Vac, fuse-protected.

2.7 WIRING

.1 Twisted copper conductors: rated 300 V.

.2 To initiating circuits: 18 AWG minimum, and in accordance with manufacturer's requirements.

.3 To signal circuits: 16 AWG minimum, and in accordance with manufacturer's requirements.

.4 To control circuits: 14 AWG minimum, and in accordance with manufacturer's requirements.

2.8 MANUAL ALARM STATIONS

.1 Addressable manual fire alarm boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.

.2 All operated stations shall have a positive, visual indication of operation and utilize a key type reset.

.3 Manual fire alarm boxes shall be constructed of Steel with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches (44 mm) or larger.

.4 Shall be Cerberus Pyrotronics MSI-SI.

2.9 AUTOMATIC ALARM INITIATING DEVICES

.1 Addressable smoke detectors shall match existing:

.1 Ionization type.

.2 Electronics to communicate detector's status to addressable module/transponder.

.3 Detector address to be set on detector base in field.

.4 Shall be Siemens FP-11.

2.10 AUDIBLE SIGNAL DEVICES

.1 Horns and horn/strobes shall match existing:

.1 Siemens U-MMT series, 24V DC.

2.11 END-OF-LINE DEVICES

.1 End-of-line devices to control supervisory current in alarm circuits and signalling circuits, sized to ensure correct supervisory current for each circuit. Open, short or ground fault in any circuit will alter supervisory current in that circuit, producing audible and visible alarm at main control panel and remotely as indicated.

Part 3 Execution

3.1 INSTALLATION

.1 Install systems in accordance with CAN/ULC-S524 and TB OSH Chapter 3-04.

.2 Install central control unit and connect to ac power supply, dc standby power.

.3 Install manual alarm stations and connect to alarm circuit wiring.

.4 Locate and install detectors and connect to alarm circuit wiring. Do not mount detectors within 1 m of air outlets. Maintain at least 600 mm radius clear space on ceiling, below and around detectors. Locate duct type detectors in straight portions of ducts.

.5 Connect alarm circuits to main control panel.

.6 Install bells and connect to signalling circuits.

.7 Connect signalling circuits to main control panel.

.8 Install end-of-line devices at end of alarm and signalling circuits.

.9 Room detection system.

- .1 Install detectors. Make necessary connections between room detection panel and main fire alarm panel.

.10 Splices are not permitted.

.11 Provide necessary raceways, cable and wiring to make interconnections to terminal boxes, annunciator equipment and CCU, as required by equipment manufacturer.

.12 Ensure that wiring is free of opens, shorts or grounds, before system testing and handing over.

.13 Identify circuits and other related wiring at central control unit, annunciators, and terminal boxes.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 01 - Common Work Results – Electrical and CAN/ULC-S537.

.2 Fire alarm system:

- .1 Test such device and alarm circuit to ensure manual stations, thermal and smoke detectors transmit alarm to control panel and actuate first stage alarm.
- .2 Check annunciator panels to ensure zones are shown correctly.
- .3 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of systems.
- .4 Addressable circuits system style DCLB:
  - .1 Test each conductor on all DCLB addressable links for capability of providing 3 or more subsequent alarm signals on line side of single open-circuit fault condition imposed near electrically most remote device on each link. Operate

Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.

.2 Test each conductor on all DCLB addressable links for capability of providing 3 or more subsequent alarm signals during ground-fault condition imposed near electrically most remote device on each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.

.3 Provide final PROM program re-burn for system Engineer incorporating program changes made during construction.

3.3 DEMONSTRATION AND TRAINING

.1 Provide on-site lectures and demonstration by fire alarm equipment manufacturer to train operational personnel in use and maintenance of fire alarm system.

END OF SECTION

Osoyoos POE

CONTROLS POINTS LIST — **SECTION 15900**

17-Apr-07

DESCRIPTION

BREAKOUT PRICE #1 ITEM 5.4 BUS PASSENGER PROCESSING AREA HVAC CONTROL UPGRADE

DATA	INPUT	OUTPUT	STATUS	TYPE	ALARM	NOTES
HEAT PUMP HP-3 HVAC SYSTEM						
	Occupancy Sensor		NEW	Digital		
		HP-3 Economizer	Existing	Analog		

BREAKOUT PRICE #1 ITEM 5.5 PUBLIC WASHROOM CONTROL UPGRADE

DATA	INPUT	OUTPUT	STATUS	TYPE	ALARM	NOTES
FURNACE F-3 HVAC SYSTEM						
	Occupancy Sensor NO102 Men's		NEW	Digital		
	Occupancy Sensor NO103 Women's		NEW	Digital		
		Existing furnace and fan points to remain unchanged.				

BREAKOUT PRICE #1 ITEM 5.7 PIL BOOTH STANDBY VENTILATION ENERGY

DATA	INPUT	OUTPUT	STATUS	TYPE	ALARM	NOTES
HEAT PUMP HP-2 HVAC SYSTEM						
	Occupancy Sensor NE-101 PIL BOOTH		NEW	Digital		
	Occupancy Sensor NE-102 PIL BOOTH		NEW	Digital		
	Occupancy Sensor NE-103 PIL BOOTH		NEW	Digital		
	Occupancy Sensor NE-104 PIL BOOTH		NEW	Digital		
		EDH-2 Existing control replaced with Analog Signal)	NEW	Analog		

BREAKOUT PRICE #1 ITEM 5.8 REPLACE DEVANNING BOILER

DATA	INPUT	OUTPUT	STATUS	TYPE	ALARM	NOTES
EXISTIONG BOILER SYSTEM						
		UH-15 - 3 Way to position control valve (NO - Heating)	Existing - relocated.	digital		
	Heating Thermostat for UH-15		Existing - relocated.	T-stat		
		UH-17 - 3 Way to position control valve (NO - Heating)	Existing - relocated.	digital		
	Heating Thermostat for UH-17		Existing - relocated.	T-stat		

BREAKOUT PRICE #1 ITEM 5.9 REDUCE ADMIN BUILDING VENTILATION HEATING

DATA	INPUT	OUTPUT	STATUS	TYPE	ALARM	
EXISTING HEAT PUMP HP-22		Economizer Dampers	Existing			re-program
EXISTING HEAT PUMP HP-23		Economizer Dampers	Existing			re-program
EXISTING HEAT PUMP HP-26	CO2 Sensor Lobby Room NA127		NEW	AO	H	
		Economizer Dampers	Existing			re-program
	CO2 Sensor IM/GR Room NA128		NEW	AO	H	
	CO2 Sensor Interview Room NA129		NEW	AO	H	
	CO2 Sensor Interview Room NA130		NEW	AO	H	
EXISTING HP-27	CO2 Sensor Room NA131		NEW	AO	H	
		Economizer Dampers	Existing			re-program
	CO2 Sensor Room NA132		NEW	AO	H	
	CO2 Sensor Room NA133		NEW	AO	H	
	CO2 Sensor Room NA134		NEW	AO	H	
	CO2 Sensor Room NA135		NEW	AO	H	
	CO2 Sensor Room NA136		NEW	AO	H	
	CO2 Sensor Room NA137		NEW	AO	H	
	CO2 Sensor Room NA138		NEW	AO	H	
	CO2 Sensor Room NA139		NEW	AO	H	
	CO2 Sensor Room NA140		NEW	AO	H	
EXISTING HEAT PUMP HP-29		Economizer Dampers	Existing			re-program

Osoyoos POE

CONTROLS POINTS LIST — **SECTION 15900** — 17-Apr-07

DESCRIPTION					
BREAKOUT PRICE #1 ITEM 5.10 REPLACE VESTIBULE ELECTRIC UNIT HEATER THERMOSTAT					
DATA	**INPUT**	**OUTPUT**	**STATUS**	**TYPE**	**ALARM**	
EXISTING VH-1						
	Heating Thermostat		NEW	Thermostat		electric point / not ddc
BREAKOUT PRICE #1 ITEM 5.11INSTALL PROGRAMMABLE THERMOSTAT IN PWGSC CONTAINER						
DATA	**INPUT**	**OUTPUT**	**STATUS**	**TYPE**	**ALARM**	
Existing PWGSC Container HVAC System						
	Heat / Cool Thermostat		NEW	Thermostat		electric point / not ddc

CBSA PENTICTON DISTRICT OFFICE RELOCATION						
DATA	**INPUT**	**OUTPUT**	**STATUS**	**TYPE**	**ALARM**	**NOTES**
CBSA Office HVAC System						
FAN COIL (FC-1 through FC-5)		Enable (On/Off)	New	Digital		
		Mode of operation	New	Analog		
		Heating Set Point	New	Analog		
		Cooling Set Point	New	Analog		
		Room Temp Sensor (DDC)	New	Analog	H,L	
		Room Thermostat	New	Thermostat		1,2
	Error		New	Digital		
	Compressor start (on/off)		New	Digital		
	Mode of Operation (Reversing Valve)		New	Digital		
HEAT RECOVERY VENTILATOR HRV-1						
	Start / Stop		New	Digital		
	Status		New	Analog		
	Preheated outside air temp		New	Analog	L	
	HRV Supply Temp		New	Analog		
		O/A Damper	New	Digital		
		E/A Damper	New	Digital		
EXISTING BOILER SYSTEM						
		UH-15 - 3 Way to position control valve (NO - Heating)	Existing - relocated.	digital		
	Heating Thermostat for UH-15		Existing - relocated.	T-stat		electric point / not ddc
		UH-17 - 3 Way to position control valve (NO - Heating)	Existing - relocated.	digital		
	Heating Thermostat for UH-17		Existing - relocated.	T-stat		electric point / not ddc
	HRV-HC1 HWR Temp		New	Analog	L	L
	HRV-HC1 Modulation		New	Analog		
EXISTING CO/NO EXHAUST FAN EF-2						
		FAN Start / Stop	Existing - relocated.			electric point / not ddc
	CO/NO Sensor		New			electric point / not ddc

ALARM LEGEND

LL - LOW LIMIT
HL - HIGH LIMIT
OR - OUT OF NORMAL RANGE
RP - REPORT FAULT CODE

NOTES

1. Thermostat provided with fan coil. Wired by this division.
2. Wire relays from thermostat to control back up base board heating for each fan coil as noted. Refer to drawings for details
3. Map boiler points to DDC. Provide list of monitored points only do not show all points in graphics.

1.0 GENERAL

1.1 DOCUMENTS

.1 This section of the specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 SECTION INCLUDES

.1 Furnish all labour, materials, equipment and service necessary for the complete installation of fencing as indicated on the drawings and as hereinafter specified.

.2 The work of this section shall include the supply and installation of the following:

. 1 Wire wall steel fencing, posts and gates.

.2 Concrete footings for fencing line posts and terminal posts.

.3 Barbed wire at top of top rail.

1.3 SUBMITTALS

.1 Provide shop drawings of fencing a minimum of one week prior to installation to the Consultant for approval- Drawings shall show the general arrangement with proper details of all components necessary to complete installation.

.2 Provide samples of proposed galvanized steel chain link fence components for approval prior to installation.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

.1 Store packaged material in original containers with manufacturer's seals and labels intact.

.2 Prevent damage to materials during handling and storage. Keep materials under cover and free from dampness.

1.5 APPROVED EQUALS

.1 All items as specified or pre-approved equals.

2.0 PRODUCTS

2.1 MATERIALS

.1 All pipe, tie wires, tension wires and bands, connectors, fittings, throw-bolts and hardware shall be hot-dipped galvanized.

.2 Pipe: to CAN2-138.2 MBO, Table 1 Medium Duty. Schedule 40 (wall thicknesses as shown below), standard continuous weld, modulus of elasticity 30,000.

Pipe Dia.	Sched. 40Wall Thickness
1-5/8"	0.140" (9/64")
1-7/8"	0.145" (19/128")
2-3/8"	0.154" (5/32")
2-7/8"	0.203" (13/64")
3-1/2"	0.226" (7/32")
4-1/2"	0.237" (15/64")

.3 Tension Bar: 16 x 5mm (5/8" x 3/16"), length to match entire height of fencing.

.4 Tie Wire: 3.55mm. (9 gauge) galvanized.

.5 Bottom Tension Wire (where applicable) 4.88mm (6ga.) fixed to fencing by hog rings.

.6 Woven fabric: to CAN2-138.1.M80. See 2.1.8. for gauge and mesh size. Top and bottom selvedges to have knuckled finish. Wire diameters shall be as follows for the specified wire gauges:

Specified Gauge	Min. Core Wire Diameter
6ga.:	3.60mm (0.142")
9ga.:	2.64mm {0.104")
11ga.:	1.98mm (0.078")

.7 Concrete Footings: compressive strength 18 MPa at 28 days.

.8 Table One: Component Size and Description for each Location. Note: pipe sizes shown are outside diameter.

Component	Fences
Bottom Rail	41mm (1-5/8")
Mid Rail	41mm (1-5/8")
Top Rail	41mm (1-5/8")
Line Posts	60mm (2-3/8")
End Posts	89mm (3-1/2")
Gate Posts	89mm (3-1/2")
Mid Brace	41mm (1-5/8")
Chain Link	50 mm (2")
Fabric	galvanized grid 12.7mm x 76mm, 10.5ga. Tie Wire, Hog Rings 300mm. (12") o.c. at all tension bands and frame members

.9 Touch-up paint: Zinc rich organic ready-mixed coating to CGSB-1-GP-18M.

.10 Gate Hardware: Galvanized pin-type hinge. Latch for exterior gate, to be designed to receive padlock. All sized to suit the gate they are installed on.

.11 Fabric fastening mechanism in accordance with wire wall manufacturer's recommendation.

3.0 EXECUTION

3.1 POST SPACING

.1 Maximum post spacing 2.1 metres on centre. Set end posts of straight runs and adjust on centre spacing of line posts equally between.

3.2 FOOTINGS

.1 All footings shall be set relative to finished surfaces as detailed.

.2 Minimum footing dimensions, except where detailed otherwise: footing depth 1200 mm, footing diameter 150mm larger than outside post diameter, post depth 75mm from bottom of footing.

.3 All posts shall be installed in footings for each section of fence before welding in the rails for that section.

3.3 FENCE CONSTRUCTION

.1 All fences shall be all welded construction. Weld all ends continuously to adjoining member. Grind all welds smooth.

.1 Cope all posts to accept top rail
.2 Cope all mid braces and bottom rails to fit posts
.3 Cut angle iron to fit backstop posts

.2 Cope all Connections. NO crimping or flattening will be permitted. Any connection not meeting this

specification will be rejected and replaced with specified construction at the contractors expense.

.3 Mid braces shall be installed at all end sections and all sections adjacent to gates and comers, for all fences. All fences 2.4m high or higher shall have horizontal mid rails installed continuous in all sections.

3.4 TACK WELDING

.1 Tack weld ALL 6 gauge galv. wire mesh in lieu of tie wires as described in item Table One above. Spacing for tack welds shall match specified tie wire spacing and as detailed.

3.5 TENSION BANDS

.1 Install tension bands where fabric terminates at all terminal, comer and gate posts.

3.6 FINISH

.1 Clean all welds and other breaks in the galvanized surface. Touch up with zinc rich paint. All link fence and posts to be galvanized finish.

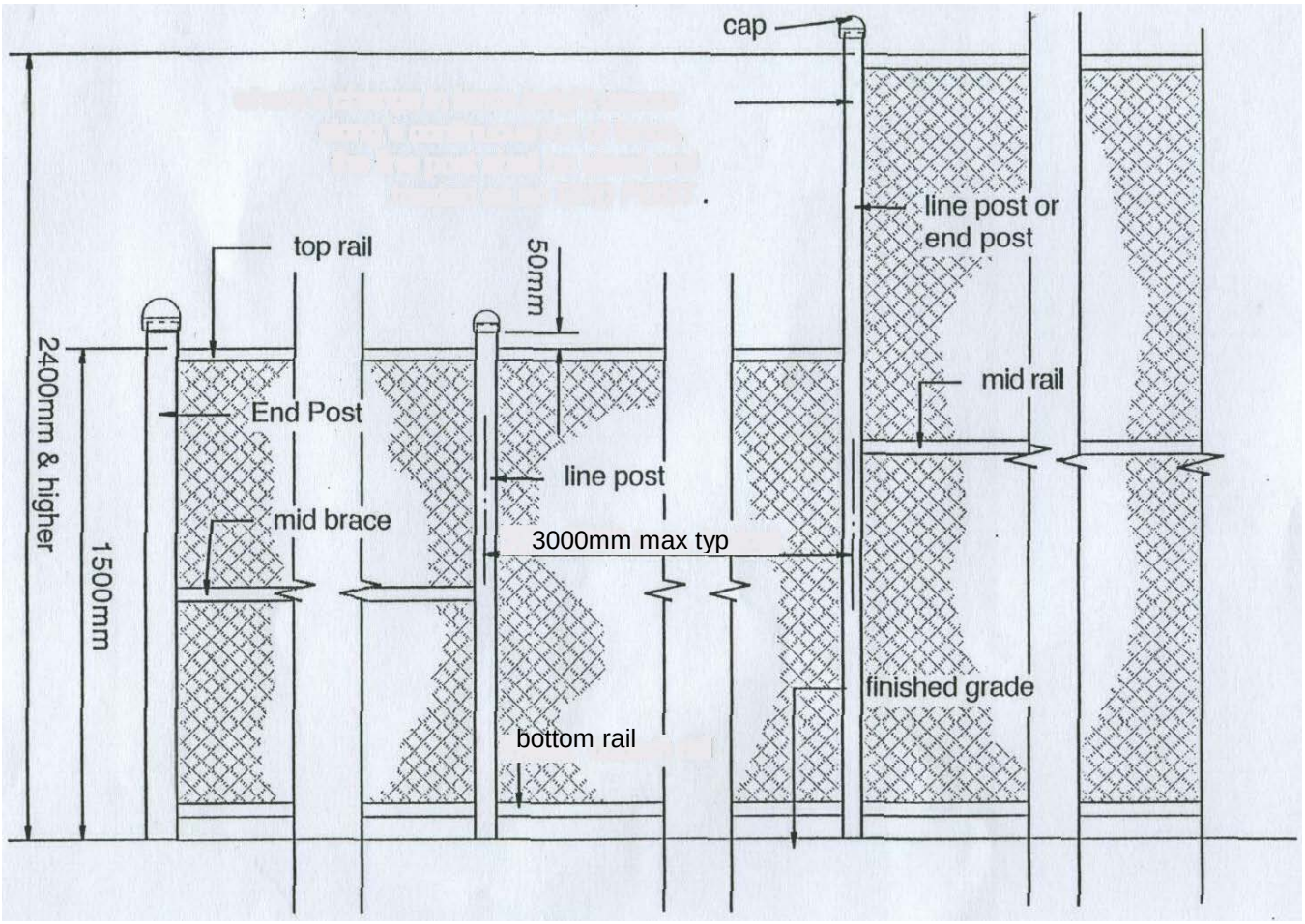
3.7 CLEANUP

.1 Clean up all excess and waste material and remove from the site.

FENCE CONSTRUCTION

Definition of Terms

- see tables in this section for sizes and gauges of components
- mid braces shall occur for a minimum one full panel, each side of a corner or bend
- where a change in fence height occurs along a continuous run of fence, the line post shall be sized and treated as an end post
- top rails, bottom rails and mid rails shall be continuous between line posts
- install a continuous mid rail on all fences equal to or greater than 2400mm high
- Post to be a maximum 2.1m spacing to suit maximum width of wire wall. Diagram below is only generic.



END OF SECTION 32 31 13

APPENDIX A

SCOPE OF WORK

			Scope of Work by Contractor	Scope of Work by Departmental Representative
A	**Storage**			
	1	High security four drawer lateral file cabinets (2)		Supply & Install
B	**Furniture**			
	1	Office furniture (new)		Supply & Install

APPENDIX B

INTERIOR FINISHES MATERIAL AND COLOUR SCHEDULE

REFERENCE SPECIFICATION SECTION	ACCEPTABLE PRODUCTS			REMARKS
	LEGEND	MATERIALS	MANUFACTURER / STYLE / COLOUR	
06 40 00 Architectural Woodwork	**PL-1**	Plastic Laminate	Formica, Neutral Weft 5875-58	
	PL-2	Plastic Laminate	Formica Weathered Ash 8842-WR	
	PL-3	Plastic Laminate	Formica Sarum Gray 2770-58	
	PL-4	Plastic Laminate	Formica Black Riftwood 6414-NG	
	PL-5	Plastic Laminate	Formica Colorcore2, New White 7223C-90	
09 30 13 Ceramic Tiling	**PRT-1**	Floor Tile – Porcelain	“Regal”, colour Charcoal Black by Olympia Tile 300x 600 (mm)	
	CT-1	Wall Tile – Ceramic	“Color & Dimension”, colour Silver Grey by Olympia Tile 53 x 218 (mm)	
	-	Tile Edge Protection	“Jolly” by Schluter	
09 51 99 Acoustical Ceilings for Minor Works	**ACT**	Acoustic Ceiling Tiles	“Cirrus Open Plan” #551 by Armstrong	
		Suspended T-Bar	“Prelude XL”, colour White by Armstrong	
09 65 99 Resilient Flooring for Minor Works	**SF**	Linear Linoleum	“Marmoleum Modular” colour Grey Granite by Forbo	
	RB	Rubber Base	“TA4”l” wall base, colour Gateway WG by Johnsonite	
	RT	Tactile Warning Rubber Base	“Johnsonite” rounded raised round solid colour #63 Burnt Umber B	
09 68 13 Carpeting	**CPT**	Carpet Tile	“Silver Lining”, colour SL930-104530 Mica Fade by Interface	

REFERENCE SPECIFICATION SECTION	ACCEPTABLE PRODUCTS			REMARKS
	LEGEND	MATERIALS	MANUFACTURER / STYLE / COLOUR	
09 91 23 Interior Painting	**PT-1**	Paint	Sherwin Williams/Extra White SW7006	
	PT-2	Paint	Sherwin Williams/Network Grey SW7073	
	PT-3	Paint	Sherwin Williams/Web Grey SW7075	
12 24 13 Roller Window Shades	**-**	Roller Window Shades	“Solarfective” motorized ceiling-mounted shades with 500 Series Solar shield shade cloth, colour Mid-Grey.	

NOTE:

.1 This schedule is a separate document from the specification and may list specific manufacturers related to patterns and colours upon which the colour scheme for the project is based.

.2 The following “acceptable products” are listed in order to establish a quality of product upon which a price can be tendered. Other products having the same characteristics will not be excluded. Refer to the specification sections as listed for quality specifics.

.3 The Departmental Representative will consider substitute Products which meet or exceed the properties of the specified Product and are similar in material, construction, thickness, colour, texture, and overall quality, provided that proposals are submitted to the Departmental Representative complete with samples and whatever other data the Departmental Representative may require in order to evaluate the proposed substitute Product. If the Departmental Representative approves the proposed substitute Product, the Contractor will have the option of providing Product listed in the Finish schedule or an approved alternative.

END OF SCHEDULE

APPENDIX C

SITE PHOTOS

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

Photo 1

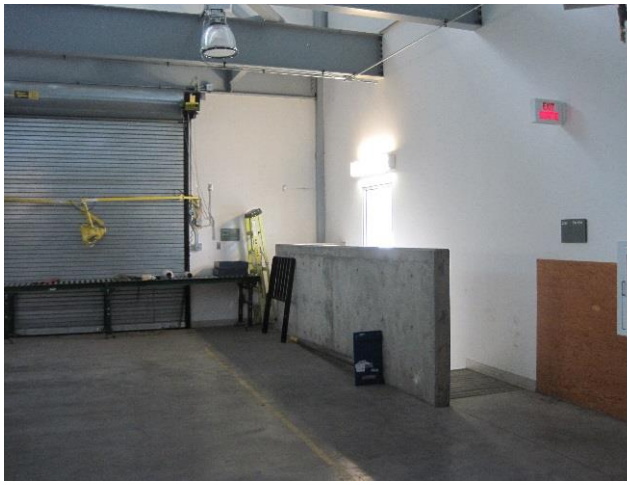


Photo 2

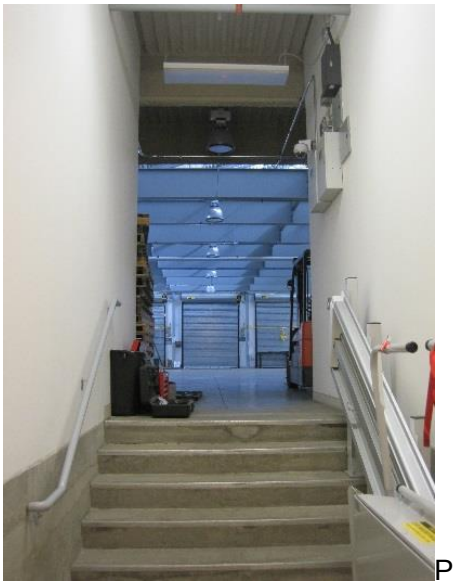


Photo 3

Photo 4

Photo 5

Photo 6

Photo 1

Photo 2

Photo 3

Photo 4

END OF APPENDIX C