



Specification

Abbotsford, BC
33344 King Rd.
Fraser Valley Institution
Twenty Bed Living Unit

Bid Package for:

**MECHANICAL HVAC
(Divisions 23 & 25)**

Requisition No.: 21C82-120411/A

Project No. R.052462.001
April 2013

Project № R.052462.001

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Bound Separately

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A801	Interior Elevations & Plans - Washrooms
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A805	Interior Elevations & Plans
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C02	Site Grading Plan / Landscape Plan
C03	Site Utility Plan
C04	Details
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S102	Typical Details
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S202	Level 2 Floor Framing Plan
S203	Roof Framing Plan
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S302	Level 2 Floor Sections and Details
S303	Roof Sections and Details - Sheet 1

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MECHANICAL *Drawings included in contract.*

(*) Drawings related to plumbing.

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M-4	(*)	Floor Plan - Main Level Plumbing & Drainage
M-5	(*)	Floor Plan - Main Level Fire Protection
M-6		Floor Plan - Level 2 HVAC
M-7	(*)	Floor Plan - Level 2 Plumbing & Drainage
M-8	(*)	Floor Plan - Level 2 Fire Protection
M-9		Roof Plan
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M-11		Sections
M-12		Schematics and Details
M-13		Schematic
M-14		Details

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E002	Electrical Single Line Diagram Communications Room and Electrical Room Details
E003	System Riser Diagram
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E401	Level 2 - Low Tension Layout
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Solicitation 21C82-120411
STATEMENT OF WORK

Work under this contract is for the **Supply and Install of Heating, Ventilating and Air Conditioning (HVAC) and Integrated Automation (EMCS) and any related Sections/References:**

Note:

1. Does not include trenching and backfill for gas service.
2. Thermal Insulation – Include Insulation for all Plumbing and HVAC.

As per the Plans, Specification and Addendums provided by Corcan from PWGSC:

Division 1 GENERAL REQUIREMENTS

01 01 50	General Instructions
01 14 10	Security Requirements
01 35 33	Health and Safety Requirements
01 91 00	Commissioning

Division 23 HEATING, VENTILATING AND AIR CONDITIONING

23 05 01	Use of HVAC Systems During Construction
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Division 25 Integrated Automation (EMCS)

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25 01 12 EMCS: Training
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25 05 54 EMCS: Identification
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25 30 01 EMCS: Building Controllers
25 30 02 EMCS: Field Control Devices
25 90 01 EMCS: Site Requirements Applications and Systems Sequences of
Operation
25 90 02 EMCS: Control Point Lists/Schedules

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MECHANICAL

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M-4 (*)	Floor Plan - Main Level Plumbing & Drainage
M-5 (*)	Floor Plan - Main Level Fire Protection
M-6	Floor Plan - Level 2 HVAC
M-7 (*)	Floor Plan - Level 2 Plumbing & Drainage
M-8 (*)	Floor Plan - Level 2 Fire Protection
M-9	Roof Plan
M-10	Sections
M-11	Sections
M-12	Schematics and Details
M-13	Schematic
M-14	Details

All other Plans and Specifications are for reference only.

Work to be performed in accordance with the contract schedules within the scope of work

1 SUMMARY OF WORK

- .1 Work covered by Contract Documents:
 - .1 Work under this Contract comprises new HVAC work for the new twenty bed living unit and remedial work as indicated, located at Fraser Valley Institution, Matsqui Complex, 33344 King Road, Abbotsford B.C.
- .2 Contractor's Use of Premises:
 - .1 Corcan Construction will control use of site within the construction area for Work, storage, and access to site. Coordinate work activities and schedule with Corcan Construction.
 - .2 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
 - .3 The new Twenty Bed Living Unit is outside the FVI perimeter security fence. Matsqui Complex will be operational during work of this Contract.
- .3 Terminology:
 - .1 In accordance with General Provisions GC1 and in addition to GC1.1.2 Terminology:
 - .1 Corcan Construction: is the liason contact for contractors and has control of the construction site, including scheduling, temporary facilities etc., as specified in this section.
 - .2 Departmental Representative:
 - .1 Canada shall designate a Departmental Representative and shall notify the Contractor of the name, address and telephone number of the Departmental Representative.
 - .2 The Departmental Representative shall perform Canada's duties and functions under the contract.
 - .3 The Departmental Representative shall be authorized to issue notices, instructions and directions to the Contractor and to accept on behalf of Canada any notice, order or other communication from the contractor relating to the Work.
 - .4 The Departmental Representative shall, within a reasonable time, review and respond to submissions made by the Contractor in accordance with the requirements of the Contract.

2 WORK RESTRICTIONS

- .1 Notify Corcan Construction of intended interruption of disconnected services and provide schedule for review. Schedule major disruption of services in existing during approved times.
 - .2 Where Work involves connecting to existing power and communication lines, give Corcan Construction and Departmental Representative 48 hours of notice for necessary interruption of electrical service throughout course of work. Keep duration of interruptions to a minimum. Coordinate interruptions affecting premises if affected by the disruption.
 - .3 Construct barriers in accordance with Temporary Barriers and Enclosures clause.
 - .4 Security Requirements: refer to Section 01 14 10 - Security requirements.
 - .5 Hours of work:
 - .1 Perform work during normal working hours of the construction site (0730 to 1600) as directed by Corcan Construction, Monday through Friday except holidays.
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.2 Work may be performed after normal working hours, Monday through Friday, on weekends and holidays, with a minimum forty-eight (48) hours advance notice and approval of Corcan Construction. Provide schedule for prior approval.

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

3 CONSTRUCTION WORK SCHEDULE

.1 Commence work immediately upon official notification of acceptance of offer and complete the work within the Corcan Construction approved schedule.

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

.3 Submittals:

.1 Submit to Corcan Construction within ten (10) working days of Award of Contract Bar (GANNT) Chart as Master Plan for planning, monitoring and reporting of construction progress.

.2 Identify each trade or operation.

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

.4 Corcan Construction will review schedule with Departmental Representative and return one copy.

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

.4 Project Scheduling Reporting:

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

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

.5 Project Meetings:

.1 Discuss Project Schedule at regular site meetings with Corcan Construction and Departmental Representative, 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.

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

4 SUBMITTAL PROCEDURES

.1 Administrative:

.1 Submit to Corcan Construction, submittals to be reviewed by Departmental Representative. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work.

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

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

- .4 Present shop drawings, product data, samples and mock-ups in SI Metric units.
 - .5 Where items or information is not produced in SI Metric units converted values are acceptable.
 - .6 Review submittals prior to submission to Corcan Construction. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and shall be considered rejected.
 - .7 Notify Corcan Construction, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
 - .8 Verify field measurements and affected adjacent Work are coordinated.
 - .9 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative review of submittals.
 - .10 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.
 - .11 Keep one reviewed copy of each submission on site.
- .2 Shop Drawings:
- .1 Drawings to be originals prepared by Contractor, Subcontractor, Supplier or Distributor, which illustrate appropriate portion of work; showing fabrication, layout, setting or erection details as specified in appropriate sections.
- .3 Product Data:
- .1 Certain specification Sections specify that manufacturer's standard schematic drawings, catalogue sheets, diagrams, schedules, performance charts, illustrations and other standard descriptive data will be accepted in lieu of shop drawings, provided that the product concerned is clearly identified. Submit in sets, not as individual submissions.
- .4 Samples:
- .1 Submit samples in sizes and quantities specified.
 - .2 Where colour is criterion, submit full range of colours.
 - .3 Submit all samples as soon as possible after the contract is awarded, to facilitate production of complete colour scheme by the Departmental Representative.
- .5 Mock-ups:
- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of all Sections required to provide mock-ups.
 - .2 Construct in location as specified in specific Section .
 - .3 Prepare mock-ups for Departmental Representative' review with reasonable promptness and in an orderly sequence, so as not to cause any delay in Work.
 - .4 Failure to prepare mock-ups in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.
 - .5 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.
- .6 Submission Requirements:
- .1 Schedule submissions at least ten days before dates reviewed submissions will be needed.
 - .2 Submit number of copies of product data, shop drawings which Contractor requires for distribution plus four (4) copies which will be retained by Corcan Construction and Departmental Representative.
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- .3 Accompany submissions with transmittal letter in duplicate.
- .4 Submit either bond copies or one (1) electronic pdf file of each shop drawing and product data as directed by Corcan Construction.

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

5 HEALTH AND SAFETY

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

6 ENVIRONMENTAL PROCEDURES

- .1 Fires and burning of rubbish on site not permitted.
- .2 Do not bury rubbish and waste materials on site unless approved by Departmental Representative.
- .3 Do not dispose of waste or volatile materials such as oil, paint thinner or mineral spirits into waterways, storm or sanitary systems.
- .4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.
- .5 Under no circumstances dispose of rubbish or waste materials on property or CSC waste bins.

7 REGULATORY REQUIREMENTS

- .1 References and Codes:
-

- .1 Perform Work in accordance with National Building Code of Canada (NBCC2010) including all amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.

8 QUALITY CONTROL

- .1 Inspection:
 - .1 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work.
 - .2 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
 - .3 Corcan Construction or Departmental Representative may order any part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.
 - .2 Independent Inspection Agencies:
 - .1 Provide independent Inspection for purpose of inspecting and/or testing portions of Work as specified in relevant sections. Cost of such services will be borne by the Contractor.
 - .2 Provide equipment required for executing inspection and testing by appointed agencies.
 - .3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
 - .4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no extra cost to Contract. Pay costs for retesting and reinspection.
 - .3 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 an orderly sequence so as not to cause delay in Work.
 - .4 Rejected Work:
 - .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by 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.
 - .5 Reports:
 - .1 Submit (4) four copies or one scanned pdf copy of inspection reports to Corcan Construction.
-

- .6 Equipment and Systems:
 - .1 Submit adjustment and balancing reports for electrical and building equipment systems.
 - .2 Refer to specific Section for definitive requirements.

9 TEMPORARY UTILITIES

- .1 Installation and Removal:
 - .1 Provide temporary utilities controls in order to execute work expeditiously.
 - .2 Remove from site all such work after use.
- .2 Water Supply:
 - .1 Existing water supply system may be used for construction purposes provided that damaged components are replaced when damaged. Provide own hoses from source.
- .3 Temporary Heating and Ventilation:
 - .1 Temporary heating and ventilation required during construction period, including attendance, maintenance and fuel, is provided by Corcan Construction.
- .4 Temporary Power and Light:
 - .1 Temporary electrical power and lighting provided by Corcan Construction and installed power and lighting may be used for construction purposes at no extra cost provided that guarantees are not affected thereby and electrical components used for temporary power are replaced when damaged.
- .5 Temporary Communication Facilities:
 - .1 Cell phones are permitted on construction site as approved by Corcan Construction.
- .6 Fire Protection:
 - .1 Provided and maintained by Corcan Construction.

10 CONSTRUCTION FACILITIES

- .1 Installation and Removal:
 - .1 Provide construction facilities in order to execute work expeditiously.
 - .2 Remove from site all such work after use.
 - .2 Scaffolding:
 - .1 Arrange with Corcan Construction for use of scaffolding on site and use in safe manner, in accordance with WCBBC regulations and Section 01 35 33. Provide additional scaffolding where required to complete work.
 - .2 Erect scaffolding independent of walls. Remove promptly when no longer required.
 - .3 Hoisting/lifts:
 - .1 Provide, operate and maintain hoists/lifts required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for use thereof.
 - .2 Hoists/lifts: operated by qualified operator.
 - .4 Site Storage/Loading:
 - .1 Confine work and operations of employees as directed by Corcan Construction . Do not unreasonably encumber premises with products.
-

- .2 Do not load or permit to load any part of Work with a weight or force that will endanger the Work.
- .5 Construction Parking:
 - .1 Make good damage to local roads used for access to project site.
 - .2 Parking space is available outside construction fence and temporary parking of delivery vehicles within construction site as directed by the Corcan Construction.
- .6 Contractor's Site Office:
 - .1 Corcan Construction's site office is available to contractor for limited operational use as arranged with Corcan Construction.
 - .2 Corcan Construction will have a clearly marked and fully stocked first-aid case in a readily available location.
- .7 Equipment, Tools and Material Storage:
 - .1 Provide and maintain, in a clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.
 - .2 Locate materials not required to be stored in weatherproof sheds on site in a manner to cause least interference with work activities as directed by Corcan Construction.
- .8 Sanitary Facilities:
 - .1 Sanitary facilities for work force is provided on site by Corcan Construction.
- .9 Construction Signs:
 - .1 Signs and notices for safety or instruction to be in English language, or commonly understood graphic symbols.
 - .2 Maintain signboards, signs and notices for duration of project. Remove and dispose of signs off site when directed by Corcan Construction.

11 TEMPORARY BARRIERS AND ENCLOSURES

- .1 Enclosure of Structure:
 - .1 Corcan Construction will provide temporary weathertight secure protection for exterior openings until permanently enclosed.
 - .2 Guardrails and Excavations:
 - .1 Corcan Construction will provide guard rails and barricades around deep excavations, open edges of floors and roofs in accordance with WCB requirements.
 - .3 Access to Site:
 - .1 As directed by Corcan Construction.
 - .4 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 Corcan Construction for locations and installation schedule 3 days prior to installation.
 - .4 Be responsible for damage incurred due to lack of or improper protection.
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12 COMMON PRODUCT REQUIREMENTS

.1 Reference Standards:

- .1 If there is a question as to whether any product or system is in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .2 Cost for such testing will be born by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.
- .3 Conform to latest date of issue of referenced standards in effect on date of submission of Bids, except where specific date or issue is specifically noted.

.2 Quality:

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

.3 Storage, Handling and Protection:

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

.4 Transportation:

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

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

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

 - .8 Concealment:
 - .1 In finished areas, conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
 - .2 Before installation, discuss with Corcan Construction to determine if there is interference. Install as directed by Corcan Construction.

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

 - .10 Location of Fixtures:
 - .1 Inform Corcan Construction of conflicting installation. Install as directed.
 - .2 Submit field drawings to indicate relative position of various services and equipment when required by Departmental Representative.

 - .11 Fastenings:
 - .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
 - .2 Prevent electrolytic action between dissimilar metals and materials.
 - .3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.
 - .4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
 - .5 Keep exposed fastenings to a minimum, space evenly and install neatly.
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.6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

.12 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. Use resilient washers with stainless steel.

.13 Protection of Work in Progress:

.1 Prevent overloading of any part of building. Do not cut, drill or sleeve any load bearing structural member, unless specifically indicated without written approval of Departmental Representative. Coordinate cutting and drilling with Corcan Construction.

.14 Existing Utilities:

.1 Where work involves breaking into or connecting to existing services, carry out work at times directed by Corcan Construction and Departmental Representative, with minimum of disturbance to use of site and vehicular traffic. Maintain vehicular access on roadways at all times.

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

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

.4 Where unknown services are encountered, immediately advise Corcan Construction and confirm findings in writing.

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

13 EXAMINATION AND PREPARATION

.1 Surveying and requirements:

.1 Setting out point for location of building and top of slab elevation is designated on drawings.

.1 Establish setting out point location on site as directed by the Departmental Representative.

.2 Building grid lines aligned to cardinal points, except as approved otherwise.

.2 Locate, confirm and protect setting out point prior to starting site work. Preserve permanent reference points during construction.

.3 Make no changes or relocations without prior written notice to Departmental Representative.

.4 Report to Departmental Representative when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

.5 Require surveyor to replace control points in accordance with original survey control.

.6 Provide qualified registered land surveyor, licensed to practice in Place of Work, acceptable to Departmental Representative for all survey work.

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

- .2 Existing Services:
 - .1 Before commencing work, establish location and extent of service lines in area of Work and notify Corcan Construction of findings.
- .3 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 Corcan Construction of impending installation and obtain approval for actual location.
 - .4 Submit field drawings to indicate relative position of various services and equipment when required by Departmental Representative.

14 EXECUTION REQUIREMENTS

- .1 Preparation:
 - .1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
 - .2 After uncovering, inspect conditions affecting performance of Work.
 - .3 Beginning of cutting or patching means acceptance of existing conditions.
 - .4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.
 - .5 Provide protection from elements for areas which may be exposed by uncovering work; maintain excavations free of water.
 - .2 Execution:
 - .1 Coordinate execution of cutting, fitting and patching, for completion of Work, with Corcan Construction.
 - .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, full thickness of the construction element.
 - .12 Refinish surfaces to match adjacent finishes: For continuous surfaces refinish to nearest intersection; for an assembly, refinish entire unit.
 - .13 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.
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15 CLEANING

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

- .2 Final Cleaning:
 - .1 When Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
 - .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
 - .3 Prior to final review, remove surplus products, tools, construction machinery and equipment.
 - .4 Remove waste products from site.
 - .5 Clean and polish electrical fixtures and trim. Replace broken, scratched or disfigured lens glass.
 - .6 Remove stains, spots, marks and dirt from electrical fixtures.
 - .7 Clean lighting reflectors, lenses, and other lighting surfaces.
 - .8 Inspect fitments and equipment and ensure specified workmanship and operation.

16 CONSTRUCTION/DEMOLITION WASTE MANAGEMENT AND DISPOSAL

- .1 Waste and salvage bins provided on site by Corcan Construction.

17 CLOSEOUT PROCEDURES

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

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

 - .3 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 from electrical inspectors have been submitted.
 - .5 Operation of systems have been demonstrated to Department's personnel.
 - .6 Work is complete and ready for Final Inspection.
- .4 Final Inspection: when items noted above are completed, request final inspection of Work by Departmental Representative. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request reinspection..

18 CLOSEOUT SUBMITTALS

- .1 Record Drawings:
- .1 As work progresses, maintain accurate records to show all deviations from the Contract Drawings. Note on as-built drawings as changes occur. At completion supply:
 - .1 Four (4) copies of CD's in AutoCad file format (version: 2011) with all as-built information on the CD's.
 - .2 Four (4) sets of printed as-built drawings following review.
 - .3 Submit one copy of check plots to Departmental Representative prior to final printing/copying of as-built drawings.
 - .4 Convert reviewed as-built Autocad drawings to PDF format for inclusion to electronic interactive O&M manual.
 - .5 Departmental Representative will supply copies of the original AutoCad files.
 - .6 Retain original logo and title block on the as-built drawings. Contractor may place on the upper right-hand title block area a small company logo, the text "AS-BUILT" and the date.
 - .2 Costs for transferring as-built information from marked up working set of drawings to electronic format using ACAD and plotting service is included in the Contract.
- .2 Maintenance manual:
- .1 On completion of project submit to Departmental Representative four (4) paper copies (in loose leaf type binder) of Operations and Maintenance Manual, made up as follows:
 - .1 Provide maintenance manual on approved format for descriptive writing, page size images and page size drawings. Organize manuals into industry standard maintenance manual tabs with links in index to each descriptive section describing the component or maintenance procedure etc.
 - .2 Organize files into CSI Masterformat numbering system or other approved descriptive titles.
 - .3 Label disk "Operation and Maintenance Data", project name, date, names of Contractor, subcontractors, consultants and subconsultants.
 - .4 Include guarantees, diagrams and drawings.
 - .5 Organize contents into applicable sections of work to parallel project specification break-down. Mark each section by labeled tabs.
 - .6 Drawings, diagrams and manufacturer's literature must be legible.
 - .2 Maintenance manual submitted will be incorporated into a digital O&M manual, encompassing the entire project, by Corcan Construction.
- .3 Maintenance Materials, Special Tools and Spare Parts:
- .1 Specific requirements for maintenance materials, tools and spare parts are specified in individual sections.
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- .2 Deliver maintenance materials, special tools and spare parts to Corcan Construction and store in designated area as directed by Departmental Representative.
- .3 Prepare lists of maintenance materials, special tools and spare parts for inclusion in Manual specified in Clause 18.2.
- .4 Maintenance materials:
 - .1 Deliver wrapped, identify on carton or package, colour, room number, system or area as applicable where item is used.
- .5 Special tools:
 - .1 Assemble as specified;
 - .2 Include identifications and instructions on intended use of tools.
- .6 Spare parts:
 - .1 Assemble parts as specified;
 - .2 Include part number, identification of equipment or system for which parts are applicable;
 - .3 Installation instructions;
 - .4 Name and address of nearest supplier.

- .4 Warranties and Bonds:
 - .1 Provide electronic list with subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
 - .2 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work.
 - .3 Except for items put into use with Departmental Representative's permission, leave date of beginning of time of warranty until the Date of Interim Completion is determined.
 - .4 Verify that documents are in proper form, contain full information, and are notarized.
 - .5 Retain warranties and bonds until time specified for submittal.

19 DEMONSTRATION AND TRAINING

- .1 Demonstration and Training:
 - .1 Demonstrate operation and maintenance of equipment and systems to maintenance personnel following interim Completion and prior to date of final certificate of completion
 - .2 Departmental Representative will provide list of personnel to receive instructions, and will coordinate their attendance at agreed-upon times.

END OF SECTION

Specifications for Interactive Operating & Maintenance (IOM) System

- 1.1 All as-built 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.
- 1.2 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.
- 1.3 Program shall be capable of storing separately and independently data of multiple buildings and shall be expandable for addition of new buildings and systems.
- 1.4 Data of each building shall be accessible by the input of either the building name or building number as defined by the program user.
- 1.5 O&M data and as-built drawings shall be classified by their corresponding disciplines, including:
 - Architectural
 - Mechanical
 - Electrical
 - Data & CommunicationUnder each discipline, data shall be grouped into the following four major categories:
 - 1.5.1 Basic Documents

‘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 user:

 - Introduction
 - Consultant/Contractor/Suppliers List
 - System Description
 - Maintenance and Lubrication Schedules
 - Testing and Commissioning (T&C) Reports
 - Misc. Reports
 - Specifications
 - Equipment and/or point schedules as identified in the hard copy documents
 - Others as stipulated by the user

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.
 - 1.5.2 ‘As-Built’ Drawings

‘As-built’ drawings shall be converted from the original electronic files, such as CAD, into PDF format. If only the hard copies of the ‘as-built’ drawings are available, they shall be scanned and saved in PDF format. PDF files of the ‘As-built’ drawings shall

be enhanced with the following bookmarks to zoom into legible views on the computer screen as a minimum:

- Drawing Number and Title
- Drawing Notes
- Major Equipment Locations
- Cross-links to other related drawings
- Revisions

1.5.3 System Data

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

- System Description
- Schematic (where applicable)
- Equipment List

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.

1.5.4 Equipment Data

Equipment data shall be classified into the following categories:

- Equipment submittals
- T&C Report
- Maintenance Data
- Maintenance Records
- Photo

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-built' drawings.

- 1.6 Program shall be executed by Professional Engineers with a minimum of 10 years post qualification experience in the field of Building Services Engineering.
- 1.7 The Contractor shall provide a minimum of 3 past job references as proven record of similar undertakings commissioned by internationally renowned institutions or government agencies.
- 1.8 The Contractor shall provide a session of program demonstration free of charge to the Owner to prove meeting the intents of the commission. Time of the program demonstration subsequent to the Tender Return shall be set and agreed with the Owner.

1 PURPOSE

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

2 DEFINITIONS

- .1 "Contraband" means:
(a) an intoxicant, including alcoholic beverages, drugs and narcotics
(b) a weapon or a component thereof, ammunition for a weapon, and anything that is designed to kill, injure or disable a person or that is altered so as to be capable of killing, injuring or disabling a person, when possessed without prior authorization,
(c) an explosive or a bomb or a component thereof,
(d) currency over any applicable prescribed limit, \$25.00, and
(e) any item not described in paragraphs (a) to (d) that could jeopardize the security of a Penitentiary or the safety of persons, when that item is possessed without prior authorization.
- .2 "Unauthorized smoking and related Items" means all smoking items including, but not limited to, cigarettes, cigars, tobacco, chewing tobacco, cigarette making machines, matches and lighters.
- .3 "Commercial Vehicle" means any motor vehicle used for the shipment of material, equipment and tools required for the construction project.
- .4 "CSC" means Correctional Service Canada.
- .5 "Director" means Director, Warden or Superintendent of the Institution as applicable.
- .6 "Construction employees" means persons working for the general contractor, the sub-contractors, equipment operators, material suppliers, testing and inspection companies and regulatory agencies.
- .7 "Departmental Representative" means the Public Works and Government Services Canada representative defined in General Conditions.
- .8 "Perimeter" means the fenced or walled area of the institution that restrains the movement of the inmates.
- .9 "Construction limits" means the area, as indicated in the contract documents, that the contractor will be allowed to work". This area may or may not be isolated from the security area of the institution. Limits to be confirmed at construction start-up meeting.

3 PRELIMINARY PROCEEDINGS

- .1 At construction start-up meeting:
.1 Discuss the nature and extent of all activities involved in the Project.
.2 Establish mutually acceptable security procedures in accordance with this instruction and the institution's particular requirements.
- .2 The contractors's responsibilities:
.1 Ensure that all construction employees are aware of the security requirements.
.2 Ensure that a copy of the security requirements is always prominently on display at the job site.
.3 Co-operate with institutional personnel in ensuring that security requirements are observed by all construction employees.

4 CONSTRUCTION EMPLOYEES

- .1 Submit to the Departmental Representative a list of the names with date of birth of all construction employees to be employed on the construction site and a security clearance form for each employee.
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- .2 Allow 10 working days for processing of security clearances. Employees will not be admitted to the Institution without a valid security clearance in place and a recent picture identification such as a provincial driver's license. Security clearances obtained from other CSC institutions are not valid at this institution except as approved otherwise.
- .3 The Director may require that facial photographs may be taken of construction employees and these photographs may be displayed at appropriate locations in the institution or in an electronic database for identification purposes. The Director may require that these Photo ID cards be provided for all construction workers. ID cards will then be left at the designated entrance to be picked up upon arrival at the Institution and be displayed prominently on the construction employees clothing at all times while employees are in the institution.
- .4 Entry to Institutional Property will be refused to any person there may be reason to believe may be a security risk.
- .5 Any person employed on the construction site will be subject to immediate removal from Institutional Property if they:
 - .1 appear to be under the influence of alcohol, drugs or narcotics.
 - .2 behave in an unusual or disorderly manner.
 - .3 are in possession of contraband.

5 VEHICLES

- .1 All unattended vehicles on CSC property must have windows closed; fuel caps locked, doors and trunks locked and keys removed. The keys must be securely in the possession of the owner or an employee of the company that owns the vehicle.
- .2 The director may limit at any time the number and type of vehicles allowed within the Institution.
- .3 Drivers of delivery vehicles for material required by the project will require security clearances and must remain with their vehicle the entire time that the vehicle is in the Institution. The director may require that these vehicles be escorted by Institutional staff or PWGSC Construction Escorts while in the Institution.
- .4 If the Director permits trailers to be left inside the secure perimeter of the Institution, the trailer doors must be locked at all times. All windows must be securely locked bars when left unoccupied. Cover all windows with expanded metal mesh. When not in use lock all storage trailers located inside and outside the perimeter.

6 PARKING

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

7 SHIPMENTS

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

8 TELEPHONES

- .1 The installation of telephones, facsimile machines and computers with Internet connections is not permitted within the Institution perimeter unless prior approved by the Director.
- .2 The Director will ensure that approved telephones, facsimile machine and computers with Internet connections are located where they are not accessible to inmates. All computers will have an approved password protection that will stop an Internet connection to unauthorized personnel.

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

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

9 WORK HOURS

.1 Conform to Division 1.

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

10 OVERTIME WORK

.1 Conform to Division 1.

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

11 TOOLS AND EQUIPMENT

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

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

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

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

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

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

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

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

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

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

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

12 KEYS

- .1 Security Hardware Keys.
 - .1 Arrange with the security hardware supplier/installer to have the keys for the security hardware to be delivered directly to Institution, specifically the Security Maintenance Officer (SMO).
 - .2 The SMO will provide a receipt to the Contractor for security hardware keys.
 - .3 Provide a copy of the receipt to the Departmental Representative.

- .2 Other Keys
 - .1 Use standard construction cylinders for locks for his use during the construction period.
 - .2 Issue instructions to employees and sub-trades, as necessary, to ensure safe custody of the construction set of keys.
 - .3 Upon completion of each phase of the construction, the CSC representative will, in conjunction with the lock manufacturer:
 - .1 Prepare an operational keying schedule
 - .2 Accept the operational keys and cylinders directly from the lock manufacturer.
 - .3 Arrange for removal and return of the construction cores and install the operational core in all locks.
 - .4 Upon putting operational security keys into use, the PWGSC construction escort shall obtain these keys as they are required from the SMO and open doors as required by the Contractor. The Contractor shall issue instructions to his employees advising them that all security keys shall always remain with the PWGSC construction escort.

13 SECURITY HARDWARE

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

14 PRESCRIPTION DRUGS

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

15 SMOKING RESTRICTIONS

- .1 Smoking is not permitted inside correctional facilities or outdoors within the perimeter of a correctional facility and persons must not possess unauthorized smoking items within the perimeter of a correctional facility.
- .2 Persons in violation of this policy will be requested to immediately cease smoking or dispose of any unauthorized smoking items and, if they persist will be directed to leave the Institution.
- .3 Smoking is permitted outside the perimeter of a correctional facility in an area designated by the Director.

16 CONTRABAND

- .1 Weapons, ammunition, explosives, alcoholic beverages, drugs and narcotics are prohibited on institutional property.
 - .2 The discovery of contraband on the construction site and the identification of the person(s) responsible for the contraband shall be reported immediately to the Director.
 - .3 Contractors should be vigilant with both their staff and the staff of their sub-contractors and suppliers that the discovery of contraband may result in cancellation of the security clearance of the affected employee. Serious infractions may result in the removal of the company from the Institution for the duration of the construction.
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- .4 Presence of arms and ammunition in vehicles of contractors, sub-contractors and suppliers or employees of these will result in the immediate cancellation of security clearances for the driver of the vehicle.

17 SEARCHES

- .1 All vehicles and persons entering institutional property may be subject to search.
- .2 When the Director suspects, on reasonable grounds, that an employee of the Contractor is in possession of contraband, he may order that person to be searched.
- .3 All employees entering the Institution may be subject to screening of personal effects for traces of contraband drug residue.

18 ACCESS TO AND REMOVAL FROM INSTITUTIONAL PROPERTY

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

19 MOVEMENT OF VEHICLES

- .1 Escorted commercial vehicles may not be allowed to enter or leave the institution through the vehicle access gate during the regular "inmate count" occurring at breakfast, lunch and dinner hour as established by the Institution. Confirm "count" times with Director or Departmental Representative to reduce down times for deliveries to Institution and movement of contractors vehicles through Institution vehicle access gate.
 - .2 Construction vehicles will not be allowed to leave the Institution until an inmate count is completed.
 - .3 The contractor shall advise the Director twenty four (24) hours in advance to the arrival on the site of heavy equipment such as concrete trucks, cranes, etc.
 - .4 Vehicles being loaded with soil or other debris, or any vehicle considered impossible to search, must be under continuous supervision by CSC staff or PWGSC construction escorts working under the authority of the Director.
 - .5 Commercial vehicles will only be allowed access to institutional property when their contents are certified by the Contractor or his representative as being strictly necessary to the execution of the construction project.
 - .6 Vehicles shall be refused access to institutional property if, in the opinion of the Director, they contain any article which may jeopardize the security of the institution. Arrange with Director for parking of contractor's vehicles at minimum security Institutions.
 - .7 Private vehicles of construction employees will not be allowed within the security wall or fence of medium or maximum security institutions without the permission of the Director.
 - .8 With prior approval of the Director, a vehicle may be used in the morning and evening to transport a group of employees to the work site. This vehicle will not remain within the Institution the remainder of the day.
 - .9 With the approval of the Director, certain equipment may be permitted to remain on the construction site overnight or over the weekend. This equipment must be securely locked, with the battery removed. The Director may require that the equipment be secured with a chain and padlock to another solid object.
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20 MOVEMENT OF CONSTRUCTION EMPLOYEES ON INSTITUTIONAL PROPERTY

- .1 Subject to the requirements of good security, the Director will permit the Contractor and his employees as much freedom of action and movement as is possible.
- .2 However, notwithstanding paragraph above, the Director may:
 - .1 Prohibit or restrict access to any part of the institution.
 - .2 Require that in certain areas of the institution, either during the entire construction project or at certain intervals, construction employees only be allowed access when accompanied by a member of the CSC security staff.
- .3 During the lunch and coffee/health breaks, all employees will remain within the construction site. Employees are not permitted to eat in the officer's lounge and dining room.

21 SURVEILLANCE AND INSPECTION

- .1 Construction activities and all related movement of personnel and vehicles will be subject to surveillance and inspection by CSC security staff members to ensure that established security requirements are met.
- .2 CSC staff members will ensure that an understanding of the need to carry out surveillance and inspections, as specified above, is established among construction employees and maintained throughout the construction project.

22 STOPPAGE OF WORK

- .1 The director may request at any time that the contractor, his employees, sub-contractors and their employees not enter or leave the work site immediately due to a security situation occurring within the Institution. The contractor's site supervisor shall note the name of the staff member making the request and the time of the request and obey the order as quickly as possible.
- .2 The contractor shall advise the Departmental Representative within 24 hours of this delay to the progress of the work.

23 CONTACT WITH INMATES

- .1 Unless specifically authorized, it is forbidden to come into contact with inmates, to talk with them, to receive objects from them or to give them objects. Any employee doing any of the above will be removed from the site and his security clearance revoked.
- .2 It is forbidden to take pictures of inmates, of CSC staff members or of any part of the Institution other than those required as part of this contract.

END OF SECTION

1 REFERENCES

- .1 Government of Canada:
 - .1 Canada Labour Code - Part II.
 - .2 Canada Occupational Health and Safety Regulations.
- .2 American National Standards Institute (ANSI):
 - .1 ANSI A10.3-2006, – Safety Requirements for Powder-Actuated Fastening Systems ANSI for Construction and Demolition Operations
- .3 Canadian Standards Association (CSA):
 - .1 CSA Z797-2009 Code of Practice for Access Scaffold.
- .4 HRSDC Fire Protection Engineering Section:
 - .1 FCC No. 301-1982, Standard for Construction Operations.
- .5 National Building Code of Canada (NBCC 2005):
 - .1 Part 8, Safety Measures at Construction and Demolition Sites
- .6 Province of British Columbia Building Code (2006):
 - .1 Part 8, Safety Measures at Construction and Demolition Sites.
- .7 Province of British Columbia:
 - .1 Workers Compensation Act Part 3 - Occupational Health & Safety.
 - .2 Occupational Health & Safety Regulations.

2 RELATED SECTIONS

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

3 WORKERS' COMPENSATION BOARD COVERAGE

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

4 COMPLIANCE WITH REGULATIONS

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

5 SUBMITTALS

- .1 Make submittals in accordance with Section 01 01 50 General Instructions for Submittals.
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- .2 Submit the following:
 - .1 Health and Safety Plan.
 - .2 Copies of reports or directions issued by federal and provincial health and safety inspectors.
 - .3 Copies of incident and accident reports.
 - .4 Complete set of Material Safety Data Sheets (MSDS), and all other documentation required by Workplace Hazardous Materials Information System (WHMIS) requirements.
 - .5 Emergency Procedures.
- .3 The Departmental Representative will review the Contractor's site-specific project Health and Safety Plan and emergency procedures, and provide comments to the Contractor within 5 days after receipt of the plan. Revise the plan as appropriate and resubmit to Departmental Representative for review.
- .4 Medical surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of work, and submit additional certifications for any new site personnel to Departmental Representative.
- .5 Submission of the Health and Safety Plan, and any revised version, to the Departmental Representative is for information and reference purposes only. It shall not:
 - .1 Be construed to imply approval by the Departmental Representative.
 - .2 Be interpreted as a warranty of being complete, accurate and legislatively compliant.
 - .3 Relieve the Contractor of his legal obligations for the provision of health and safety on the project.

6 RESPONSIBILITY

- .1 Assume responsibility as the Prime Contractor for work under this contract and appoint a qualified coordinator for the purpose of ensuring the coordination of health and safety activities for the location in accordance with sections 118 and 119 of Part 3 of the Workers Compensation Act.
- .2 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .3 Comply with and enforce compliance by employees with safety requirements of Contract documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

7 HEALTH AND SAFETY COORDINATOR

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

8 GENERAL CONDITIONS

- .1 Provide safety barricades and lights around work site as required to provide a safe working environment for workers and protection for pedestrian and vehicular traffic.
- .2 Ensure that non-authorized persons are not allowed to circulate in designated construction areas of the work site.
 - .1 Provide appropriate means by use of barricades, fences, warning signs, traffic control personnel, and temporary lighting as required.
 - .2 Secure site after working hours in accordance with Section 01 14 10 - Security Requirements.

9 PROJECT/SITE CONDITIONS

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

10 REGULATORY REQUIREMENTS

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

11 FILING OF NOTICE

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

12 HEALTH AND SAFETY PLAN

- .1 Conduct a site-specific hazard assessment based on review of Contract documents, required work, and project site. Identify any known and potential health risks and safety hazards.
 - .2 Prepare and comply with a site-specific project Health and Safety Plan based on hazard assessment, including, but not limited to, the following:
 - .1 Primary requirements:
 - .1 Contractor's safety policy.
 - .2 Identification of applicable compliance obligations.
 - .3 Definition of responsibilities for project safety/organization chart for project.
 - .4 General safety rules for project.
 - .5 Job-specific safe work, procedures.
 - .6 Inspection policy and procedures.
 - .7 Incident reporting and investigation policy and procedures.
 - .8 Occupational Health and Safety Committee/Representative procedures.
 - .9 Occupational Health and Safety meetings.
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- .10 Occupational Health and Safety communications and recordkeeping procedures.
 - .2 Summary of health risks and safety hazards resulting from analysis of hazard assessment, with respect to site tasks and operations which must be performed as part of the work.
 - .3 List hazardous materials to be brought on site as required by work.
 - .4 Indicate engineering and administrative control measures to be implemented at the site for managing identified risks and hazards.
 - .5 Identify personal protective equipment (PPE) to be used by workers.
 - .6 Identify personnel and alternates responsible for site safety and health.
 - .7 Identify personnel training requirements and training plan, including site orientation for new workers.
- .3 Develop the plan in collaboration with all subcontractors. Ensure that work/activities of subcontractors are included in the hazard assessment and are reflected in the plan.
 - .4 Revise and update Health and Safety Plan as required, and re-submit to the Departmental Representative.
 - .5 Departmental Representative's review: the review of Health and Safety Plan by Public Works and Government Services Canada (PWGSC). PWGSC's review shall not relieve the Contractor of responsibility for errors or omissions in final Health and Safety Plan or of responsibility for meeting all requirements of construction and Contract documents.

13 EMERGENCY PROCEDURES

- .1 List standard operating procedures and measures to be taken in emergency situations. Include an evacuation plan and emergency contacts (i.e. names/telephone numbers) of:
 - .1 Designated personnel from own company.
 - .2 Regulatory agencies applicable to work and as per legislated regulations.
 - .3 Local emergency resources.
 - .4 Departmental Representative.
- .2 Include the following provisions in the emergency procedures:
 - .1 Notify workers of the nature and location of the emergency.
 - .2 Evacuate all workers safely.
 - .3 Check and confirm the safe evacuation of all workers.
 - .4 Notify the fire department or other emergency responders.
 - .5 Notify adjacent workplaces which may be affected if the risk extends beyond the workplace.
 - .6 Notify Departmental Representative.
- .3 Provide written rescue/evacuation procedures as required for, but not limited to:
 - .1 Work at high angles.
 - .2 Work in confined spaces or where there is a risk of entrapment.
 - .3 Work with hazardous substances.
 - .4 Underground work.

14 HAZARDOUS PRODUCTS

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of hazardous materials, and regarding labeling and provision of Material Safety Data Sheets (MSDS) acceptable to the Departmental Representative and in accordance with the Canada Labour Code.
- .2 Where use of hazardous and toxic products cannot be avoided:
 - .1 Advise Departmental Representative beforehand of the product(s) intended for use. Submit applicable MSDS and WHMIS documents in accordance with clause 5.2.4.

15 ELECTRICAL SAFETY REQUIREMENTS

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

16 ELECTRICAL LOCKOUT

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

17 OVERLOADING

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

18 FALSEWORK

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

19 SCAFFOLDING

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

20 CONFINED SPACES

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

21 POWDER-ACTUATED DEVICES

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

22 FIRE SAFETY AND HOT WORK

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

23 FIRE SAFETY REQUIREMENTS

- .1 Store oily/paint-soaked rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
- .2 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

24 FIRE PROTECTION AND ALARM SYSTEM

- .1 Do not obstruct, shut-off or leave inactive at the end of a working day or shift, the fire protection and alarm systems.
- .2 Do not use fire hydrants for purposes other than firefighting.
- .3 Be responsible/liable for costs incurred from the fire department and the Departmental Representative, resulting from false alarms.

25 UNFORESEEN HAZARDS

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

26 POSTED DOCUMENTS

- .1 Post legible versions of the following documents on site:
 - .1 Health and Safety Plan.
 - .2 Sequence of work.
 - .3 Emergency procedures.
 - .4 Site drawing showing project layout, locations of the first-aid station, evacuation route and marshalling station, and the emergency transportation provisions.
 - .5 Notice of Project.
 - .6 Floor plan(s).
 - .7 Notice as to where a copy of the Workers' Compensation Act and Regulations are
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available on the work site for review by employees and workers.

- .8 Workplace Hazardous Materials Information System (WHMIS) documents.
 - .9 Material Safety Data Sheets (MSDS).
 - .10 List of names of Joint Health and Safety Committee members, or Health and Safety Representative, as applicable.
- .2 Post all Material Safety Data Sheets (MSDS) on site, in a common area, visible to all workers and in locations accessible to tenants when work of this Contract includes construction activities adjacent to occupied areas.
 - .3 Postings should be protected from the weather, and visible from the street or the exterior of the principal construction site shelter provided for workers and equipment, or as approved by the Departmental Representative.

27 MEETINGS

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

28 CORRECTION OF NON-COMPLIANCE

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

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 01 50 - General Instructions: training.
- .2 Division 22- Plumbing.
- .3 Division 23 - Heating, Ventilating and Air-Conditioning.
- .4 Division 25 - Integrated Automation (EMCS).
- .5 Division 26 – Electrical.
- .6 Division 28 - Electronic Safety and Security.

1.2 GENERAL

- .1 Cx is a planned program of checks, procedures and tests carried out systematically on components, systems and integrated systems. Component Performance Verification includes a check of individual components of a system to ensure their conformance with the specification and the manufacturer's installation requirements prior to start-up. System and Integrated System Performance Verification is undertaken to ensure conformance with the performance requirements of the specifications. Cx therefore achieves the following objectives:
 - .1 Verifies individual components correspond to their specification requirements and are correctly installed;
 - .2 Verifies installed components, systems and integrated systems operate in accordance with contract documents, design criteria and intent;
 - .3 Ensures appropriate documentation is compiled and recorded in the project Closeout Documentation phase.
 - .4 Ensures the operators are effectively trained.
- .2 The contractor assists in the Cx process, operating equipment and systems, troubleshooting and making adjustments as required.
 - .1 Systems are to be operated through a load range to full capacity, under various modes, to determine acceptable performance and efficiencies.
 - .2 Systems are to be observed to interact as intended and in accordance with the Contract Documents to confirm design intent.
 - .3 Adjustments are to be made to enhance performance and to meet environmental or user requirements.

1.3 COMMISSIONING OVERVIEW

- .1 Commissioning Authority:
 - .1 Hired and paid for by the Contractor.
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- .2 Reports to the Departmental Representative, and will oversee all commissioning activities during the construction and post construction stages of the project.
 - .3 Responsibilities:
 - .1 develop the commissioning plan,
 - .2 develop the component, system and integrated system verification check forms;
 - .3 organize and monitor all commissioning activities as per the contract agreement;
 - .4 witness and certify all documented results of commissioning activities;
 - .5 be responsible for verifying the design implementation, and the resolution of deficiencies.
 - .2 Commissioning agent:
 - .1 Hired and paid for by the Contractor.
 - .2 Responsibilities:
 - .1 participate in the development of the commissioning schedule;
 - .2 undertake the component, system and integrated system performance verification testing and commissioning;
 - .3 plan and carry out the equipment demonstration and acceptance testing;
 - .4 organise and verify effective operator training;
 - .5 complete all commissioning verification documentation.
 - .4 Cx to be a line item of Contractor's cost breakdown.
 - .5 Cx activities supplement field quality and testing procedures described in relevant technical sections.
 - .6 The Departmental Representative will declare Substantial Completion when:
 - .1 Completed Cx documentation has been received from the Commissioning Authority, reviewed for suitability and approved by Departmental Representative.
 - .2 Equipment, components and systems have been commissioned.
 - .3 O&M training has been completed.
 - .7 Hire a Commissioning Authority and a Commissioning Agent to perform the specified Cx, using one of the following acceptable firms:
 - .1 KD Engineering.
 - .2 Western Mechanical.
 - .3 MDP Systems.
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1.4 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

- .1 Should components, systems or integrated systems be incorrectly installed and/or malfunction during Cx, correct the deficiencies, and re-commission to successfully verify components and/or systems performance to the approval of the Commissioning Authority.
- .2 Any costs for corrective work, additional tests, inspections, required to verify performance shall be borne by the Contractor.

1.5 CX REVIEW

- .1 During early stages of Construction:
 - .1 Review contract documents and confirm in writing to Departmental Representative:
 - .1 Adequacy of provisions for Cx.
 - .2 Aspects of design and installation pertinent to success of Cx.
- .2 During Construction:
 - .1 Co-ordinate the provisions for Cx activities.
- .3 Before start of Cx:
 - .1 Ensure installation of related components, equipment, sub-systems and systems is complete.
 - .2 Fully understand Cx requirements and procedures.
 - .3 Have Cx documentation shelf-ready.
 - .4 Fully understand the design intent and special features.
 - .5 Submit complete start-up documentation to the Commissioning Authority.
 - .6 Maintain Cx schedules up-to-date.
 - .7 Ensure systems have been cleaned thoroughly.
 - .8 Complete TAB procedures on systems, and submit TAB reports to the Commissioning Authority for review and approval.
 - .9 Ensure "As-Built" system schematics are available.

1.5 CONFLICTS

- .1 Report conflicts between requirements of this section and other sections to the Commissioning Authority before start-up and obtain clarification.
- .2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit immediately after award of Contract the name of Commissioning Authority.
 - .2 Submit no later than 2 weeks after award of Contract:
 - .1 Name of Contractor's Cx agent.
 - .2 Draft Cx documentation.
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- .3 Preliminary Cx schedule.
- .3 Submit proposed Cx procedures to Departmental Representative where not specified and obtain written approval at least 1 week prior to start of Cx.
- .4 Provide additional documentation relating to Cx process required by the Commissioning Authority.

1.7 COMMISSIONING DOCUMENTATION

- .1 Provide the following verification check sheets:
 - .1 Component Performance Verification (CPV) Check Form.
 - .2 System Performance Verification (SPV) Check Form.
 - .3 Integrated System Performance Verification (ISPV) Check Form.
 - .4 Additional documentation requested by the Commissioning Authority.
- .2 Commissioning Authority to review and approve Cx documentation.
- .3 Provide completed and approved Cx documentation to Departmental Representative.

1.8 COMPONENT PERFORMANCE VERIFICATION (CPV) CHECK FORMS

- .1 Component Performance Verification (CPV) Check forms compile product information from the manufacturer for individual components, including nameplate data, installation instructions, pertinent technical data and recommended checks necessary for start-up.
- .2 Prior to System Performance Verification (SPV), the Component Performance Verification (CPV) forms for all components of the system must be completed and approval obtained from Commissioning Authority before proceeding.

1.9 SYSTEM PERFORMANCE VERIFICATION (SPV) FORMS

- .1 System Performance Verification (SPV) forms record and compile data while running dynamic tests, record adjustments made to improve operation and efficiency, and prove the system can function as intended within the project requirements.
- .2 Prior to Integrated System Performance Verification (IPV) of integrated systems, the System Performance Verification (SPV) forms for all systems must be completed and approval obtained from Commissioning Authority before proceeding.

1.10 INTEGRATED SYSTEM PERFORMANCE VERIFICATION (IPV) FORMS

- .1 Integrated System Performance Verification (ISPV) forms record and verify the process whereby certain prescribed events/actions in one system result in the correct outcome in another integrated system (i.e. safety interlocks, fire alarm shutdowns, emergency power, etc.)

1.11 COMMISSIONING SCHEDULE

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

1.12 COMMISSIONING MEETINGS

- .1 Convene Cx meetings following project meetings.
- .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 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.
- .5 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 Cx Agent, who will record and distribute minutes.
- .7 Ensure subcontractors and relevant manufacturer representatives are present.

1.13 STARTING AND TESTING

- .1 Only to proceed on approval of the completed Component Performance Verification forms for all components comprising the completed system, and with signed approval of the Commissioning Authority.
- .2 Contractor assumes liability and costs for inspections, including possible disassembly and re-assembly of equipment, start-up of equipment and systems, testing and adjustment to fine tune performance, including the supply of all required testing equipment and services.

1.14 WITNESSING OF STARTING AND TESTING

- .1 Provide 4 days notice prior to commencement.
 - .2 Commissioning Authority to witness start-up and testing.
 - .3 Contractor's Cx Agent to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.
 - .4 Commissioning Authority to notify Departmental Representative of Start-up and Testing.
-

1.15 MANUFACTURER'S INVOLVMENT

- .1 Factory testing: manufacturer to:
 - .1 Provide testing documentation for approval by Commissioning Authority.
 - .2 Obtain written approval of test results and documentation from Commissioning Authority before delivery.
- .2 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Departmental Representative.
 - .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.

1.16 PROCEDURES

- .1 Verify that equipment and systems are complete, clean, and ready to operate in a normal and safe manner.
 - .2 Conduct start-up and testing in the following distinct phases:
 - .1 Verify conformity of individual components to the specification and approved shop drawings, including manufacturer's installation instructions.
 - .2 Verify installation of system, layout of components, operation of controls and safety devices and systems.
 - .3 Start-up: follow accepted start-up procedures.
 - .4 Complete Component Performance Verification (CPV) forms.
Correct deficiencies and obtain approval from the Commissioning Authority before commencing next phase.
 - .3 Document required tests on approved PV forms:
 - .1 Operational testing: document equipment performance.
-

- .2 System Performance Verification (SPV): include repetition of tests after correcting deficiencies, and results of fine-tuning. Complete forms and obtain signed approval.
- .4 Correct deficiencies and obtain approval from the Commissioning Authority before commencing next phase.
- .5 Document required integrated tests on approved forms:
 - .1 Integrated System Performance Verification (ISPV): include testing of all safety systems, and switch over to emergency power and back. Complete forms and obtain signed approval
- .6 Failure to follow accepted procedures will result in re-evaluation of equipment and systems by an independent testing agency selected by the Departmental Representative.

1.17 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 to repeat start-up at any time.
 - .6 Component verification Forms to be completed, approved and signed-off by Commissioning Authority.

1.18 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

- .1 After start-up, operate and maintain equipment and systems as directed by equipment/systems manufacturer.
 - .2 With assistance of manufacturer develop written maintenance program and submit to Commissioning Authority for approval 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.
-

1.19 RESULTS OF TESTS AND COMMISSIONING

- .1 If start-up, testing and/or Performance Verification produces unacceptable results, repair, replace or repeat specified starting and/or Performance Verification procedures until acceptable results are achieved.
- .2 Provide manpower and materials, assume costs for re-commissioning.

1.20 START OF COMMISSIONING

- .1 Notify Departmental Representative and Commissioning Authority at least 7 days prior to start of Cx.

1.21 INSTRUMENTS/TEST 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 Combustion analyser, including all sensors.
 - .4 Equipment required to complete work.

1.22 COMMISSIONING PERFORMANCE VERIFICATION

- .1 Carry out Cx under actual operating conditions, over entire operating range, in all modes.
- .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.

1.23 WITNESSING COMMISSIONING

- .1 Commissioning Authority to witness activities and verify results.

1.24 REPEAT VERIFICATIONS

- .1 Assume costs incurred by Commissioning Authority for third and subsequent verifications where:
 - .1 Verification of reported results fail to receive Commissioning Authority approval.
-

- .2 Repetition of second verification again fails to receive approval.
- .3 Commissioning Authority deems Contractor's request for second verification was premature.

1.25 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 requested.

1.26 DEFICIENCIES, FAULTS, DEFECTS

- .1 Correct deficiencies found during start-up and Cx to satisfaction of Commissioning Authority.
- .2 Report problems, faults or defects affecting Cx to Commissioning Authority in writing. Stop Cx until problems are rectified. Proceed with written approval from Departmental Representative.

1.27 COMPLETION OF COMMISSIONING

- .1 Upon completion of Cx leave systems in normal operating mode.
- .2 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Departmental Representative.

1.28 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.

1.29 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS

- .1 Supply, deliver, and document maintenance materials, spare parts, and special tools as specified in contract.

1.30 INSTALLED INSTRUMENTATION

- .1 Use instruments installed under Contract for TAB and PV if:
 - .1 Accuracy complies with these specifications
 - .2 Calibrated EMCS sensors may be used to obtain performance data provided that sensor calibration has been completed and accepted.

1.31 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.

1.32 DEPARTMENT'S PERFORMANCE TESTING

- .1 Performance testing of equipment or system by Departmental Representative will not relieve Contractor from compliance with specified start-up and testing procedures.

END OF SECTION

PART 1 GENERAL

1.1 Related Work

- .1 Section 31 23 10 Excavating, Trenching and Backfilling
- .2 Section 03 20 00 Concrete Reinforcing
- .3 Section 03 30 05 Cast-In-Place Concrete Short Form

1.2 References

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1-04/A23.2-[04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA-O86S1-05, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.
 - .3 CSA O121-M1978(R2003), Douglas Fir Plywood.
 - .4 CSA O151-04, Canadian Softwood Plywood.
 - .5 CSA O153-M1980(R2003), Poplar Plywood.
 - .6 CAN/CSA-O325.0-92(R2003), Construction Sheathing.
 - .7 CSA O437 Series-93(R2006), Standards for OSB and Waferboard.
 - .8 CSA S269.1-1975(R2003), 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 01 50 – General Instructions for Shop Drawings, Product Data and Samples.
 - .2 Submit shop drawings for formwork and falsework.
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia, Canada.
 - .3 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 33 – Health and Safety Requirements.
 - .4 Co-ordinate submittal requirements and provide submittals required by Section 01 01 50.
-

- .5 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.
- .6 Indicate formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms.
- .7 Indicate sequence of erection and removal of formwork/falsework as directed by Departmental Representative.

1.4 Delivery, Storage and Handling

- .1 Store and manage hazardous materials in accordance with Section 01 01 50 – General Instructions for Temporary Facilities.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 01 50 – General Instructions for Waste Management and Disposal.
 - .2 Place materials defined as hazardous or toxic in designated containers.
 - .3 Divert wood materials from landfill to a recycling, reuse, composting facility as approved by Departmental Representative.
 - .4 Divert plastic materials from landfill to a recycling, reuse, composting facility as approved by Departmental Representative.
 - .5 Divert unused form release material from landfill to an official hazardous material collections site as approved by the Departmental Representative.

PART 2 PRODUCTS

2.1 Materials

- .1 Materials and resources in accordance with Section 01 01 50 – General Instructions for – 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. Drawings should designate areas requiring special architectural concrete features.
 - .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.
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- .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 mm²/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 10 – Joint Sealing.

PART 3 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.
-

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- .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 Outer face of outside girders beams and vertical edge of sidewalk slab.
 - .2 Soffit of girders and underside of bridge decks if exposed.
 - .3 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.
 - .4 Pull down lining over edges of formwork panels.
 - .5 Ensure lining is new and not reused material.
 - .6 Ensure lining is dry and free of oil when concrete is poured.
 - .7 Application of form release agents on formwork surface is prohibited where drainage lining is used.
 - .8 If concrete surfaces require cleaning after form removal, use only pressurized water stream so as not to alter concrete's smooth finish.
 - .9 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 Three 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

PART 1 GENERAL

1.1 Related Work

- | | | |
|----|------------------|---------------------------------------|
| .1 | Section 31 23 10 | Excavating, Trenching and Backfilling |
| .2 | Section 03 10 00 | Concrete Forming and Accessories |
| .3 | Section 03 30 05 | Cast-In-Place Concrete Short Form |

1.2 Measurement Procedures

- .1 Measure reinforcing steel in kilograms tonnes of steel incorporated into Work, computed from theoretical unit mass specified in CAN/CSA-G30.18 for lengths and sizes of bars as indicated or authorized in writing by Departmental Representative.
- .2 No measurement will be made under this Section.
 - .1 Include reinforcement costs in items of concrete work in Section 03 30 05 - Cast-In-Place Concrete.

1.3 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-05a, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - .3 ASTM A497/A497M-05a, Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
 - .4 ASTM A775/A775M-04a, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
 - .3 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1-04/A23.2-04, 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.
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- .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(R2002), Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .4 Reinforcing Steel Institute of Canada (RSIC)
 - .1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.4 Submittals

- .1 Submittals in accordance with Section 01 01 50 – General Instructions for Shop Drawings, Product Data and Samples.
- .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.

1.5 Delivery, Storage and Handling

- .1 Store and manage hazardous materials in accordance with Section 01 01 50 – General Instructions for Temporary Facilities.
 - .2 Waste Management and Disposal:
-

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 01 50 – General Instructions for Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic in designated containers.

PART 2 PRODUCTS

2.1 Materials

- .1 Materials and resources in accordance with Section 01 01 50 – General Instructions for 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.
 - .3 Provide in flat sheets only.
 - .8 Welded deformed steel wire fabric: to ASTM A497/A497M.
 - .1 Provide in flat sheets only.
 - .9 Epoxy Coating of non-prestressed reinforcement: to ASTM A775/A775M.
 - .10 Galvanizing of non-prestressed reinforcement: to CAN/CSA-G164, minimum zinc coating 610 g/m².
 - .1 Protect galvanized reinforcing steel with chromate treatment to prevent reaction with Portland cement paste.
 - .2 If chromate treatment is carried out immediately after galvanizing, soak steel in aqueous solution containing minimum 0.2% by weight sodium dichromate or 0.2% chromic acid.
 - .1 Temperature of solution equal to or greater than 32 degrees and galvanized steels immersed for minimum 20 seconds.
 - .3 If galvanized steels are at ambient temperature, add sulphuric acid as bonding agent at concentration of 0.5% to 1%.
 - .1 In this case, no restriction applies to temperature of solution.
 - .4 Chromate solution sold for this purpose may replace solution described above, provided it is of equivalent effectiveness.
 - .1 Provide product description as described in clause 1.4 Submittals.
-

- .11 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.
- .12 Mechanical splices: subject to approval of Departmental Representative.
- .13 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.
- .3 Obtain Departmental Representative's approval for locations of reinforcement splices other than those shown on placing drawings.
- .4 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186.
- .5 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.
 - .1 Ship epoxy coated bars in accordance with ASTM A775A/A775M.

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.

PART 3 EXECUTION

3.1 Preparation

- .1 Galvanizing to include chromate treatment.
 - .1 Duration of treatment to be 1 hour per 25 mm of bar diameter.
- .2 Conduct bending tests to verify galvanized 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.
 - .2 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.
- .5 Protect epoxy and paint coated portions of bars with covering during transportation and handling.

3.4 Field Touch-Up

- .1 Touch up damaged and cut ends of epoxy coated or galvanized reinforcing steel with compatible finish to provide continuous coating.

END OF SECTION

Part 1 General**1.1 SCOPE OF WORK**

- .1 This section relates to civil concrete work external to the building, relevant to concrete walks (other than those specified on structural drawings) and cast-in-place concrete associated with subsurface utility works, manholes, catchbasins, lawn drains, watermains, sewers and drainage.
- .2 Building structure concrete is specifically excluded from the scope of this section.

1.2 RELATED SECTIONS

- .1 Section 32 16 15 – Concrete Walks, Curbs and Gutters
- .2 Section 32 31 14 – Wood Post and Dowel Rail Fences and Gates
- .3 Section 33 05 13 – Manholes and Catchbasin Structures
- .4 Section 33 11 16 – Site Water Utility Distribution Piping
- .5 Section 33 31 13 – Public Sanitary Utility Sewerage Piping

1.3 REFERENCES

- .1 ASTM International
 - .1 ASTM A185/A185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - .2 ASTM D260-86(2001), Standard Specification for Boiled Linseed Oil.
 - .3 ASTM D1751-04, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non extruding and Resilient Bituminous Types).
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-19.24-M90, Multicomponent, Chemical-Curing Sealing Compound.
- .3 CSA International
 - .1 CSA-A23.1/A23.2-2004, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .3 CAN/CSA-G30.18-M92(R2002), Billet-Steel Bars for Concrete Reinforcement.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

1.5 QUALITY ASSURANCE

- .1 Provide to Departmental Representative, 4 weeks minimum prior to starting concrete work, valid and recognized certificate from plant delivering concrete.

- .1 Quality Control Plan (QCP): provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements. The QCP is to include details of the sampling and testing of concrete in compliance with CSA-A23.1. The results of all testing are to be furnished to the Departmental Representative.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements:
 - .1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
 - .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

Part 2 Products

2.1 DESIGN CRITERIA

- .1 Alternative 1 - Performance: to CSA A23.1/A23.2, and as described in MIXES of PART 2 - PRODUCTS.

2.2 PERFORMANCE CRITERIA

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by Departmental Representative and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

2.3 MATERIALS

- .1 Cement: to CSA A3001.
- .2 Water: to CSA A23.1/A23.2.
- .3 Reinforcing bars: to CAN/CSA-G30.18, Grade 400.
- .4 Welded steel wire fabric: to ASTM A185.
- .5 Premoulded joint filler:
 - .1 Bituminous impregnated fibreboard: to ASTM D1751.
- .6 Joint sealer/filler: grey to CAN/CGSB-19.24, Type 1, Class B.
- .7 Sealer: boiled linseed oil to ASTM D260, mixed with mineral spirits 1:1 proprietary poly-siloxane resin blend.
- .8 Waterstops: extruded ribbed PVC strips, 12MPa tensile strength, minimum 350% elongation, minus 45 to plus 80 degrees centigrade working temperature.
- .9 Supplementary and other concrete materials: to CSA A23.1/A23.2.

2.4 MIXES

- .1 Alternative 1 - Performance Method for specifying concrete: to meet Departmental Representative performance criteria to CSA A23.1/A23.2.

- .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as described in PART 3 - VERIFICATION.
- .2 Intended application: Pavements, walks, curbs and gutters and exposed site concrete.
 - .1 Uniformity and workability: free of surface blemishes, loss of mortar, colour variations, segregation.
 - .2 Durability and class of exposure: C-2.
 - .3 Compressive strength at 28 days: 32 MPa minimum.
 - .4 Nominal maximum aggregate size 20 mm.
- .3 Intended application: Subsurface civil works.
 - .1 Uniformity and workability: free of loss of mortar, segregation.
 - .2 Durability and class of exposure: C-4.
 - .3 Compressive strength at 28 days: 25 MPa minimum.
 - .4 Nominal maximum aggregate size 28 mm.
 - .5 For cast-in-place manhole bases achieve reduced permeability in the long term.
- .4 Concrete supplier's certification required.
- .5 Provide quality management plan to ensure verification of concrete quality to specified performance.

Part 3 Execution

3.1 PREPARATION

- .1 Provide Departmental Representative 24 hours notice before each concrete pour.
- .2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing. **(NOT REQUIRED FOR CIVIL WORKS IN THIS CONTRACT).**
- .3 During concreting operations:
 - .1 Development of cold joints not allowed.
 - .2 Ensure concrete delivery and handling facilitates placing with minimum of rehandling, and without damage to existing structure or Work.
- .4 Protect previous Work from staining.
- .5 Clean and remove stains prior to application of concrete finishes.

3.2 INSTALLATION/APPLICATION

- .1 Do cast-in-place concrete work in accordance with CSA A23.1/A23.2.
- .2 Sleeves and inserts:
 - .1 Cast in sleeves, ties, slots, anchors, reinforcement, frames, conduit, bolts, waterstops, joint fillers and other inserts required to be built-in.
 - .2 Sleeves and openings greater than 100 mm x 100 mm not indicated, must be reviewed by Departmental Representative.

3.3 FINISHES

- .1 Formed surfaces exposed to view: in accordance with CSA A23.1/A23.2, unless specified otherwise.
- .2 Pavements, walks, curbs and exposed site concrete:
 - .1 Screed to plane surfaces and using aluminum, magnesium or wood floats.
 - .2 Provide round edges and joint spacings using standard tools.
 - .3 Trowel smooth to provide lightly brushed non-slip finish, unless specified otherwise.

3.4 CONTROL JOINTS

- .1 Form control joints as indicated, to CSA A23.1/A23.2 and install specified joint sealer/filler.

3.5 EXPANSION AND ISOLATION JOINTS

- .1 Install premoulded joint filler in expansion and isolation joints full depth of slab flush with finished surface to CSA A23.1/A23.2.

3.6 CURING

- .1 Use curing compounds compatible with applied finish on concrete surfaces free of bonding agents and to CSA A23.1/A23.2.

3.7 SEALING APPLICATION

- .1 After curing is complete, apply poly-siloxane resin blend sealer at 4 m²/L.

3.8 FIELD QUALITY CONTROL

- .1 Concrete testing: to CSA A23.1/A23.2 by independent testing laboratory. Accelerated test methods will apply.

3.9 CLEANING

- .1 Use trigger operated spray nozzles for water hoses.
- .2 Designate cleaning area for tools to limit water use and runoff.

END OF SECTION

PART 1 GENERAL

1.1 Related Work

- .1 Section 31 23 10 Excavating, Trenching, and Backfilling
- .2 Section 03 10 00 Concrete Forming and Accessories
- .3 Section 03 20 00 Concrete Reinforcing
- .4 Section 03 35 00 Concrete Finishing

1.2 References

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A185-05, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - .2 ASTM D260-86(2001), Standard Specification for Boiled Linseed Oil.
 - .3 ASTM D1751-04, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non extruding and Resilient Bituminous Types).
- .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/A23.2-2004, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete. CAN/CSA-A3000-03, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .1 CSA-A3001-03, Cementitious Materials for Use in Concrete.
 - .2 CAN/CSA-G30.18-M92(R2002), Billet-Steel Bars for Concrete Reinforcement.

1.3 Design Requirements

- .1 Alternative 2 - Prescription: in accordance with CSA-A23.1/A23.2, and as described in Mixes of PART 2 - PRODUCTS.

1.4 submittals

- .1 Submittals in accordance with Section 01 01 50 – General Instructions for Shop Drawings, Product Data and Samples.
 - .2 Shop Drawings:
 - .1 Submit placing drawings prepared in accordance with plans to clearly show size, shape, location and all necessary details of reinforcing.
 - .2 Submit drawings showing formwork and falsework design to: CSA-A23.1/A23.2.
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- .3 Drawings to bear stamp and signature of qualified professional engineer registered or licensed in British Columbia.
 - .3 At least 4 weeks prior to beginning Work, inform Departmental Representative source of fly ash and submit samples to Departmental Representative.
 - .1 Do not change source of Fly Ash without written approval of Departmental Representative.
 - .4 At least 4 weeks prior to beginning Work, submit to Departmental Representative samples of following materials proposed for use: curing compound.
 - .5 Submit samples of materials to be used in concrete mix for testing:
 - .1 Supplementary cementing materials.
 - .2 Blended hydraulic cement.
 - .3 Admixture.
 - .6 Submit testing inspection results and reports for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.
 - .7 Concrete hauling time: submit for review by Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.

1.5 Quality Assurance

- .1 Submit to Departmental Representative, minimum 4 weeks prior to starting concrete work, valid and recognized certificate from plant delivering concrete.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.6 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.

1.7 Waste Management and Disposal

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 01 50 – General Instructions for Waste Management and Disposal.
 - .2 Ensure emptied containers are sealed and stored safely.
 - .3 Use excess concrete for:
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- .4 Divert unused concrete materials from landfill to local facility as reviewed by Departmental Representative.
 - .5 Provide appropriate area on job site where concrete trucks and be safely washed.
 - .6 Divert admixtures and additive materials from landfill to approved official hazardous material collections site as reviewed by Departmental Representative.
 - .7 Unused admixtures and additive materials must not be disposed of into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

PART 2 PRODUCTS

2.1 Materials

- .1 Cement: to CAN/CSA-A3001, Type GU.
 - .2 Blended hydraulic cement: Type GUb to CAN/CSA-A3001.
 - .3 Supplementary cementing materials: with minimum 10% Type F fly ash replacement, by mass of total cementitious materials to CAN/CSA A3001. Water: to CSA-A23.1/A23.2.
 - .4 Air entraining admixture: to CAN/CSA-23.1
 - .5 Chemical admixtures: to CAN/CSA-A23.1 as approved by Departmental Representative.
 - .6 Reinforcing bars: to CAN/CSA-G30.18, Grade 400.
 - .7 Welded steel wire fabric: to ASTM A185.
 - .8 Premoulded joint filler:
 - .1 Bituminous impregnated fibreboard: to ASTM D1751.
 - .9 Joint sealer/filler: grey to CAN/CGSB-19.24, Type 1, Class B.
 - .10 Sealer: boiled linseed oil to ASTM D260, mixed with mineral spirits 1:1 proprietary poly-siloxane resin blend. Exterior pavement areas : to ASTM C309 Liquid Membrane-Forming compound for Curing Concrete, Type 1.
 - .11 Other concrete materials: to CSA-A23.1/A23.2.
-

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
Footings, Columns, Walls (Interior)	25	25	N	-
Perimeter footings/walls, Exterior footings, columns	25	25	F-2	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 superplasticizers are used, the slump may be increased by shall kept below the point where segregation will occur. The cost of superplasticizers 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.

PART 3 EXECUTION

3.1 Preparation

- .1 Provide Departmental Representative 72 hours notice before each concrete pour.
- .2 Place concrete to CAN/CSA A23.1, Clause 19; Adhere strictly to CSA A23.1 for proper preparation of Cold Weather Concrete.
- .3 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.
- .4 During concreting operations:
 - .1 Development of cold joints not allowed.
 - .2 Ensure concrete delivery and handling facilitates placing with minimum of rehandling, and without damage to existing structure or Work.

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- .5 Protect previous Work from staining.
 - .6 Clean and remove stains prior to application of concrete finishes.

3.2 Construction

- .1 Perform cast-in-place concrete work in accordance with CSA-A23.1/A23.2.

3.3 Inserts

- .1 Cast in sleeves, ties, slots, anchors, reinforcement, frames, conduit, bolts, waterstops, joint fillers and other inserts required to be built-in.
 - .1 Sleeves and openings greater than 100 mm x 100 mm not indicated, must be reviewed by Departmental Representative.

3.4 Finishes

- .1 Formed surfaces exposed to view: sack rubbed finish in accordance with CSA-A23.1/A23.2.
- .2 Interior floor slabs to be left exposed to receive epoxy, carpet, sheet vinyl, other covering requiring smooth surface: initial finishing operations followed by final finishing comprising mechanical floating and steel trowelling as specified in CSA-A23.1/A23.2 to produce hard, smooth, dense trowelled surface free from blemishes.
- .3 Floor slabs to receive mortar bed for ceramic or quarry tile: screed to correct grade to provide broomed texture.
- .4 Equipment pads: provide smooth trowelled surface.
- .5 Pavements, walks, curbs and exposed site concrete:
 - .2 Screed to plane surfaces and use [aluminum] [magnesium] [wood] floats.
 - .3 Provide round edges and joint spacings using standard tools.
 - .4 Trowel smooth to provide lightly brushed non-slip finish.

3.5 Control Joints

- .1 Cut and form control joints in slabs on grade at locations indicated, in accordance with CSA-A23.1/A23.2 and install specified joint sealer/filler.

3.6 Expansion and Isolation Joints

- .1 Install premoulded joint filler in expansion and isolation joints full depth of slab flush with finished surface to CSA-A23.1/A23.2.

3.7 Curing

- .1 Use curing compounds compatible with applied finish on concrete surfaces free of bonding agents and in accordance with CSA-A23.1/A23.2.
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3.8 Sealing

- .1 Following curing, apply two even coats of linseed oil mixture to clean dry surfaces, each at 8 m²/L. Allow first coat to dry before applying second coat. Apply poly-siloxane resin blend sealer at 4 m²/L.

3.9 Site Tolerances

- .1 Concrete floor slab finishing tolerance in accordance with CSA-A23.1/A23.2.

3.10 Field Quality Control

- .1 Concrete testing: to CSA-A23.1/A23.2 by testing laboratory designated and paid for by Departmental Representative. Accelerated test methods will apply.

3.11 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.

3.12 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 01 50 General Instructions for: Environmental Procedures.

END OF SECTION

PART 1 GENERAL

1.1 Related Work

- .1 Section 03 30 05 Cast-in-Place Concrete

1.2 References

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-25.20- 95, Surface Sealer for Floors.
- .2 Canadian Standards Association (CSA)
 - .1 CSA-A23.1- 94, Concrete Materials and Methods of Concrete Construction.

1.3 Performance Requirements

- .1 Product quality and quality of work in accordance with Section 01 01 50 – General Instructions for Product Requirements.
- .2 Submit written declaration that components used are compatible and will not adversely affect finished flooring products and their installation adhesives.

1.4 Product Data

- .1 Submit product data in accordance with Section 01 01 50 – General Instructions for Shop Drawings, Product Data and Samples.
- .2 Submit WHMIS MSDS - Material Safety Data Sheets. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada for concrete floor treatment materials. Indicate VOC content.
- .3 Include application instructions for concrete floor treatments.

1.5 Waste Management and Disposal

- .1 Separate and recycle waste materials in accordance with Section 01 01 50 – General Instructions for Waste Management And Disposal and 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 for children.
 - .4 Use chemical hardeners that are non-toxic, biodegradable and have zero or low VOC's.
 - .5 Dispose of surplus chemical and finishing materials in accordance with federal, provincial and municipal regulations.
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- .6 Dispose of waste from stripping of floors in a manner that will not have unfavourable effects on the environment.

1.6 Environmental Requirements

- .1 Temporary lighting:
 - .1 Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40 sq m of floor being treated.
- .2 Electrical power:
 - .1 Provide sufficient electrical power to operate equipment normally used during construction.
- .3 Work area:
 - .1 Make the work area water tight protected against rain and detrimental weather conditions.
- .4 Temperature:
 - .1 Maintain ambient temperature of not less than 10°C from 7 days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.
- .5 Moisture:
 - .1 Ensure concrete substrate is within moisture limits prescribed by flooring manufacturer.
- .6 Safety:
 - .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.
- .7 Ventilation:
 - .1 Departmental Representative will arrange for ventilation system to be operated during installation of concrete floor treatment materials. 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 01 50 – General Instructions for Temporary Utilities.
 - .3 Provide continuous ventilation during and after coating application.

PART 2 PRODUCTS

2.1 Chemical Hardeners

- .1 Type 1 - Sodium silicate.
-

- .2 Water: potable.

2.2 Sealing Compounds

- .1 Surface sealer: to CAN/CGSB-25.20, Type 1 - solvent-based.
- .2 Surface sealer: acrylic carnuba wax, clean.
- .3 Surface sealers may not be manufactured or formulated with aromatic solvents, formaldehyde, halogenated solvents, mercury, lead or cadmium hexavalent chromium and their compounds.

2.3 Curing Compounds

- .1 Select low VOC, water-based and organic-solvent free curing compounds.

2.4 Concrete Stains

- .1 Select low VOC, water-based concrete stains.

2.5 Mixes

- .1 Mixing, ratios and application in accordance with manufacturer's instructions.

PART 3 EXECUTION

3.1 Examination

- .1 Verify that slab, substrate and site conditions surfaces are ready to receive work and elevations are as indicated on shop drawings instructed by manufacturer.

3.2 Preparation of Existing Slab

- .1 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radiused edges unless otherwise indicated.
- .2 Saw cut control joints to CSA-A23.1, 24 hours maximum after placing of concrete.
- .3 Use strong solvent mechanical stripping to remove chlorinated rubber or existing surface coatings.
- .4 Use protective clothing, eye protection, respiratory equipment during stripping of chlorinated rubber or existing surface coatings.

3.3 Application

- .1 After floor treatment is dry, seal control joints and joints at junction with vertical surfaces with sealant.
-

- .1 Sealants
- .2 Apply floor treatment in accordance with Sealer manufacturer's written instructions.
- .3 Clean overspray. Clean sealant from adjacent surfaces.

3.4 Protection

- .1 Protect finished installation in accordance with manufacturer's instructions.

3.5 Schedule

- .1 Table

Surface Sealer	Location
CAN/CGSB-25.20, Type 1 - waterbased	As required

END OF SECTION

1 General

1.1 RELATED WORK

- .1 Section 05 50 00 - Metal fabrications.
- .2 Section 07 19 00 - Water Repellants.
- .3 Section 07 62 00 - Metal Flashings.
- .4 Section 08 50 50 - Aluminum Window, sills.
- .5 Section 14 24 23 - Hydraulic Elevator.

1.2 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA A165 SERIES-04(R2009), CSA Standards on Concrete Masonry Units covers: A165.1, A165.2, A165.3.
 - .2 CSA A179-04(R2009), Mortar and Grout for Unit Masonry.
 - .3 CSA-A370-04(2009), Connectors for Masonry.
 - .4 CSA-A371-04(R2009), Masonry Construction for Buildings
 - .5 CAN/CSA G30.18-09, Billet-Steel Bars for Concrete Reinforcement.
 - .6 CSA-S304.1-04(R2010), Masonry Design for Buildings.
 - .7 CSA A82-06, Fired Masonry Brick Made from Clay or Shale.
- .2 ASTM International (ASTM)
 - .1 ASTM A497 / A497M - 07 Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
 - .2 ASTM D2240 - 05(2010) Standard Test Method for Rubber Property - Durometer Hardness.
 - .3 ASTM C207 - 06 Standard Specification for Hydrated Lime for Masonry Purposes.
 - .4 STM C144 - 04 Standard Specification for Aggregate for Masonry Mortar.

1.3 SUBMITTALS

- .1 Submit Samples and Product Data in accordance with Section 01 01 50 - General Instructions - Submittal Procedures clause.
- .2 Submit representative samples for each type masonry unit and full sized units as directed.
- .3 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheets.
 - .2 Submit WHMIS MSDS - Material Safety Data Sheets and indicate VOC's for coatings and galvanized protective coatings and touch-up products.
 - .3 Indicate VOC's for mortar, grout, parging, colour additives and admixtures.
 - .4 Indicate sizes, spacing, location and quantities of reinforcement and connectors.

1.4 COLD WEATHER REQUIREMENTS

- .1 Comply with Clause 3.15 of CAN/CSA-S304.
 - .2 When air temperature is below 5° C take following precautions in preparing and using mortar:
 - .1 Heat sand slowly and evenly. Do not use scorched sand, having a reddish cast, in mortar.
-

- .2 Heat water to 70° C maximum; 20 deg. C minimum.
- .3 After combining heated ingredients maintain temperature of mortar between 5° C and 50 deg. C until used.
- .4 Protect mortar from rain and snow.

- .3 Maintain dry beds for masonry and use dry masonry units only.

1.5 HOT WEATHER REQUIREMENTS

- .1 Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.
- .2 Comply with Clause 6.7 of CSA A371.

1.6 PROTECTION

- .1 Keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until completed and protected by permanent construction.
- .2 Protect masonry and other work from marking and other damage. Protect completed work from mortar droppings. Use non-staining coverings.
- .3 Provide temporary bracing of masonry work during and after erection until permanent lateral support is in place.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 01 50 – General Instructions for Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities approved by Departmental Representative.
- .3 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.

2 Products

2.1 MASONRY UNITS

- .1 Standard concrete block units: to CAN3-A165 Series (CAN3-A165.1).
 - .1 Classification: H / 15 / A / M.
 - .2 Size: modular, 190 mm wide for walls except as noted otherwise.
 - .3 Special shapes: Provide purpose-made "H" shapes for lintels and bond beams. Provide additional special shapes as indicated.
 - .4 Exterior wythe veneer: 90 mm wide concrete block, split faced units with integral colour. Standard gray colour not acceptable. Provide outside corner blocks with split face block on two faces. Use 190 x 390 block with two faces split, cut to fit 90 mm wide wythe. Mitred joints at outside corners are not permitted.
-

2.2 REINFORCEMENT AND CONNECTORS

- .1 Bar reinforcement: to CSA-A371 and CAN/CSA G30.18, Grade 400.
- .2 Wire reinforcement: to CSA-A371 and ASTM A497, truss or ladder type.
- .3 Connectors shall be corrosion resistant: hot dip galvanized to CSA-A370 and CSA-S304.

2.3 MORTAR MATERIALS

- .1 Mortar and grout: to CSA A179.
- .2 Lime: Type S to ASTM C207.
- .3 Sand: clean white quartzite or silica type to ASTM C144.
- .4 Admixtures for mortar colour: metallic oxide pigment

2.4 MORTAR TYPES

- .1 Mortar: to CSA A179M.
 - .1 For all interior concrete block masonry: type S based on mortar proportion by volume.
 - .2 For all exterior concrete block masonry: type S or N based on mortar proportion by volume. Special colour to match coloured exterior block as selected by the Departmental Representative.

2.5 GROUT

- .1 Grout: to Table 3 of CAN/CSA A179, minimum compressive strength 20 MPa, 10 mm maximum sized aggregate and slump of 200 mm ± 20 mm.

2.6 ACCESSORIES

- .1 Masonry flashing and air barrier membranes:
 - .1 Liquid applied air barrier membrane: Specified in Section 07 11 26.
- .2 Weep Vent:
 - .1 Purpose-made PVC, galvanized steel, polypropylene fibre filter, colour to blend with masonry.
 - .2 Fluid and air conducting, non-absorbent, mold and mildew resistant, non-woven, polymer mesh.
 - .3 100 percent post-consumer plastics with a flame-retardant binder.
- .3 Control joints: extruded PVC compound with 85 durometer hardness conforming to ASTM D 2240 and sized to fit masonry unit.

2.7 REINFORCING AND TYING

- .1 Metal ties, wire and bar type reinforcement, bolts and anchors: to CSA-S304.
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- .2 Wire ties at stud walls:
 - .1 Veneer anchor: (plates and pintles), 2.6 mm thickness formed plate sized to accommodate rigid insulation and air space in wall cavity, with 5 mm ϕ wire pintle sized to accommodate masonry thickness, to fit plates with vertical adjustment. Plates with two holes for attachment to steel stud with two stainless steel self drilling/threading screws. All steel hot dip galvanized. Dur-O-Wal DA213, Hohmann & Barnard HB-200 meets this specification.
 - .2 Fasteners: 50 mm long wood screws at stud walls. Drive pins at concrete walls.
- .3 Horizontal reinforcement:
 - .1 Structural masonry at exterior wall: steel wire, knurled, ladder type, to CAN3-A370.
- .4 Corrosion protection: to Clauses 4.2.1 and Table 2 of CAN3-A370, for metal ties and horizontal reinforcing in exterior walls.

3 Execution

3.1 INSTALLATION

- .1 Do masonry work in accordance with CSA-A371 except where specified otherwise.
 - .1 Bond: running stretcher bond with vertical joints in perpendicular alignment and centred on adjacent stretchers above and below alternating course. Soldier courses where indicated.
 - .2 Coursing height:
 - .1 CMU: 200 mm for one CMU and one joint
 - .3 Tooled joints:
 - .1 Concave tooled joints where exposed or where paint or other finish coating is specified to provide smooth compressed concave surface.
 - .2 Strike flush all joints concealed in walls and joints in walls to receive insulation or other applied material.
- .2 Build masonry plumb, level, and true to line, with vertical joints in alignment.
- .3 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

3.2 CONSTRUCTION

- .1 Exposed masonry:
 - .1 Remove chipped, cracked, and otherwise damaged units, in exposed masonry and replace with undamaged units.
 - .2 Cut out for electrical switches, outlet boxes, and other recessed or built-in objects. Make cuts straight, clean, and free from uneven edges.
 - .2 Building-In:
 - .1 Install masonry connectors and reinforcement where indicated.
 - .2 Build in items required to be built into masonry.
 - .3 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.
 - .4 Brace door jambs to maintain plumb.
-

- .3 Joining of Work:
 - .1 Where necessary to temporarily stop horizontal runs of masonry, and in building corners:
 - .1 Step-back masonry diagonally to lowest course previously laid.
 - .2 Do not "tooth" new masonry.
 - .3 Fill in adjacent courses before heights of stepped masonry reach 1200 mm.
- .4 Support of loads:
 - .1 Use grout to CSA A179.
 - .2 Install building paper below voids to be filled with concrete or grout; keep paper 25 mm back from faces of units.
- .5 Build in flashings in masonry in accordance with CSA-A371.
 - .1 Install flashings under exterior veneer masonry bearing on foundation walls. Install flashings under weep hole courses and as indicated.
 - .2 In cavity walls and veneered walls, carry flashings from front edge of masonry, under outer wythe, then up backing not less than 150 mm, and as follows:
 - .1 Bond membrane flashing to wall using manufacturer's recommended adhesive and lap under air barrier membrane.
 - .3 Lap joints 150 mm and seal with adhesive.
- .6 Install weep hole vents in vertical joints immediately over flashings, in exterior wythes of masonry veneer wall construction, at maximum horizontal spacing of 600 mm on centre.

3.3 REINFORCING AND CONNECTING

- .1 Install masonry connectors and reinforcement in accordance with CSA-A370, CSA-A371 and CSA-S304.1 unless indicated otherwise.
- .2 Horizontal Reinforcing:
 - .1 Install in all CMU walls continuous in every second course beginning at 2nd course (400 mm above floor), horizontal truss or ladder type reinforcement comprising two 3.65 mm rods, each rod 25 mm from each face, and lapped 150 mm at each splice.

3.4 BONDING AND TYING

- .1 Tie masonry veneer to backing in accordance with NBCC2010, CSA-S304.1, CSA-A371 and as indicated.
- .2 Space ties 400 mm horizontally and vertically. Fasten ties to wood studs using stainless steel wood screws and to concrete using 6 mm drive pins with 50 mm embed.

3.5 GROUTING

- .1 Grout masonry in accordance with CSA-S304.1, CSA-A371 and CSA-A179 and as indicated.

3.6 ANCHORS

- .1 Supply and install metal anchors as indicated.
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3.7 LATERAL SUPPORT AND ANCHORAGE

- .1 Supply and install lateral support and anchorage in accordance with CSA-S304.1 and as indicated.

3.8 SITE TOLERANCES

- .1 Tolerances in notes to Clause 5.3 of CSA-A371 apply.

3.9 FIELD QUALITY CONTROL

- .1 Inspection and testing will be carried out by Testing Service as directed by the Departmental Representative.

3.10 CLEANING

- .1 Allow mortar droppings on concrete masonry to partially dry then remove by means of trowel, followed by rubbing lightly with small piece of block and finally by brushing.

3.11 PROTECTION

- .1 Protect masonry and other work from marking and other damage. Protect completed work from mortar droppings. Use non-staining coverings.

END OF SECTION

- .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.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings including fabrication and erection documents and materials list in accordance with Section 01 01 50 – General Instructions.
- .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 fabricator designed assemblies, components and connections, and drawings to be stamped and signed by qualified professional engineer licensed in the province of 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 01 50 – General Instructions.

Part 2 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 A 325
- .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/m².

2.2 FABRICATION

- .1 Fabricate structural steel in accordance with CAN/CSA-S16-01 and in accordance with reviewed shop drawings.
- .2 Continuously seal members by continuous welds where indicated. Grind smooth.

2.3 SHOP PAINTING

- .1 Clean, prepare surfaces and shop prime structural steel in accordance with CAN/CSA-S16-01 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.

Part 3 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 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 Provide safe access and working areas for testing on site, as required by testing agency and as authorized by Departmental Representative.
- .4 Submit test reports to Departmental Representative within 1 week of completion of inspection.

- .5 Departmental Representative will pay costs of tests as specified in Section 01 01 50 – General Instructions.

3.6 FIELD PAINTING

- .1 Paint in accordance with Section 09 91 23 – Painting.
 - .1 Touch up damaged surfaces and surfaces without shop coat with primer to SSPC-SP-6 except as specified otherwise. Apply in accordance with CAN/CGSB 85.10.

END OF SECTION

1 General

1.1 RELATED WORK

- .1 Section 03 05 10 - Cast-in-Place Concrete for Installation of anchors in concrete.
- .2 Section 09 91 23 - Finish painting.

1.2 REFERENCE STANDARDS

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM A53 / A53M - 12 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - .2 ASTM A 307-10, Specification for Carbon Steel Bolts and Studs, 60,000psi Tensile.
 - .3 ASTM A 653/A653M-11, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - .4 ASTM A1011 / A1011M - 12 Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
 - .5 ASTM F1267 - 07 Standard Specifications For Expanded Metal - Steel.
- .2 Canadian Standards Association (CSA)
 - .1 CAN/CSA-G40.21-04(2009), Structural Quality Steels.
 - .2 CAN/CSA-S16-01 Consolidation (R2007) includes; Limit States Design of Steel Structures; S16S1-05, Supplement #1 to CAN/CSA-S16-01, Limit States Design of Steel Structures.
 - .3 CSA W59-03(R2009), Welded Steel Construction (Metal Arc Welding).
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.40-M97, Primer, Structural Steel, Oil Alkyd Type.
 - .2 CAN/CGSB-1.181-99, Ready-Mixed, Organic Zinc-Rich Coating.

1.3 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 01 50 - General Instructions, Submittals clause.
 - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section Section 01 01 50 - General Instructions, Submittals clause. Indicate VOC's:
 - .1 For finishes, coatings, primers and paints.
- .2 Shop Drawings
 - .1 Submit shop drawings in accordance with Section 01 01 50 - General Instructions, Submittals clause.
 - .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.
 - .3 Design ladder and handrails in accordance with WCB requirements.

1.4 QUALITY ASSURANCE

- .1 Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
-

- .2 Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Packing, Shipping, Handling and Unloading:
 - .1 Deliver, store, handle and protect materials in accordance with Section 01 01 50 - General Instructions, Common Product Requirements clause.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 01 50 - General Instructions for Construction/Demolition Waste Management And Disposal clause.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal packaging material in appropriate on-site containers for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.

2 Products

2.1 MATERIALS

- .1 Steel sections and plates: to CSA-G40.21, Grade 300W.
 - .2 Steel pipe: to ASTM A53, Type S, Grade A, standard weight.
 - .3 Welding materials: to CSA W59.
 - .4 Bolts and anchorbolts: to ASTM A307; corrosion resistant types to ASTM A325M, Type 3. Provide all required anchoring devices including anchor clips, bar and strap anchors, expansion bolts and shields, and other devices designed to support and secure work.
 - .5 Expanded sheet steel mesh: commercial sheet steel to ASTM A1011 and to ASTM A1267 type II, flattened expanded, class 1 uncoated, Style: 20 - #13, opening size SWD-17 mm x LWD-45 mm \pm 1 mm, designed for penetration resistance, sheet thickness 1.78 mm, 72-77% open area and 3.7 kg/m². Acceptable Product: Exmet C3/4-13F.
 - .6 Galvanizing: hot dipped galvanizing with minimum zinc coating of 600 g/m² to ASTM A123. All ferrous metal fabrication for exterior locations to be galvanized after fabrication.
 - .7 Drilled adhesive anchors: injection adhesive anchor consisting of fast curing 2-part adhesive injected into drilled hole, followed by insertion of bolt, rod or reinforcing bar.
 - .8 Expansion anchors: stud type expansion anchor driven into drilled hole, expands when nut torques. Size to suit loading.
-

- .9 Security fasteners:
 - .1 Provide security screws, security nuts, rivets, spanner screws or other equally secure approved devices for affixing various items, ie torx pin head, socket pin head, phillips pin head, hex pin head or equivalent.
 - .2 Spanner screws to have slots that require a special spanner tool to remove screws.
 - .3 Round head screws not acceptable except at locations approved where material is not thick enough to permit counter-sinking.
 - .4 Use security screws where indicated.
- .10 Aluminum extrusions: Aluminum Association alloy AA6063-T5 anodizing quality.
- .11 Shop coat primer: to CAN/CGSB-1.40M.
- .12 Galvanize touch-up primer: zinc rich, ready mix to CAN/CGSB-1.181.

2.2 FABRICATION

- .1 Build work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .2 Fabricate items from steel unless indicated otherwise; use galvanized steel for exterior items, unless indicated otherwise.
- .3 Where possible, fit and shop assemble work, match mark, ready for erection.
- .4 Use self-tapping shake-proof countersunk flat headed screws on items requiring assembly by screws or as indicated. Use screws for interior work. Use welded connections for exterior work, unless approved otherwise by Engineer.
- .5 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush with sharp edges and corners rounded to 3 mm radius. Where continuous welds may cause distortion of fabrication use stitch welds and plastic filler, grind and sand smooth.
- .6 Seal exterior steel fabrications to provide corrosion protection in accordance with CAN/CSA-S16.

2.3 MISCELLANEOUS STEEL BRACKETS AND ANGLES

- .1 Supply for installation by respective trades. Drill for countersunk screws and anchor bolts.
- .2 Prime paint interior steel and hot dip galvanized exterior steel.
- .3 Provide 25 x 25 x 4.8 mm glazing stops for window in Medical Storage Room 140.

2.4 PIPE GUARDRAIL AND HAND RAILING

- .1 Handrails:
 - .1 Steel pipe: 40 mm OD with ends closed. Handrails with horizontal extension at top and bottom of stair radiused towards wall.
 - .2 Provide purpose made steel brackets, as indicated, spaced at maximum 1200 mm o.c. and designed to hold railing 40 mm clear of wall except as noted. Bracket not to break handhold.
-

- .2 Cap and weld open ends of handrails.
- .3 Provide self drilling anchors to solid wood blocking in stud walls.
- .4 Prime paint handrail and brackets

2.5 ELEVATOR ACCESS LADDER

- .1 Stringers: 50 x 7.9 mm thick, steel.
- .2 Rungs: 20 mm diameter pipe, welded to stringers at 300 mm o.c.
- .3 Ladder brackets: 50 x 6 bent plate with predrilled holes, weld to stringers, complete with fixing anchors to concrete wall and floor. Space wall brackets at maximum 1500 oc, 175 clear of wall at rungs.
- .4 Dimensioned as indicated.
- .5 Prime paint after welding and fabrication.

2.6 ALUMINUM ANGLE

- .1 Fabricate anodized aluminum angle 20 x 20 x 3 mm for window openings at sill. Drill and countersink holes at 300 oc.

2.7 FINISHES

- .1 Galvanizing: hot dipped galvanizing with minimum zinc coating of 600 g/m² to ASTM A123. All ferrous metal fabrication for exterior locations to be galvanized after fabrication.
- .2 Shop coat primer: to CAN/CGSB-1.40M.
- .3 Galvanize touch-up primer: zinc rich, ready mix to CAN/CGSB-1.181.

2.8 ISOLATION COATING

- .1 Isolate aluminum 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.

2.9 SHOP PAINTING

- .1 Remove scale rust, grease and other surface coating and apply one shop coat of primer to all ferrous metal items after fabrication, with exception of galvanized or concrete encased items.
 - .2 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°C.
 - .3 Clean surfaces to be field welded; do not paint.
-

3 Execution

3.1 ERECTION

- .1 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections. Hold in place until concrete embedment are cured.
- .2 Provide suitable means of anchorage as indicated or as acceptable to the Engineer, such as dowels, anchor clips, bar anchors, expansion bolts and shields, toggles.
- .3 Make field connections with high tensile bolts, to CAN/CSA-S16 or weld.
- .4 Hand items over for casting into concrete, building into masonry and to appropriate trades together with setting templates.
- .5 Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection using primer.
- .6 Touch-up galvanized surfaces with zinc primer where burned by field welding.

3.2 MISCELLANEOUS STEEL BRACKETS AND ANGLES

- .1 Supply to respective trades and install miscellaneous metal items in accordance with reviewed shop drawings and details.
- .2 Supply masonry section with steel loose angle lintels of sizes required to suit masonry openings.
- .3 Apply alkyd primer to interior lintels.
- .4 Provide 150 mm bearing at ends.
- .5 Drill and tap glazing frame to accept stop screws at 200 mm oc.

3.3 SECURITY MESH WALL REINFORCEMENT

- .1 Fasten security mesh to wood studs with pan head screws at maximum 300 mm oc along all framing members.
- .2 Butt join panels at solid bearing and fasten each panel to stud frame.
- .3 Refer to Wall Type schedule for walls with security mesh.

3.4 PIPE GUARDRAIL AND HAND RAILING

- .1 Handrails:
 - .1 Mount to wall backing in stud walls with purpose made fasteners at wall brackets.
 - .2 Touch up damaged interior primed surfaces after installation.

3.5 ELEVATOR ACCESS LADDER

- .1 Erect ladder minimum 175 mm clear of wall obstructions. Fasten to floor and wall using 10 mm ϕ galvanized expansion type or epoxy type anchors drilled to minimum 50 mm depth.

3.6 ALUMINUM ANGLE

- .1 Fasten aluminum angle to all window sills as indicated using stainless steel wood screws.
- .2 Coordinate location of angle with window shop drawings and installer.

END OF SECTION

1 General

1.1 RELATED WORK

- .1 Section 05 55 00 - Metal Fabrications
- .2 Section 06 11 01 - Rough Carpentry.
- .3 Section 06 23 00 - Finish Carpentry and Laminated Plastic for cabinet work.
- .4 Section 08 80 50 - Glazing, for stainless steel speaker ports.

1.2 REFERENCE STANDARDS

- .1 ASTM International (ASTM)
 - .1 ASTM A167-99(2009) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - .2 ASTM A666 - 03 Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
- .2 CSA W59-03(R2008), Welded Steel Construction (Metal Arc Welding).

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 01 50, General Instructions for Submittals.
- .2 Submit Product Data in accordance with Section 01 01 50, General Instructions for Submittals.
 - .1 Indicate, by large scale details, all materials, finishes, dimensions, anchorage and assembly.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Packing, Shipping, Handling and Unloading:
 - .1 Deliver, store, handle and protect materials in accordance with Section 01 01 50 - General Instructions, Common Product Requirements clause.
- .2 Storage and Protection:
 - .1 Cover exposed stainless steel surfaces with pressure sensitive heavy protection paper or apply strippable plastic coating, before shipping to job site.
 - .2 Leave protective covering in place until final cleaning of building. Provide instructions for removal of protective covering.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 01 50 - General Instructions for Construction/Demolition Waste Management And Disposal clause.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
-

- .3 Collect and separate for disposal packaging material in appropriate on-site containers for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.

2 Products

2.1 MATERIALS

- .1 Stainless steel sheet: to ASTM A666 type 302 or 304 with No. 4 finish.

2.2 JANITOR SINK APRON

- .1 Custom fabricate from 1.0 mm thick stainless steel apron, No. 4 satin finish, at Janitor sinks.

2.3 ACCESSORIES

- .1 Fastening: construction adhesive and as recommended by manufacturer.
- .2 Fasteners: stainless steel screws as indicated.
- .3 Sealant: to CAN/CGSB-19.13, aluminum coloured sealing compound, silicone adhesive/sealant, meeting National Sanitation Foundation (NSF) requirements for direct contact with food and stay flexible during long term exposure to temperatures ranging from minus 73°C to plus 232°C.

3 Execution

3.1 INSTALLATION

- .1 Install units and erect with materials and components straight, tight and in alignment in accordance with reviewed shop drawings.
- .2 Measure and cut wall dados for exact fit. Adhere to plywood backup panel using recommended contact adhesive. Seal edges of stainless steel with silicone sealant.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

- .1 Section 01 01 50 – General Instructions for Construction/Demolition Waste Management And Disposal.
- .2 Section 03 30 05 – Anchor bolts
- .3 Sections 05 50 00, 06 18 20, 06 17 53 - Steel Shoes and brackets
- .4 Structural Drawings S101/S102 – Wood Products General Notes and Typical Details
- .5 Section 06 18 20 – Engineered Wood – “Parallam”
- .6 Section 06 17 53 – Prefabricated Wood Trusses.

1.2 Reference Standards

- .1 Canadian Standards Association (CSA International)
 - .1 CSA B111-1974(R1998), Wire Nails, Spikes and Staples.
 - .2 CAN/CSA-G164-M92(R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CSA O121-M1978(R1998), Douglas Fir Plywood.
 - .4 CAN/CSA-O141-91(R1999), Softwood Lumber.
 - .5 CSA O151-M1978(R1998), Canadian Softwood Plywood.
 - .6 CAN/CSA-O325.0-92(R1998), Construction Sheathing.
 - .7 Comply with AWWA.M4 and revisions specified in CAN/CSA-080 Series, Supplementary Requirements to AWWA Standard M2.
- .2 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2000.

1.3 Quality Assurance

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

1.4 Waste Management and Disposal

- .1 Separate and recycle waste materials in accordance with Section 01 01 50 – General Instructions for 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.
- .4 Divert unused wood materials from landfill to recycling, reuse and composting facility approved by Departmental Representative.
- .5 Do not dispose of preservative treated wood through incineration.
- .6 Do not dispose of preservative treated wood with materials destined for recycling or reuse.
- .7 Dispose of treated wood, end pieces, wood scraps and sawdust at sanitary landfill approved by Departmental Representative.
- .8 Dispose of unused wood preservative material at official hazardous material collections site approved by Departmental Representative.
- .9 Do not dispose of unused preservative material into sewer system, into streams, lakes, onto ground or in other locations where they will pose health or environmental hazard.

PART 2 PRODUCTS

1.1 Lumber Material

- .1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% or less in accordance with following standards:
 - .1 CAN/CSA-O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
 - .2 Furring, blocking, nailing strips, grounds, rough bucks, cants, curbs, fascia backing and sleepers:
 - .1 Board sizes: "Standard" or better grade.
 - .2 Dimension sizes: "Standard" light framing or better grade.
 - .3 Post and timbers sizes: "Standard" or better grade species except as indicated.
 - .4 Framing and board lumber: in accordance with NBCC 2005 Subsection 9.3.2, except as follows:
 - .1 Roof joists, studs, chords in built-up beams: D-Fir NLGA No.2 as noted on drawings S102.
 - .2 Post and Beams: D-Fir species, NLGA No.1 grade.
 - .3 Wall studs: D-Fir species, NLGA No.2 grade or better.
 - .3 Glued end-jointed (finger-jointed) lumber products are acceptable for framing of interior non-load bearing studs.
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2.2 Panel Materials

- .1 Douglas fir plywood (DFP): to CSA O121, standard construction.
- .2 Canadian softwood plywood (CSP): to CSA O151, standard construction.
- .3 Plywood, OSB and wood based composite panels: to CAN/CSA-O325.

2.3 Panel Materials End Uses

- .1 Roof sheathing: DFP sheathing grade T&G edge, 16 mm thick.
- .2 Wall sheathing: DFP sheathing grade square edge, 12 mm thick.
- .3 Miscellaneous plywood panels: DFP or CSP sheathing grade square edge, 19 mm thick, for wall backing, panel mounting boards and as indicated.

2.4 Sheathing Paper

- .1 Exterior wall sheathing paper:
 - .1 Single ply asphalt-kraft sheet conforming to CAN/CGSB 51.32M77, US st'd UUB-790a as a 30 minute water resistant paper applied in two layers.

2.5 Damproof Membrane

- .1 Wood plates in contact with concrete: use pressure preservative treated wood D-Fir Grade No. 1 or better with compressible gasket filler of either 25 mm fibreglass insulation, closed cell polyethylene sponge 3 mm thick or roll roofing.
 - .1 Fibre glass insulation to: Section 07 21 30.
 - .2 Roll roofing: to CSA A123.2, Type S.
 - .3 Poly closed cell sponge gasket: as approved by Departmental Representative.
 - .2 Waterproofing membrane: Self-adhering or adhesive-applied SBS modified bituminous membrane minimum 1.5 mm thickness reinforced with material for application over primed substrate; of steel, aluminium, galvanized steel, gypsum board and plywood, conforming to the following:
 - .1 Tensile strength: 150 n/5 cm.
 - .2 Air permeance: less than 0.01 l/m sq. at 75 Pa pressure difference.
 - .3 Sheet membrane: conforming to CGSB 37-GP-56M-1980.
 - .4 Acceptable products:
 - .1 Perm-a-Barrier System 4000, Grace Membrane Group
 - .2 BlueSkin SA Air Barrier Membrane, Monsey-Bakor.
 - .3 Sopraseal Stick 1100, Soprema.
 - .4 QSC-705 Carlisle Coatings and Waterproofing.
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2.6 Accessories

- .1 Nails, spikes and staples: to CSA B111. All nailing shall be common nails. If P-nails (Power driven nails) are intended as substitution, submit P-nails information for Departmental representative's review prior to use. Adjustment of nails spacing or requirements may be required.
- .2 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and cut steel washers. All bolts and anchor bolts shall conform to ASTM A307. Bolt holes shall be 1 mm larger than the bolt diameter. Bolts in wood shall not be less than 7 diameter from the end and 4 diameters from the edge unless otherwise detailed.
- .3 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, explosive actuated fastening devices, recommended for purpose by manufacturer.
- .4 Steel plates: All steel plates used in connection details shall be grade 300W.
- .5 Lag screws: Lag screws shall be predrilled with a bit size of 65% of the shank diameter for the threaded portion. Lead holes shall be the same length as the unthreaded portion and the same diameter as the shank. Screw all lags into place. Cut washers shall be provided under heads which bear on wood.
- .6 No checks or splits allowed at areas to be bolted or lagged.
- .7 All bolts, steel plates/connections and nails for use with red cedar wood to be hot dipped galvanized to ASTM A653 class G90 as produced by Simpson Strong Tie or approved equal by the Departmental representative.
- .8 Galvanizing: to CSA G164 unless noted otherwise. Use galvanized fasteners for exterior work, interior highly humid areas.
- .9 Joist/beam hangers, post bases: unless noted otherwise shall be hot dipped galvanized as per manufacture and approved by the Departmental representative.

2.7 Finishes

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

2.8 Wood Preservative

- .1 Surface-applied wood preservative: clear, coloured, or copper napthenate or 5% pentachlorophenol solution, water repellent preservative.
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- .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.
- .4 Borax wood preservatives, pressure treatment may be used for weather protected wood ie painted wood.

PART 3 EXECUTION

3.1 Preparation

- .1 Comply with AWPAM4, use copper naphthenate to manufacturer's instructions.
- .2 Treat surfaces of material with wood preservative, before installation.
- .3 Apply preservative by dipping, or by brush to completely saturate and maintain wet film on surface for minimum 3 minute soak on lumber and one minute soak on plywood.
- .5 Re-treat surfaces of PT Lumber and plywood exposed by cutting, trimming or boring with liberal brush application of preservative before installation.
- .6 Treat material as indicated and as follows:
 - .1 Wood fascia backing, curbs, nailers, sleepers on roof deck.
 - .2 Wood furring for member on outside surface of exterior masonry and wood stud walls.
 - .3 Wood sleepers over concrete slabs in contact with ground or fill.
 - .4 Plywood wall sheathing under water proofing membrane.

3.2 Installation

- .1 Comply with requirement of NBCC 2005, Part 9 and General Notes on Structural Drawings. Where conflict exists, the more stringent requirements will apply.
 - .2 Install members true to line, levels and elevations.
 - .3 Construct continuous members from pieces of longest practical length.
 - .4 Install spanning members with "crown-edge" up.
 - .5 Install all exterior pressure treated timber sill plates using 16 DIA. Anchor bolts @ 1200o.c. into ground U.N.O.; refer to structural drawing S102 for shearwall anchorage. Anchor interior non-structural wall sill plates with minimum 12 Dia. Anchor bolts @ 2400 o.c.
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- .6 Stud walls abutting a concrete or masonry wall shall be bolted to the wall with 12 Dia. Anchor bolts @ 600 o.c. through a double stud.
 - .7 Install lumber and panel materials so that grade-marks and other defacing marks are not visible or are removed by sanding at location (s) where exposed in final assembly.
 - .8 All built-up beams to be D-fir Grade No. 2 or better nailed through each lamination using 82 min. nails on a 150 mm grid.
 - .9 Install plywood roof sheathing with surface grain at right angles to roof framing. Provide solid blocking necessary to ensure maximum span on roof sheathing edge does not exceed 610 mm in either direction.
 - .10 Install sheathing over framing members as indicated using nails to NBCC part 9 requirements and in accordance with structural drawing.
 - .11 Install wall sheathing with panel side joints on solid bearing staggered at least 800 mm. Nail at perimeter edge 150 mm o.c. minimum and at interior of panels 300 mm o.c. minimum. Use minimum 65 mm long nails. Refer to general Notes on structural drawing for nailing pattern.
 - .12 Apply peel and stick waterproof membrane at all window and door openings at jambs, head and sill. Apply waterproofing membrane over wood framing where wood framed wall is adjacent to concrete.
 - .13 Apply building paper in two layer application over sheathing using staples or auto-nailer.
 - .14 Install furring, strapping and solid backing in walls and structures as required to space-out and support casework, cabinets, applied finishes, facings, pipe chases, wall mounted door stops, access hatches, electrical and mechanical fixtures, washroom accessories, benches, prefab showers, overhead door hardware and other work as required. Use solid blocking or 19 mm plywood securely nailed to framing members.
 - .15 Frame and strap for suspended gypsum board ceiling finishes.
 - .16 Align and plumb faces of furring and blocking to tolerance of 1:600.
 - .17 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.
 - .18 Align and plumb faces of furring and blocking to tolerance of 1:600.
 - .19 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.
 - .20 Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using galvanized, or steel fasteners.
 - .21 Install wood backing, dressed, tapered and recessed slightly below top surface of roof insulation for roof hopper.
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- .22 Install sleepers as indicated.
- .23 Use caution when working with particle board. Use dust collectors and high quality respirator masks.

3.3 Erection

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

3.4 Schedules

- .1 Provide electrical equipment backboards for mounting electrical equipment as indicated. Use 19 mm thick plywood on 19 x 38 mm furring around spacing, perimeter and at maximum 300 mm intermediate

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Material and installation for prefabricated wood trusses.
 - .2 Sustainable requirements for construction and verification
- .2 Related Sections:
 - .1 Section 01 01 50 – General Instructions for Construction Progress Schedules.
 - .2 Section 01 01 50 – General Instructions for Submittal Procedures.
 - .3 Section 01 35 33 - Health and Safety Requirements.
 - .4 Section 01 01 50 – General Instructions for Sustainable Requirements: Construction.
 - .5 Section 01 01 50 – General Instructions for Sustainable Requirements: Contractor's Verification.
 - .6 Section 01 01 50 – General Instructions for Common Product Requirements.
 - .7 Section 01 01 50 – General Instructions for Construction/Demolition Waste Management and Disposal.
 - .8 Section 06 10 11 – Rough Carpentry.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA O80 Series-97(R2002), Wood Preservation.
 - .2 CAN/CSA-O86-01, Engineering Design in Wood.
 - .3 CAN/CSA-O141-91(R1999), Softwood Lumber.
 - .4 CSA S307-M1980(R2001), Load Test Procedure for Wood Roof Trusses for Houses and Small Buildings.
 - .5 CSA S347-99(R2004), Method of Test for Evaluation of Truss Plates Used in Lumber Joints.
 - .6 CSA W47.1-03, Certification of Companies for Fusion Welding of Steel.
- .2 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 National Lumber Grades Authority (NLGA)
 - .1 NLGA-03, Standard Grading Rules for Canadian Lumber.
- .4 National Research Council (NRC)/Institute for Research in Construction (IRC) - Canadian Construction Materials Centre (CCMC)
 - .1 CCMC-2002, Registry of Product Evaluations.
- .5 Truss Plate Institute of Canada (TPIC)

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- .1 TPIC - 1996 (R2001), Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses (Limit States Design).

1.3 DESIGN REQUIREMENTS

- .1 Design light metal plate connected wood trusses in accordance with TPIC truss design procedures for wood truss chords and webs in accordance with engineering properties in CAN/CSA-O86.
- .2 Design light metal plate connected wood trusses in accordance with TPIC truss design procedures for truss joint designs to test engineering properties in accordance with CSA S347 and listed in CCMC Registry of Product Evaluations.
- .3 Design trusses, bracing, bridging in accordance with CAN/CSA-O86.1 including supplement CSA-86S1.05 for loads indicated for building locality as ascertained by NBC, Climatic Information for Building Design in Canada and minimum uniform and minimum concentrated loadings stipulated in NBC commentary.
- .4 Limit live load deflection to 1/360th of span where plaster and gypsum board ceilings are hung directly from trusses.
- .5 Limit live load deflections to 1/240th of span unless otherwise specified or indicated.
- .6 Provide camber for trusses as indicated: precamber for dead load plus 25% live load.

1.4 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Fabricator for trusses to show evidence of quality control program such as provided by regional wood truss associations, or equivalent.
 - .2 Fabricator for welded steel connections to be certified in accordance with CSA W47.1.
- .2 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 01 50 – General Instructions for Construction Progress Schedules - Bar (GANTT) Chart.
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.
- .3 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements.
- .4 Construction requirements: in accordance with Section 01 01 50 – General Instructions for Sustainable Requirements: Construction.

- .5 Verification: contractor's verification in accordance with Section 01 01 50 – General Instructions for Sustainable Requirements: Contractor's Verification.

1.5 SUBMITTALS

- .1 Submittals in accordance with Section 01 01 50 – General Instructions for Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit two copies of Workplace Hazardous Materials Information System WHMIS MSDS in accordance with Section 01 47 15 - Sustainable Requirements: Construction and Section 02 61 33 - Hazardous Materials. Indicate VOCs during application and curing.
- .3 Shop Drawings:
 - .4 Each shop and erection drawing submission showing connection details to be signed and stamped by professional engineer registered or licensed in province of British Columbia, Canada.
 - .5 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, provide to the Departmental Representative a completed Schedules 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.
 - .6 Indicate special structural application and specification as according to local Authorities having jurisdiction.
 - .7 Indicate TPIC Truss Design Procedure and CSA O86 Engineering Design in Wood and specific CCMC Product Registry number of the truss plates
 - .8 Indicate species, sizes, and stress grades of lumber used as truss members. Show pitch, span, camber, configuration and spacing of trusses. Indicate connector types, thicknesses, sizes, locations and design value. Show bearing details. Indicate design load for members.
 - .9 Submit stress diagram or print-out of computer design indicating design load for truss members. Indicate allowable load and stress increase.
 - .10 Do load testing on representative trusses selected by Departmental Representative. Provide certification that trusses meet requirements of CSA S307 and CSA S347.
 - .11 Indicate arrangement of webs or other members to accommodate ducts and other specialties.
 - .12 Show location of lateral bracing for compression members.

- .13 Test reports: submit certified test reports for prefabricated wood trusses from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
- .14 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .15 Instructions: submit manufacturer's installation instructions.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, handle, store and protect materials in accordance with 01 01 50 – General Instructions for Common Product Requirements.
- .2 Storage and Protection:
 - .1 Store trusses on job site in accordance with manufacturer's instructions. Provide bearing supports and bracings. Prevent bending, warping and overturning of trusses.
- .3 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 01 50 – General Instructions for Construction/Demolition Waste Management and Disposal.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan (WMP).
 - .4 Separate for reuse and recycling and place in designated containers Steel, Metal, and Plastic waste in accordance with Waste Management Plan (WMP).
 - .5 Fold up metal and plastic banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 MATERIALS

- .1 Materials and products in accordance with Section 01 01 50 – General Instructions for Sustainable Requirements: Construction.
- .2 Lumber: Hem-Fir or S-P-F species, No 2 or better grade, softwood, S4S, with maximum moisture content of 19% at time of fabrication and to following standards:
 - .1 CAN/CSA-O141.
 - .2 NLGA (National Lumber Grading Association), Standard Grading Rules for Canadian Lumber.

- .3 Fastenings: to CAN/CSA-O86.

2.2 FABRICATION

- .1 Fabricate wood trusses in accordance with reviewed shop drawings.
- .2 Provide for design camber and roof slopes when positioning truss members.
- .3 Connect members using plywood gussets or metal connector plates.
- .4 Cut truss members to accurate length, angle, and size to assure tight joints for finished trusses.
- .5 Assemble truss to design configuration.

2.3 SOURCE QUALITY CONTROL

- .1 Identify lumber by grade stamp of an agency certified by Canadian Lumber Standards Administration Board.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 ERECTION

- .1 Erect wood trusses as indicated in accordance with reviewed approved shop drawings.
- .2 Handling, installation, erection, bracing and lifting in accordance with manufacturers instructions.
- .3 Make adequate provisions for handling and erection stresses.
- .4 Exercise care to prevent out-of-plane bending of trusses.
- .5 Install temporary horizontal and cross bracing to hold trusses plumb and in safe condition until permanent bracing and decking are installed.
- .6 Install permanent bracing in accordance with reviewed shop drawings, prior to application of loads to trusses.
- .7 Do not cut or remove any truss material without approval of Departmental Representative.

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- .8 Remove chemical and other surface deposits on treated wood, in preparation for applied finishes.

3.3 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
 - .1 Have manufacturer of products supplied under this Section review work involved in handling, installation/application, protection and cleaning of its 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 to review work at stages listed:
 - .1 After delivery and storage of products, and when preparatory work on which work of this Section depends is complete, but before installation begins.
 - .2 Twice during progress of work at 25% and 60% complete.
 - .2 Upon completion of work, after cleaning is carried out.
 - .3 Obtain reports within three days of review and submit immediately to Departmental Representative.
 - .4 Verification requirements in accordance with Section 01 01 50 – General Instructions for Sustainable Requirements: Contractor's Verification, include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Certified Wood.
 - .8 Low-emitting materials.

3.4 CLEANING

- .1 Remove surplus materials, excess materials, rubbish, tools and equipment on completion of installation.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 01 50 – General Instructions for Submittal Procedures.
- .2 Section 01 01 50 – General Instructions for Construction/Demolition Waste Management And Disposal.
- .3 Section 01 01 50 – General Instructions for Common Product Requirements.
- .4 Section 06 10 11 – Rough Carpentry.
- .5 Section 06 17 53 – Shop Fabricated Wood Trusses.

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A36/A36M-01, Specification for Carbon Structural Steel.
 - .2 ASTM A47/A47M-99, Specification for Ferritic Malleable Iron Castings.
 - .3 ASTM A307-00, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .4 ASTM A653/A653M-02, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.40-97, Anti-corrosive Structural Steel Alkyd Primer.
 - .3 Canadian Standards Association (CSA International)
 - .1 CSA B111-1974(R1998), Wire Nails, Spikes and Staples.
 - .2 CSA G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .3 CAN/CSA-G164-M92(R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .4 CAN/CSA-O80 Series-97, Wood Preservation.
 - .5 CAN/CSA-O86.01,(including supplement CSA-086S1-05 Limit States Design), Engineering Design in Wood.
 - .6 CSA O112 Series-M1977(R2001), CSA Standards for Wood Adhesives.
 - .7 CAN/CSA-O122-M89(R1999), Structural Glued-Laminated Timber.
 - .8 CAN/CSA-O177-M89(R1998), Qualification Code for Manufacturer's of Structural Glued-Laminated Timber.
 - .9 CAN/CSA-S16-01, Limit States Design of Steel Structures.
 - .10 CSA W47.1-92(R2001), Certification of Companies for Fusion Welding of Steel Structures.
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- .11 CAN/CSA-Z808-96, A Sustainable Forest Management System: Guidance Document.
 - .4 Others
 - .1 Canada Mortgage and Housing Corporation Report Ho.11161 issued 80-04-03 Revised 88-11-29
 - .2 General Notes
 - 1.3 SHOP DRAWINGS**
 - .1 Submit shop and erection drawings in accordance with Section 01 01 50 – General Instructions for Submittal Procedures.
 - .2 Submit erection drawings in accordance with CAN/CSA-S16.
 - .3 Shop drawings for members to indicate stress grade, service grade and appearance grades, shop applied finishes, camber, cuts, ledgers, holes and connection details.
 - .4 Each erection and shop drawing submission shall bear signature and stamp of qualified professional engineer registered or licensed in province of British Columbia, Canada, for items designed by fabricator or manufacturer.
 - 1.4 QUALIFICATIONS**
 - .1 Manufacture structural “Parallam” Parallel Strand Lumber (PSL) Engineered Wood members in plant certified by CSA as meeting requirements of CAN/CSA-O177, class X.
 - .2 Submit certificate in accordance with CAN/CSA-O177, Appendix B at completion of fabrication.
 - .3 Fabricator for welded steel connections to be certified in accordance with CSA W47.1.
 - .4 Place authorization labels on “Parallam” Parallel Strand Lumber (PSL) Engineered Wood members indicating manufactured in CSA certified plant.
 - .5 Certification of material protective sealer.
 - 1.5 DELIVERY, STORAGE, AND HANDLING**
 - .1 Deliver, handle, store and protect materials of this section in accordance with Section 01 61 00 - Common Product Requirements.
 - .2 Apply protective sealer to PSL units before shipping unless specified otherwise.
 - .3 Wrap quality commercial grade members prior to leaving plant with a moisture resistant wrapping.
 - .4 Use padded, non-marring slings for handling PSL members.
 - .5 Protect corners with wood blocking.
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- .6 Slit underside of membrane covering during storage at site. Do not deface member.
- .7 Store PSL units and protect from weather, block off ground and separate with stripping, so air may circulate around all faces of members.
- .8 Cover PSL units with opaque moisture resistant membrane if stored outside.
- .9 Make adequate provision for delivery and handling stresses.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 01 50 – General Instructions for Construction/Demolition Waste Management And Disposal.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site for recycling in accordance with Waste Management Plan.
 - .4 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.
 - .5 Divert unused paint material from landfill to official hazardous material collections site approved by Departmental Representative.
 - .6 Do not dispose of unused paint materials or preservative material into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.
 - .7 Do not dispose of preservative treated wood through incineration.
 - .8 Do not dispose of preservative treated wood with materials destined for recycling or reuse.
 - .1 Dispose of treated wood, end pieces, wood scraps and sawdust at sanitary landfill approved by Departmental Representative.
 - .9 Dispose of unused wood preservative material at official hazardous material collections site approved by Departmental Representative.
 - .10 Divert unused wood materials from landfill to recycling, reuse, and composting facility approved by Departmental Representative.
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Part 2 PRODUCTS

2.1 MATERIALS

- .1 Parallel Strand: Douglas Fir-Larch, Hem Fir and Douglas Fir-Larch, Lodgepole Pine and/or Spruce to CAN/CSA-O122 as manufactured by,

	Grade 2.0 E	Grade 2.1 E
Property	Stress (MPa)	
Flexural Stress, f_b	20.0	21.4
Tension parallel to grain, f_t	16.5	16.5
Compression parallel to grain, f_c	20.0	20.0
Compression to perpendicular to grain, f_{cp}		
load parallel to wide face of strand	5.17	5.17
load perpendicular to wide face of strand	3.31	3.31
Horizontal shear, f_v		
load parallel to wide face of strand	2.0	2.0
load perpendicular to wide face of strand	1.45	1.45
Modulus of elasticity, MOE	13790	14480

- .2 Adhesive: to CSA O112 Series, to grade of service required in accordance with CAN/CSA-O122.
- .3 Sealer for PSL members: penetrating type, clear, non-yellowing liquid.
- .4 Fastenings:
- .1 Split ring connections: hot rolled carbon steel, SAE 1010, meeting requirements of SAE handbook.
 - .2 Shear plate connections.
 - .1 Pressed steel type: hot rolled carbon steel, SAE 1010, meeting requirements of SAE handbook.
 - .2 Malleable iron type: to ASTM A47/A47M, grade [350].
 - .3 Lag screws: to general notes.
 - .4 Bolts: to ASTM A307.
 - .5 Side plates: to CAN/CSA-G40.20/G40.21 or ASTM A36.
 - .6 Drift pins: to ASTM A307.
 - .7 PSL rivets: hot dip galvanized to CAN/CSA-G40.20/G40.21, ASTM A36.
 - .8 Nails and spikes: to CSA B111.

- .9 Truss plates: light gauge galvanized sheet steel to ASTM A653, grade A, yield point 230 MPa.
- .5 Shop coat primer for steel connections: to CAN/CGSB-1.40.
- .6 Galvanizing: to CAN/CSA-G164, hot dipped, minimum zinc coating of 610 g/m².
- .7 Preservative: Pressure treatment to CSA-080-Series 97 applies in accordance with manufacturers instructions.

2.2 FABRICATION

- .1 Fabricate members to following classifications:
 - .1 All 68 mm thick Parallam shall be Grade 2.1E.
 - .2 All other thickness shall be Grade 2.0E.
- .2 Mark "Parallam" parallel strand members for identification during erection. Marks not to be visible in final assembly.
- .3 Do not apply sealer to areas which are to receive stained finish or preservative treatment.
- .4 Design connections to CAN/CSA-O86, and CAN/CSA-S16 unless specifically detailed, to resist shears, moments and forces indicated.
 - .1 Fabricate in accordance with CAN/CSA-S16.
- .5 Galvanize or prime paint connections after fabrication.

Part 3 Execution

3.1 PRESERVATIVE TREATMENT

- .1 Pressure treat all indicated members with preservative and fire-retardant in accordance with CAN/CSA-O80 Series after fabrication.

3.2 ERECTION

- .1 Protect protective sealer from damage before erection.
 - .1 Touch up damaged areas on site with specified sealer.
 - .2 Erect "Parallam" parallel strand members in accordance with reviewed shop drawings and in strict accordance with manufacturer's instructions.
 - .3 Except where detailed otherwise on the drawings provide lateral support at points of bearing to prevent lateral displacement and rotation.
 - .4 Brace and anchor materials until permanently secured by the structure.
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- .5 Where members are framed into masonry or concrete provide a minimum 12 mm air space at ends and sides of member.
- .6 "Parallam" parallel strand members supported on concrete shall be separated from the concrete surface with .05 mm polyethylene sheet or type S roll roofing.
- .7 Nailing to conform to table 9.23.3.4 of the British Columbia Building Code - 2006. Nails installed on the narrow face, parallel to the glue lines shall be spaced a minimum of 100 mm for 76 mm common nails and a minimum of 75 mm for 64 mm common nails.
- .8 Notching and drilling is not permitted without prior approval of Departmental Representative.
- .9 Splice and joint only at locations indicated on reviewed shop drawings.
- .10 "Parallam" parallel strand lumber shall have a moisture content not exceeding 19% at time of installation.
- .12 Remove from site all damaged members. Repairs are not permitted.
- .13 Fit all members closely and accurately to all other members and other assemblies.
- .14 Field cutting and alteration of members is not permitted without Departmental Representative 's approval.
- .15 Collect waste wood pieces from cutting for reuse where appropriate.

END OF SECTION

1 General

1.1 RELATED WORK

- .1 Section 05 50 00 - Steel brackets and supports.
- .2 Section 06 10 11 - Rough carpentry.
- .3 Section 07 92 10 - Joint Sealing.
- .4 Section 08 14 10 - Wood doors.
- .5 Section 09 91 23 - Painting and finishing.

1.2 DESCRIPTION OF WORK

- .1 Supply and install cabinets and millwork trim as indicated on drawings except for supplied cabinets noted in paragraph 1.2.2
- .2 Install all cabinets supplied by Departmental Representative for:
 - .1 Kitchen cabinets and bedroom furniture in each Living Pod.
 - .2 Reception counter and Counter/cupboards in Canteen room 116.
- .3 Coordinate delivery schedule with Departmental Representative for supplied cabinets. Provide wall backing required for support of all cabinets. Coordinate installation of services, plumbing fixtures and fittings with installation of all cabinets with services.

1.3 REFERENCES

- .1 Architectural Woodwork Institute / Architectural Wood Manufacturer's Association of Canada (AWI/AWMAC)
 - .1 Architectural Woodwork Standards, 1st Edition, 2009.
 - .2 American Society for Testing and Materials (ASTM):
 - .1 ASTM E 1333-96(2002), Test Method for Determining Formaldehyde Concentrations in Air and Emissions Rates from Wood Products Using a Large Chamber.
 - .2 ASTM A123 / A123M - 09 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .3 ASTM F1667 - 05 Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
 - .3 Architectural Woodwork Manufacturers Association of Canada (AWMAC):
 - .1 AWMAC Quality Standards for Architectural Woodwork 2003.
 - .4 Canadian Standards Association (CSA):
 - .1 CSA O115-M82(R2001), Hardwood and Decorative Plywood.
 - .2 CSA O121-M78(R1998), Douglas Fir Plywood.
 - .3 CAN/CSA O141-05, Softwood Lumber.
 - .4 CSA-O112 Series M1977, Adhesive, Contact, Brushable.
 - .5 National Hardwood Lumber Association (NHLA):
 - .1 Rules for the Measurement and Inspection of Hardwood and Cypress January 2004.
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- .6 National Lumber Grades Authority (NLGA):
 - .1 Standard Grading Rules for Canadian Lumber 2010.
- .7 Environmental Choice Program (EPC):
 - .1 CCD-045-95, Sealants and Caulking Compounds.
 - .2 CCD-046-95, Adhesives.
 - .3 CCD-047-05, Architectural Surface Coatings.

1.4 SUBMITTALS

- .1 Submit shop drawings, product data, samples and maintenance data in accordance with Section 01 01 50 General Instructions for submittal requirements.
 - .1 Samples:
 - .1 Submit duplicate 300 x 300 mm samples of each type of solid wood or plywood to receive stain or natural finish.
 - .2 Plastic Laminate:
 - .1 Submit duplicate samples of manufacturer's standard range of solid colours and finishes.
 - .2 Shop drawings:
 - .1 Clearly indicate all supplied and installed cabinets showing sizes, details of construction, profiles, jointing, fastening and other related details.
 - .3 Product Data:
 - .1 Submit two copies of WHMIS MSDS - Material Safety Data Sheets. Indicate VOC's for adhesives, solvents and cleaners.
 - .4 Provide maintenance data for plastic laminate work for incorporation into manual.
- .2 Shop drawings for Departmental Representative supplied Cabinets are available upon request.

1.5 PRODUCT HANDLING

- .1 Cover finished laminated plastic surfaces with heavy kraft paper or put in cartons during shipment. Protect installed laminated surfaces by approved means. Do not remove until immediately before final inspection.
- .2 Do not store or install materials in areas where relative humidity is less than 25% or greater than 60% at 22°C.

2 Products

2.1 MATERIALS

- .1 Softwood lumber: to CAN/CSA-0141 and National Lumber Grades Authority (NLGA), requirements, with maximum moisture content of 12% for interior work, to AWMAC custom grade construction, D-fir species for all concealed areas.
 - .2 Douglas fir plywood: to CSA 0121:
 - .1 Concealed areas: to AWMAC guidelines.
 - .3 Hardwood lumber: moisture content 12% or less in accordance with following standards:
 - .1 National Hardwood Lumber Association (NHLA),.
 - .2 Species: Clear white birch to match birch plywood.
 - .3 Reception CX counter lumber specified in paragraph 2.2.2.2.
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- .4 Hardwood plywood: to CSA O115-M of thickness indicated, rotary cut white birch species veneer of Architectural A-1 grade for exposed fronts and faces, A-2 for shelves, B-1 for interior gables and B-4 for backs. Use birch plywood core. Select veneers to provide slip matching.
 - .1 Reception counter plywood specified in paragraph 2.2.2.1.
- .5 Thermally fused plastic finish: Melamine surface both sides of either particle board or MDF, minimum 19 mm thickness for areas indicated and shelves inside cabinets. Provide extruded pvc edging for all edges exposed in final assembly.
- .6 Interior mat-formed wood particleboard: to CAN3-0188.1.
- .7 Medium density fibreboard (MDF): to ANSI A208.2, density 769 kg/m3.
- .8 Nails and staples: to ASTM F1667 ; galvanized for interior highly humid areas and for treated lumber; plain finish elsewhere.
- .9 Wood screws: steel, electro-plated.
- .10 Plastic Laminate:
 - .1 Based on standard colour range with selected texture finish conforming to the following:
 - .1 Laminated plastic for flatwork: to CAN/CSA-A172, Grade GP, Standard Duty, 1.15 mm thick for horizontal surfaces and 0.8 mm for vertical surfaces.
 - .2 Laminated plastic for postforming work: to CAN3-A172, Grade PF, minimum 0.75 mm thick.
 - .3 Backing grade laminated plastic: minimum 0.7 mm thick, same manufacturer as facing sheet, sanded one (1) face.
 - .2 Core:
 - .1 For post formed countertops: particle board to CAN3-0188.1, sanded both sides, of minimum 19 thickness.
 - .2 For non-postformed horizontal and vertical surfaces: D-Fir plywood, 19 mm thickness.
 - .3 Laminated plastic adhesive: Low VOC contact adhesive.
 - .4 Sealant: silicone, one component to CAN/CGSB-19.18.
 - .5 Drawbolts and splines: type as recommended by fabricator.
 - .6 Sealer: water resistant sealer or glue acceptable to laminate manufacturer.
- .11 Casework hardware furnished and installed under this Section as follows:
 - .1 Counter/cupboard door hinges: self closing, 3-way adjustable unit (European type) for overlay construction.
 - .2 Pulls: 100 mm long "D" shaped chrome plated brass/steel or stainless steel, brushed finish.
 - .3 Drawer slides: self-closing, baked-on epoxy coated steel slides with nylon rollers, parallel close feature, with tolerance adjustment on one side and 100% extension, 45 kg capacity.
 - .4 Adjustable shelf hardware:
 - .1 Pilaster strips and four clips per shelf. Semi-recess mounted Finish in dull chrome.
 - .2 Shelf brackets: of size indicated, dull chrome finish or plastic inserts for mounting in predrilled holes.
 - .5 Cabinet locks: to ANSI A156.11, Grade 2, solid brass 6-pin cylinders , removable

for rekeying. Cabinet lock zinc bodies, 29 mm diameter, with steel bolts with 25 mm throw. All locks keyed alike to building keying system. Door and drawer thickness 22 mm. Provide two keys for each cabinet with locks. All cabinet locks keyed as directed by the Engineer. For pairs of doors provide one cabinet lock and one concealed heavy duty elbow thumb latch or flush bolt.

- .12 Applied finish: low VOC clear lacquer, satin finish. Acceptable product: Cloverdale Paint Ecologic water-borne clear lacquer 458 Series.

2.2 CASEWORK

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

.2 OPEN CX & RECEPTION DESK / COUNTER / SHELF UNIT

.1 Exposed plywood: hardwood plywood to AWI/AWMAC/WI, Architectural Woodwork Standards AWS-2009, Section 4, for use in Premium Grade work, veneer core construction, face veneer - Plain Sliced American White Ash, Book Match adjacent veneer leaves, Architectural End Match, individual panel - Balance and Center Match.

.2 Exposed hardwood at reception counter: to AWI/AWMAC/WI Architectural Woodwork Standards AWS-2009, Section 3, for use in Premium Grade work, Ash - Plain sawn. Moisture content 6% to 12% for lumber up to 50.8 mm in thickness, and less than 19% for thicker pieces.

.3 Stainless steel sheet: to ASTM A167, Type 316 alloy, 1.0 mm thickness. Finish: Unless otherwise indicated, AISI No. 4 brushed finish.

.1 Adhesive for stainless steel surfacing as recommended by manufacturer.

.4 Angled front panels at counter: 19 mm hardwood plywood, plain sliced ash face veneer with solid ash edging to match plywood, applied to 13 mm Douglas Fir G1S grade plywood.

.5 Finish 19 mm wide reveals between angled ash panels with stainless steel, as indicated on drawings.

.6 Upper transaction counter:

.1 Stainless steel top laminated over single 19 mm Ash plywood with 6 mm solid ash edging on leading edge and 19 mm edging on trailing edge. Stainless steel top surface flush with edging.

.2 Exposed surfaces under transaction counter: 13 mm hardwood plywood, ash veneer, one side.

.7 Lower work surface Counter: 19 mm solid hardwood top, ash, plain sawn, with full round, 19 mm radius edge, as indicated, on 13 mm hardwood plywood, ash face veneer one side (inside cabinets and open knee space).

.1 Outer base: 19 mm plywood, G1S Grade. Stainless steel finish.

.2 Inner Base: 13 mm plywood, 3 mm sheet rubber base to match room base colour.

.3 Cabinet doors: 19 mm hardwood plywood, ash face veneer.

.1 Fabricate doors to AWI/AWMAC/WI AWS-2009, Section 10, Premium Grade, Interface Style 1, Flush Overlay.

.4 Cabinet bottoms: 19 mm hardwood plywood, ash face veneer one side.

.5 Adjustable shelves: 19 mm hardwood plywood, ash face veneer.

.6 Cabinet backs: 13 mm hardwood plywood, ash face veneer one side.

.7 Drawers:

.1 Fronts: 19 mm ash plywood to match doors.

.2 Sides, backs: 12 mm hardwood plywood, ash face veneer (one side for cabinet bottoms).

.3 Bottoms: 7 mm hardwood plywood, ash face veneer.

.8 Cupboards and cabinet units:

- .1 Cabinet doors, drawers, fronts and faces: 19 mm hardwood plywood, ash face veneer.
 - .1 Cabinet bottoms: 19 mm hardwood plywood, ash face veneer one side.
 - .2 Adjustable shelves: 19 mm hardwood plywood, ash face veneer.
 - .3 Cabinet backs: 13 mm hardwood plywood, ash face veneer one side.
 - .4 Drawers: same as CX counter (para 2.2.2.7.7).
- .8 Apply 6 mm solid hardwood stock into all exposed plywood edges. Finish to match exposed hardwood finish.
- .9 Hardware and accessories:
 - .1 Cord grommet at CX counter: friction fit, PVC grommet and cap, 75 mm diameter, locate as directed.
 - .2 Raceway: to meet CSA Canadian Electrical Code.
 - .3 Wire 'D' stainless steel pulls, European hinges, magnetic catches, full extension drawer slides, pilaster strips with clips and seismic restraint.
- .10 Exposed hardwood and hardwood plywood finish: to AWI/AWMAC/WI AWS-2009, Section 5 - Finishing.
 - .1 Polyurethane, Water-Based.

.3 TYPICAL OFFICE COUNTER/CUPBOARD UNITS

- .1 AWI/AWMAC custom grade.
- .2 Construction: 19 mm thickness Birch plywood, gables, with 19 mm MDF shelves and interior gables with Melamine finish on interior and Birch veneer on exterior, 12 mm MDF with Melamine finish for backs.
- .3 Counter top and integral surfaces: post-formed plastic laminate on particleboard core with integral backsplash and wrap around leading counter edge.
- .4 Exposed drawer fronts, doors and faces: 19 mm Birch plywood with solid birch edging and clear finish.
- .5 Cabinet interior and shelves: Melamine finish.
- .6 Interior drawers: Melamine faced MDF with thermally fused PVC or Melamine edges, 12 mm thickness for sides, backs and bottoms
- .7 Hardware: European hinges, wire pulls, magnetic catches, full extension drawer slides, pilaster strips with seismic restraint clips.

.4 INMATE EFFECTS SHELVING UNITS

- .1 AWI/AWMAC custom grade.
- .2 Construction: 19 mm thickness G2S Birch plywood, gables, top, bottom and 12 mm birch ply back.
- .3 Shelves: 25 mm birch plywood, adjustable.
- .4 Edge banding: solid Birch edging.
- .5 Adjustable shelves: with pilaster strips and clips with seismic restraints.
- .6 Secure cabinets to wall with specialty seismic brackets.

.5 JANITOR SHELVING UNITS

- .1 AWI/AWMAC custom grade.
 - .2 Construction: 19 mm thickness MDF, gables, shelves, top, bottom and 12 mm ply back with Melamine finish.
 - .3 Shelves: 19 mm MDF, fixed and adjustable, Melamine finish.
 - .4 Edge banding: PVC edging.
 - .5 Hardware: European hinges, wire pulls, magnetic catches, pilaster strips with seismic restraint clips.
 - .6 Counter units in Janitor rooms same as typical counter cupboard units.
-

- .6 WINDOW CASING
 - .1 AWI/AWMAC custom grade.
 - .2 Material and Finish: Birch plywood stools and window casings with solid wood birch trim to match Birch plywood.

- .7 RUNNING TRIM
 - .1 AWI/AWMAC custom grade.
 - .2 Material and Finish: Solid wood species to match hardwood plywood.

2.3 CASEWORK SUPPLIED BY DEPARTMENTAL REPRESENTATIVE

- .1 KITCHEN CABINETS for Living Pods
 - .1 Supplied by Departmental Representative and installed under this Contract.
- .2 BEDROOM FURNITURE for Living Pods
 - .1 Supplied by Departmental Representative and installed under this Contract.

2.4 DRAWERS

- .1 Fabricate drawers to AWMAC custom grade supplemented as follows:
 - .1 Sides and Backs: Melamine faces, 12.7 mm thickness.
 - .2 Bottoms: Melamine faces, 6.4 mm thickness.
 - .3 Fronts and Faces: 12.7 mm thickness fronts with facing panel and finish as indicated.
 - .4 See para 2.2.2.7.7 for CX counter drawer construction.

2.5 SHOP FABRICATION - PLASTIC LAMINATE

- .1 Counters with basins:
 - .1 Form shaped profiles and bends as indicated, using postforming grade laminate to laminate manufacturer's instructions.
 - .2 Keep joints 600 mm from sink cutouts. Where joints are unavoidable, on tops longer than 3000, use draw bolts and splines.
- .2 Use straight self-edging laminate strip, at post-formed tops, to cover exposed ends of core material. Chamfer exposed edges uniformly at approximately 20 degrees. Do not mitre laminate edges.
- .3 Comply with CAN3-A172, Appendix "A".

2.6 EDGE BANDING

- .1 Melamine panels: thermally fused PVC.
- .2 Plastic laminate edging for countertops..
- .3 Plywood panels: hardwood or PVC edge to match veneer.

2.7 FABRICATION

- .1 Set nails and countersink screws, apply matching wood filler to indentations, sand smooth and leave ready to receive finish.
 - .2 Shop install cabinet hardware for doors, shelves and drawers.
-

- .3 Provide cutouts for fixtures, inserts and as indicated.
- .4 Shop assemble work for delivery to site in size easily handled and to ensure passage through building openings.

2.8 FINISHING

- .1 Except as indicated otherwise Birch veneered and trim surfaces of cabinets: factory applied, low VOC clear lacquer in satin finish.
- .2 Site finishing of wood trim specified in Section 09 91 23.

3 Execution

3.1 INSTALLATION OF ALL CASEWORK AND TRIM

- .1 Install prefinished millwork and casework at locations shown on reviewed shop drawings including Departmental Representative supplied casework. Position accurately, shim level, plumb and straight.
- .2 Fasten and anchor millwork/casework securely. Provide heavy duty fixture attachments for wall mounted cabinets. Coordinate with carpentry trade where backing is required inside walls.
- .3 Use draw bolts at joints in countertops.
- .4 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. Install trim to conceal spaces between walls and cabinets.
- .5 At junction of plastic laminate counter back splash and adjacent wall finish, apply small bead of silicone sealant for counters with sinks only, except as noted otherwise in high security areas.
- .6 Fit hardware accurately and securely in accordance with manufacturer's directions.
- .7 Adjust all cabinet hardware for correct function.

3.2 STANDING AND RUNNING TRIM

- .1 Fabricate joints of window casings to make snug, tight, joint. Cut right angle rabbet joints at casing corners.
- .2 Fit backs of casing snugly to wall surfaces to eliminate cracks at junction of casing with walls. Shim as required. Nail trim to casing frame.
- .3 Make joints, in runs longer than 3.6 m using a 45° scarf type joint.
- .4 Install trim in single lengths without splicing.

3.3 INSTALLATION SITE APPLIED PLASTIC LAMINATE

- .1 Install work plumb, true and square, neatly scribed to adjoining surfaces.
- .2 Make allowances around perimeter where fixed objects pass through or project into laminated plastic work to permit normal movement without restriction.
- .3 Use draw bolts and splines in counter top joints. Maximum spacing 450 mm o.c., 75 mm from edge. Make flush hairline joints.
- .4 Provide cutouts for inserts, grilles, appliances, outlet boxes and other penetrations. Round internal corners, chamfer edges and seal exposed core.
- .5 At junction of laminated plastic counter back splash and adjacent wall finish, apply small bead of sealant specified. Use straight self-edging laminate strip, at post-formed tops, to cover exposed ends of core material. Chamfer exposed edges uniformly at approximately 20 degrees. Do not mitre laminate edges.

3.4 PROTECTION

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

3.5 CLEANING

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .2 Perform care and cleaning with CAN3-A172, Annex B.
- .3 Remove traces of primer, caulking and filler materials; clean cabinets and millwork.

END OF SECTION

1 General

1.1 RELATED WORK

- .1 Section 03 30 05 - Cast-in-Place Concrete.
- .2 Section 07 21 13 - Board Insulation.

1.2 WORK INCLUDED

- .1 Spray apply membrane to exterior face of:
 - .1 Concrete foundation wall of building in contact with ground, above and below grade level including top of footing. (Dampproofing)
 - .2 Perimeter of foundation wall at elevator pit in contact with ground, including top of footing. (Waterproofing)
 - .3 Exterior concrete wall at elevator shaft. (Air/vapour barrier membrane)
- .2 Rigid insulation: application to foundation and exterior concrete masonry wall, specified in Section 07 21 13.

1.3 REFERENCES

- .1 CAN/CGSB 37.58-M86 Membrane, Elastomeric, Cold Applied Liquid, for Non-Exposed Use in Roofing and Waterproofing.

1.4 ENVIRONMENTAL REQUIREMENTS

- .1 Do not proceed with work when temperatures fall below recommended application requirements.
- .2 Do not apply during rain or snow unless surfaces are protected to manufacturers requirements.

1.5 PROTECTION

- .1 Provide adequate protection of materials and work of this section from damage by weather backfilling operations and other causes.
- .2 Protect work of other trades from damage resulting from work of this section. Make good such damage at own expense to satisfaction of the consultant.

1.6 COMPATIBILITY

- .1 Ensure that all materials used are compatible.

1.7 SUBMITTALS

- .1 Submit product data in accordance with Section 01 01 50 General Instructions - Submittals clause.
 - .2 Submit product data sheets for waterproofing membrane and flashings. Include:
 - .1 Product characteristics.
 - .2 Performance criteria.
 - .3 Limitations.
-

1.8 QUALITY ASSURANCE

- .1 Perform Work in accordance with the printed requirements of the membrane manufacturer and this specification. Advise Departmental Representative of any discrepancies prior to commencement of the Work.
- .2 Maintain one copy of manufacturers literature on site throughout the execution of the Work.
- .3 Submit documentation certifying that the waterproofing materials comply with CAN/CGSB 37.58, as appropriate for the application.
- .4 Submit information indicating that the materials proposed have been installed for not less than five years on projects of similar scope and nature. Submit references for a minimum of five projects.
- .5 Installers to complete a certified training program approved by manufacturer.
- .6 Spray pump system calibrated by the manufacturer.

1.9 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials to the job site in undamaged and original packaging indicating the name of the manufacturer and product.
- .2 Store membrane at temperature of 5 degrees C and above to facilitate handling except as noted otherwise by manufacturer's instructions.

1.10 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for disposal and recycling in accordance with Section 01 01 50 General Instructions for Construction/Demolition Waste Management And Disposal clause.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for recycling and disposal; paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins in accordance with Waste Management Plan.

2 Products

2.1 MATERIALS

- .1 Water based two component membrane, spray applied, with no volatile organic compounds, odourless, non-leaching, dries instantly upon application, meeting requirements specified in table following paragraph 2.1.1.1.
 - .1 Physical and Performance Requirements for Cold-Applied, Liquid, Elastomeric Roofing and Waterproofing, Non-Exposed:

Property	Unit	Requirement	Results
dimensional stability Water absorption	% %	≤ 5 dimensional change in any direction ≤ 3 change in mass	L2, W2 % 3%, Pass
Adhesion in peel (after water absorption)	N/m	≥ 175	Pass
Crack bridging	no unit	No cracking, splitting or total loss of adhesion	Pass
Low-temperature flexibility	no unit	No cracking when viewed without magnification	Pass
Recovery test	%	≥ 85 of length after being stretched 100% of it's length	88% Pass
Water tightness	no unit	No leakage	Pass
Sag-flow test (vertical and sloped applications only)	no unit	Shall not flow from 0.75 mm level into the 0.89 mm level	Pass

3 Execution

3.1 PREPARATION

- .1 Before application ensure environmental and site conditions are suitable for installation of waterproofing membrane.
- .2 Ensure all surfaces are clean, dry, free of water, frost, dirt, oil, grease, curing compounds or other deleterious to adhesion of waterproofing membrane.
- .3 Seal exterior cracks and around penetrations through waterproofing with compatible sealing compound in accordance with manufacturer's instructions.
- .4 Notify Departmental Representative in writing of any unsuitable surfaces and working conditions which may affect a successful application.

3.2 APPLICATION

- .1 Application of dampproof, waterproof and air/vapour barrier coating, using manufacturer approved spray equipment, in accordance with manufacturer's instructions:
 - .1 Apply coating to dry film thickness of 1.0 mm minimum, for dampproofing.
 - .2 Apply coating to dry film thickness of 1.5 mm minimum, for waterproofing and air/vapour barrier membrane.

3.3 CLEAN-UP

- .1 Promptly as the work proceeds and on completion clean up and remove from the premises all rubbish and surplus materials resulting from the foregoing work.

END OF SECTION

1 General

1.1 RELATED WORK

- .1 Section 06 10 11 - Rough Carpentry
- .2 Section 07 21 16 - Blanket insulation.
- .3 Section 07 11 26 - Spray Applied Elastomeric Membrane.
- .4 Section 07 46 13 - Metal Wall Cladding Assembly.
- .5 Section 07 62 00 - Metal Flashing and Trim.

1.2 REFERENCES

- .1 ASTM International:
 - .1 ASTM C 518 - 10, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - .2 ASTM C 612 - 10, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
 - .3 ASTM C 665 - 12, Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - .4 ASTM C 795 - 08, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
 - .5 ASTM C 1104 / C1104M - 00(2006) Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.
 - .6 ASTM C1338 - 08 Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
 - .7 ASTM D 1621 - 10, Standard Test Method for Compressive Properties Of Rigid Cellular Plastics.
 - .8 ASTM D2842 - 06, Standard Test Method for Water Absorption of Rigid Cellular Plastics.
 - .9 ASTM E 84 - 12b Standard Test Method for Surface Burning Characteristics of Building Materials.
 - .10 ASTM E96/ E96M - 10, Standard Test Methods for Water Vapor Transmission of Materials
 - .2 Underwriters Laboratories of Canada (ULC).
 - .1 CAN/ULC S102 - 07, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC S114 - 05, Standard Method of Test for Determination of Non-Combustibility in Building Materials.
 - .3 CAN/ULC-S701-11, Thermal Insulation, Polystyrene, Boards and Pipe Coverings.
 - .4 CAN/ULC - S702 - 09, Standard for Mineral Fibre Thermal Insulation for Buildings
 - .5 CAN/ULC-S770-09, Long-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams.
 - .3 Canadian General Standards Board (CGSB)
 - .1 CAN3-A451.1-M86 (R2001) Polystyrene Insulation Adhesives.
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1.3 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 01 50 - General Instructions for Submittal Procedures clause.
 - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 01 50 - General Instructions for Submittal Procedures clause. Indicate VOC's insulation products and adhesives.
- .2 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

- .1 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 01 50 - General Instructions for Construction/Demolition Waste Management And Disposal clause.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.

2 Products

2.1 MATERIALS

- .1 Exterior insulation below grade:
 - .1 Perimeter Foundation Insulation: Extruded polystyrene foam insulation to CAN/ULC-S701, Type 4, rigid, closed cell type, with integral high density skin, c/w intergral 9 mm thick latex- modified concrete facing.
 - .1 Thermal Resistance: Long term aged RSI value of 0.87/25 mm, to ASTM C518.
 - .2 Board Size: 610 x 1220 mm, 50 mm thick.
 - .3 Compressive Strength: to ASTM D1621, minimum 210 kPa.
 - .4 Water Absorption: to ASTM D2842, 0.7% by volume maximum.
 - .5 Edges: Tongue and groove sides, square edge ends.
 - .6 Water Vapour Permeance: to ASTM E96, 50 ng/Pas m².
 - .2 Fastening: self drilling/tapping screws with minimum 25 mm dia washers, corrosion resistant types suitable for substrates encountered and capable of retaining insulation in place.
 - .3 Metal Cap Flashing: 0.61 mm thick galvanized steel J-channel; 57 mm wide, 100 mm long leg and 57 mm short leg; prefinished in colour selected by Departmental Representative.
 - .4 Clips and Fasteners: corrosion-resistant type, sized to suit application; as supplied by insulation manufacturer.
 - .2 Sheathing board insulation: 38 mm thickness rigid mineral wool insulation sheathing board, non-combustible, breathable, water repellent, fire resistant, sound absorbent and
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conforming to the following compliance and performance:

.1 Acceptable Product: Roxul ComfortBoard IS Insulation meets the following requirements:

ASTM C 612	Mineral Fiber Block and Board Thermal Insulation	Type IVA, Complies
CAN /ULC - S702	Mineral Fibre Thermal Insulation for Buildings	Type 1, Complies
Fire Performance:		
CAN/ULC S114	Test for Non-Combustibility	Non-Combustible
ASTM E 84 (UL 723)	Surface Burning Characteristics	Flame Spread = 5 Smoke Developed =10
CAN/ULC S102.2	Surface Burning Characteristics	Flames Spread = 5 Smoke Developed =10
Moisture Resistance:		
ASTM C 1104	Moisture Sorption	0.3%
Water Vapor Permeance:		
ASTM E96	Water Vapor Transmission, Desiccant Method	1768 ng/ Pa.s.m2
Fungi Resistance:		
ASTM C1338	Determination of Fungi Resistance	Passed
Thermal Resistance:		
ASTM C 518 (C 177)	RSI value/25.4 mm @ 24°C	0.72 m2KW
Corrosive Resistance:		
ASTM C 665	Corrosiveness to Steel	Pass
ASTM C 795 (at the time of manufacturing)	Stainless Steel Stress Corrosion Specification as per Test Methods C871 and C692: U.S. Nuclear Regulatory Commission, Reg. Guide #1.36: U.S. Military Specifications MIL-I-24244 (all versions including B and C)	Conforms
Compressive Strength:		
	At 10%:	35.6 kPa
	At 25%:	60.8 kPa
Density:		
ASTM C 612 – Actual	128 kg/m ³	
Dimensions:		
610 mm (width) x 1219 mm (length) - Grand Forks,BC 914 mm (width) x 1219 mm (length) - Grand Forks,BC 1219 mm (width) x 2438 (length) - Eastern Canada		

2.2 ACCESSORIES

- .1 Clips and fasteners for attachment of concrete topped insulation as recommended by manufacturer.

2.3 ADHESIVE

- .1 Type A (for polystyrene): to CAN3-A451.1 and suitable for bead application.

2.4 COMPATIBILITY

- .1 Ensure insulation is compatible with other materials in contact with insulation.
- .2 Where incompatibility exists provide means to separate materials as recommended by manufacturer of insulation.

3 Execution

3.1 WORKMANSHIP

- .1 Install insulation after building substrate materials are dry to manufacturer's instructions.
- .2 Install insulation to maintain continuity of thermal protection to building elements and spaces.
- .3 Cut and trim insulation neatly to fit spaces. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.
- .4 Do not enclose insulation until it has been inspected and approved by Departmental Representative.

3.2 PERIMETER FOUNDATION INSULATION

- .1 Exterior application: apply Type 4 polystyrene insulation boards to exterior foundation walls using approved adhesive and fastener clips as recommended by insulation manufacturer. Apply panels horizontally to foundation wall from main floor line to top of footing.
- .2 Apply adhesive in continuous 6 mm beads in a grid pattern to prevent potential air movement behind the insulation boards. Apply adhesive fully around protrusions.
- .3 Fit insulation tight to underside of perimeter flashing.
- .4 Layout concrete-faced insulation boards to maximize board sizes. Do not use boards less than 150 mm wide.

3.3 SHEATHING BOARD INSULATION PANELS

- .1 Install rigid insulation sheathing boards to exterior surfaces of sheathed exterior stud walls and masonry/concrete walls following application of building paper/air barrier, in accordance with manufacturer's instructions.
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- .2 Install 50 mm thickness rigid insulation sheathing board panels over building paper and between steel 'Z' furring channels and nail to sheathing using common nails with 25 mm washers sufficiently spaced to hold insulation panels in place, in accordance with manufacturer's instructions. Steel furring channels specified in Section 07 46 13.
- .3 Fit insulation with tight butt joints and tight to intermediate strapping and framing at exterior door and window openings, plumbing pipes and ducts, and around other protruding elements.
- .4 At elevator shaft exterior wall, install 50 mm thickness rigid insulation sheathing boards directly to masonry wall, in accordance with manufacturer's instructions. Rigid insulation at masonry walls installed between steel 'Z' bar furring channels.
- .5 Nail insulation, not retained by furring and cladding, wood backing using common nails with 25 mm washers sufficiently spaced to hold insulation panels in place, in accordance with manufacturer's instructions.
- .6 Masonry wall air/vapour barrier membrane specified in Section 07 11 26.

END OF SECTION

1 General

1.1 RELATED WORK

- .1 Section 06 10 11 - Rough Carpentry, building paper and flashing membranes .
- .2 Section 07 21 13 - Board insulation.
- .3 Section 09 21 16 - Gypsum Board Assemblies.
- .4 Divisions 22 & 23 - Insulation for mechanical work.

1.2 REFERENCES

- .1 CAN/ULC-S702-09 -Mineral Fibre Thermal Insulation for Buildings
- .2 CAN/ULC-S702.2-03 - Mineral Fibre Thermal Insulation for Buildings, Part 2: Application Guidelines.
- .3 CAN/CGSB 19.13M-84(R1987) - Sealing Compound, One Component, Elastomeric Chemical Curing.
- .4 ASTM C919-08. - Standard Practice for Use of Sealants in Acoustical Applications.

1.3 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 01 50 - General Instructions for Submittal Procedures clause.
 - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 01 50 - General Instructions for Submittal Procedures clause. Indicate VOC's insulation products and adhesives.
- .2 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

- .1 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 01 50 - Genveral Instructions for Construction/Demolition Waste Management And Disposal clause.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.
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2 Products

2.1 INSULATION

- .1 Batt and blanket mineral fibre: to CANCAN/ULC-S702 ,semi-rigid batt manufactured from 75% recycled stone wool based content, non-combustible to ASTM E136 and CAN4 S114, melting point 1177 C°, surface burning characteristics of 0 Flame Spread and 0 Smoke Developed to CAN/ULC S102 and ASTM E84:
 - .1 Unfaced, RSI - 3.87 for walls.
 - .2 Pressed steel door frames in exterior walls
 - .3 Roof spaces: ??. (Roofing Section)
- .2 Sound attenuation batts to ASTM C665, Type 1, CAN/ULC S702.2:
 - .1 Sound attenuation fire batt Insulation, self-supporting semi-rigid batts, to fit interior wall stud cavity, manufactured from basaltic rock with a melting point in excess of 1093°C.
 - .2 Surface burning characteristics; Flame Spread <5, Smoke Developed 0, when tested in accordance with CAN4-S102, ASTM E-84, and UL 723.
 - .3 Material listed as non-combustible by ULC and ULI; tested in accordance with CAN4-S114 and ASTM E-136.
 - .4 Provide sound batts for all interior walls, floors as scheduled for batt insulation.

2.2 SHEET VAPOUR BARRIER

- .1 Polyethylene film: to CAN/CGSB 51.34M, Type 1, 0.15 mm thick.

2.3 ACCESSORIES

- .1 Sealant: to ASTM C919, for adhering poly vapour barrier to wood studs.
- .2 Moulded box vapour barrier: factory-moulded polyethylene shell for use with recessed electric outlet device boxes or other approved means.

3 Execution

3.1 INSULATION INSTALLATION

- .1 Install insulation to maintain continuity of thermal and sound protection to building elements and spaces.
 - .2 Install sound attenuation batts to walls in wall types indicated.
 - .3 Fill pressed steel door frames with mineral fibre insulation in exterior walls and in walls with sound attenuation batts.
 - .4 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
 - .5 Do not compress insulation to fit into spaces, except around window frame shim space.
 - .6 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures.
 - .7 Ensure ceiling areas exposed to outside air temperatures are insulated.
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- .8 Do not enclose insulation until installations have been approved by Departmental Representative.

3.2 SHEET VAPOUR BARRIER INSTALLATION

- .1 Install sheet vapour barrier on warm side of batt insulation filled exterior stud walls, tight to insulation and prior to installation of gypsum board or strapping, to form continuous barrier.
- .2 Lap joints 150 mm minimum and tape or seal with approved caulking. Ensure joints occur over framing members.
- .3 Use sheets of largest practical size to minimize joints.
- .4 Inspect sheets for continuity. Repair punctures and tears with sealing tape before work is concealed.
- .5 Exterior surface openings:
 - .1 Cut sheet vapour barrier to form openings and ensure material is lapped and sealed to frame and flashing membrane at window and door openings.
- .6 Perimeter seals:
 - .1 Seal perimeter of sheet vapour barrier as follows:
 - .1 Apply continuous bead of sealant to substrate at perimeter of sheets.
 - .2 Lap sheet over sealant and press into sealant bead.
 - .3 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.
- .7 Lap joint seals:
 - .1 Seal lap joints of sheet vapour barrier as follows:
 - .1 Attach first sheet to substrate.
 - .2 Apply continuous bead of sealant over solid backing at joint.
 - .3 Lap adjoining sheet minimum 150 mm and press into sealant bead.
 - .4 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.
- .8 Electrical Boxes:
 - .1 Seal electrical switch and outlet device boxes that penetrate vapour barrier as follows:
 - .1 Install moulded vapour barrier shells at same time as electrical boxes.
 - .2 Apply sealant to seal edges of flange to main vapour barrier and seal wiring penetrations through shell back and sides.

END OF SECTION

1 General

1.1 RELATED WORK

- .1 Section 06 11 01 - Rough Carpentry for plywood sheathing, air barrier and strapping.
- .2 Section 07 11 26 - Spray-Applied Elastomeric Waterproofing.
- .3 Section 07 21 13 - Rigid Board Insulation on walls.
- .4 Section 07 62 00 - Metal Flashing and Trim.

1.2 REFERENCES

- .1 Underwriters Laboratories of Canada (ULC).
 - .1 CAN/ULC-S704-05, Thermal Insulation Polyurethane and Polyisocyanurate, Boards, Faced.
 - .2 CAN/ULC-S770-09, Long-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 37-GP-5Ma-83 Cement, Plastic, Cutback, Asphalt.
 - .2 CAN/CGSB-51.32-M77 Sheathing, Membrane, Breather Type.
 - .3 CAN/CGSB-93.1-M85 Sheet, Aluminum Alloy, Prefinished, Residential.
- .3 ASTM International:
 - .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 A354-11, Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners.
 - .3 ASTM B117-11, Standard Practice for Operating Salt Spray (Fog) Apparatus.
 - .4 ASTM D3363-05(2011)e2, Standard test Method for film Hardness by Pencil Test.
 - .5 ASTM D2794-93(2010), Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid deformation (Impact).
 - .6 ASTM D3359-09e2, Standard Test Methods for measuring Adhesion by Tape Test.
 - .7 ASTM D2247-11 Standard Practice for Testing water Resistance of Coatings in 100% RH.
 - .8 ASTM E96/E96M-10 Standard Test Methods for Water Vapor Transmission of Materials.
 - .9 ASTM E283-04 Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 - .10 ASTM E331-00(2009) Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

1.3 DESIGN CRITERIA

- .1 Design preformed wall panel systems to provide for thermal movement of component materials caused by ambient temperature range of 70°C without causing buckling, failure of seals, leakage and undue stress on fasteners or other detrimental effects.
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- .2 Corrugated wall panel description:
 - .1 Prefinished galvanized sheet steel, 0.76 m thickness x 22 mm deep corrugated profiled panel by 726 ± mm wide, lapping side joints, exposed fastening, prefinished with factory-applied, oven-baked finish based on polyvinylidene fluoride resin, meeting the performance criteria of AAMA 2605 specification. Submit independent tests results to demonstrate coating will retain minimum 50% gloss retention and maximum 5% colour change after ten year test conditions.

- .3 Corrugated perforated Soffit panel description:
 - .1 Prefinished galvanized sheet steel, 1.0 m thickness x 22 mm deep corrugated profile perforated metal panel by 726 ± mm wide, lapping side joints, exposed fastening, with prefinished oven-baked finish based on polyvinylidene fluoride resin to para 1.3.3.2 in colour as selected by Departmental Representative from manufacturer's standard range. Round hole perforations of 1.588 mm ϕ spaced 2.778 mm c/c on diagonal, 30% open.

1.4 QUALIFICATIONS OF INSTALLERS

- .1 Installation of preformed metal cladding to be performed by manufacturer approved installers having at least five years experience in metal panel installations.

- .2 Panel installer/fabricator to have a minimum of five years experience in fabricating and or installing composite panels. Panel supplier must be an authorized fabricator of the specified composite supplier and have a certification program acceptable to local code authorities.

1.5 SUBMITTALS

- .1 Submit shop drawings and samples in accordance with Section 01 01 50 - General Instructions for Submittals clause.

- .2 Clearly indicate dimensions, system components, method of thermal expansion adjustment between panels and mounting clips, details at juncture with other membranes and panel system, material and finish, compliance with design criteria and related structural and metal flashing work. Submit shop drawings and/or product data for wall panel assembly composite panel.

- .3 Submit duplicate samples of representative prefinished panel materials and sealant for colour selection by Departmental Representative.

- .4 Prefinished composite fascia panels:
 - .1 Submit two samples of each colour of finish to be selected. Submit along with manufacturers standard literature. Shop drawings to show all elevations along with fasteners, details, and location of all joints.

1.6 WARRANTY

- .1 Wall panel paint system: provide manufacturer's warranty for ten (10) years against peeling and blistering, flaking, cracking or chipping, checking, or lose adhesion.
-

1.7 SOURCE QUALITY CONTROL

- .1 At least 2 weeks prior to fabrication of steel wall panels, submit two (2) copies of mill test reports showing chemical and physical properties from manufacturer.
- .2 Such mill test reports shall be certified by qualified metallurgists confirming that tests conform to requirements of referenced standards.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 01 50 - General Instructions for Construction/Demolition Waste Management And Disposal clause.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.
- .4 Place materials defined as hazardous or toxic in designated containers.
- .5 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .6 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.
- .7 Unused sealant material must be disposed of at an official hazardous material collections site as approved by Departmental Representative.
- .8 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.
- .9 Fold up metal banding, flatten and place in designated area for recycling.

2 Products

2.1 MATERIALS

- .1 Sheet steel: to ASTM A 653/A653M, Grade E or D, minimum yield strength of 500 or 290 MPa, with galvanized Z275 zinc coating.
- .2 Coating systems:
 - .1 Panels manufactured from sheet steel with galvanized coating and prefinished with factory-applied, oven-baked finish based on polyvinylidene fluoride resin, meeting the performance criteria of AAMA 2605 specification. Submit independent tests results to demonstrate coating will retain minimum 50% gloss retention and maximum 5% colour change after ten year test conditions.

2.2 ACCESSORIES

- .1 Fasteners: self-tapping screws to ASTM A354, purpose made, galvanized finish and stainless steel fasteners as indicated.
 - .1 Exposed fasteners "Climaseal" with colour matched heads where exposed.
 - .2 Concealed fasteners: stainless steel, pan heads.
-

- .3 Screws of self drilling/threading threads.
- .4 All other screws galvanized except as specified above.

- .2 Rigid Insulation for walls: specified in Section 07 21 13.

- .3 Air barrier:
 - .1 Building paper and membrane flashing at openings in stud walls specified in Section 06 10 11.
 - .2 Sprayed on elastomeric waterproofing coating on concrete walls, specified in Section 07 11 26.

- .4 Sealants:
 - .1 Exposed sealant: as recommended by manufacturer.
 - .2 Tape: butyl tape to manufacturer's standard, to meet design criteria.

- .5 Closures: laminated, semi-rigid cross linked polyethylene foam to fit panel profile without gaps.

2.3 COMPONENTS

- .1 Wall cladding assembly:
 - .1 Corrugated panels of minimum 0.76 mm thickness, with exposed fasteners conforming to profile and shape specified in Design Criteria in Clause 1.3.
 - .2 Wall support furring: metal furring "hat" channels fastened with non corroding screw fasteners, designed to transfer wind loads to stud wall and support wall panels.
 - .3 Form trim and flashings from 0.6 mm prefinished sheet steel for wall; at base, corners, wall penetrations, terminations and openings; and trim at doors, windows, and metal profile closures to match wall panel finish. Bend trim panels to profiles indicated, at corners, frames etc., without exposing cut edges except as approved by Departmental Representative.
 - .4 Screw fasteners: galvanized steel with colour matched caps where exposed.

- .2 Soffit panel assembly:
 - .1 Perforated corrugated panels of minimum 1.0 mm thickness, with exposed colour matched fasteners conforming to profile, shape and hole perforation pattern specified in Design Criteria in Clause 1.3.
 - .2 Support framing: furring and framing channels fastened to wood frame structure designed to transfer wind loads from soffit panels to support structure.
 - .3 Form trim and flashings from 0.6 mm prefinished sheet steel for soffit panels; at wall penetrations, terminations and openings and metal profile closures to match soffit panel finish. Bend trim at corners without exposing cut edges except as approved by Departmental Representative.
 - .4 Screw fasteners: galvanized steel with colour matched caps where exposed.

2.4 METAL FLASHINGS AND TRIM - GENERAL

- .1 Form flashings, trim and sheet metal work to profiles, finishes and thicknesses specified for wall and composite panels.

 - .2 Form pieces in 2400 mm maximum lengths. Make allowance for expansion at joints.
-

- .3 Hem exposed edges on underside 12 mm, provide clip fasteners spaced at 610 mm oc. Mitre and seal corners with sealant. Make allowance for expansion at joints. Use either S-lock seams at joins and seal with sealant or fasten through 12 mm slotted holes using fasteners with washers to conceal holes, space fasteners at maximum 600 mm oc. At mitred corners use standing seams. All exposed screws in wall panels with colour matched heads.
- .4 Fabricate trim for fixtures and plumbing lines penetrating soffit and wall panels in matching colour.
- .5 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .6 Apply isolation coating to metal surfaces in contact with pressure treated wood and dissimilar bare metals.

3 Execution

3.1 PREPARATION

- .1 Install wall and soffit panel assembly following completion and approval of wood trapping and insulation installation.
- .2 Precut panels and flashing sections in factory where practical. Saw cutting or torch cutting of material on site is not acceptable.

3.2 WALL PANEL ASSEMBLY

- .1 Installation of wall panel system in accordance with reviewed shop drawings and manufacturer's instructions.
- .2 Install steel girts to wall, perpendicular to span of metal wall panels fastened to wood strapping. Provide metal furring at all end panel terminations and to perimeter of wall openings at, windows, doors and louvre openings etc.
- .3 Attach wall panels to metal furring using exposed fastening system. Semi-conceal fasteners at flashings and trim where possible. Install wall panels starting from lowest point at one corner or at termination point. Fit panels tight to flashings and trim to ensure installation is continuously weather tight. Install break formed trim at corners, windows and door frames, openings and as indicated and seal. Install flashing at transition between vertical and horizontal spanning panels.
- .4 Install and seal notched and formed closures, to arrest direct weather penetration behind panels at all openings.

3.3 SOFFIT PANEL ASSEMBLY

- .1 Installation of soffit panel system to layout indicated in accordance with manufacturer's instructions.
 - .2 Attach perforated soffit panels and metal screw channels and framing to wood support framing using colour matched exposed fastening system.
-

- .3 Conceal fasteners at trim where possible. Install soffit panels starting from one corner or termination point and insure installation is tight fitting with no exposed edges.
- .4 Install break formed trim at exposed edges and penetrations through panels.

3.4 CLEANING

- .1 Remove excess sealant using recommended solvent.
- .2 Clean prefinished metal panels flashings and trim.

END OF SECTION

1 General

1.1 RELATED WORK

- .1 Section 06 10 11 - Rough Carpentry: building paper.
- .2 Section 06 23 00 - Finish Carpentry and Laminated plastic; for interior woodwork and trim.
- .3 Section 07 46 13 - Metal Wall Cladding Assembly.
- .4 Section 07 62 00 - Metal Flashing and Trim.
- .5 Section 09 91 23 - Painting: Staining - Final coats.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-O141-91(R1999), Softwood Lumber.
- .2 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2000.
- .3 ASTM F1667 - 11ae1, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

1.3 SUBMITTALS

- .1 Submit samples in accordance with Section 01 01 50 - General Instructions for Shop Drawings, Product Data, Samples and Mock-ups.
- .2 Submit duplicate size samples of each different type of wood trim pieces.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 01 50.
- .2 Deliver materials and store in dry area. If stored outside place poly ground sheet and raise lumber 150 mm above ground. and stack original unbroken and undamaged packages with the maker's name and brand distinctly marked thereon, and upon delivery store in a shed until used on the Work.
- .3 Cover stored units with non-staining, weather-proof protective enclosure if exposed to weather.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 01 50 - General Instructions for Waste Management And Disposal clause.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.
 - .4 Divert unused wood materials from landfill to recycling composting facility approved by Departmental Representative.
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2 Products

2.1 MATERIALS

- .1 Lumber: to NLGA Standard Grading Rules for Canadian Lumber.
 - .1 Trim: maximum 15% moisture content, western red cedar, B or better clear, mill finish, thickness and width as indicated.
 - .5 Dimension lumber for backing: kiln dried, No 2 or better construction grade Hem-fir, size as indicated.
- .2 Exterior wall sheathing paper: specified in Section 06 10 11.
- .3 Fasteners: nails to ASTM F1667, either, hot dip galvanized steel, high tensile strength aluminum or stainless steel, sized to suit application, spiral or ring thread type with casing head for exposed nailing and finishing head for blind nailing.
- .4 Sealants: polyurethane based elastomeric sealant to Section 07 92 10.
- .5 Framing anchors: specified in Section 06 10 11.
- .6 Primer: semi-transparent stain, to match finish coat stain specified in Section 09 91 23.

3 Execution

3.1 PREPARATION

- .1 Ensure building paper and membrane flashing is applied to walls and at openings and metal flashing are installed at head of all openings, prior to start of wood trim installation.
- .2 Apply semi-transparent stain to all surfaces of trim, prior to installation. Seal cut surfaces. Final application of semi-transparent stain specified in Section 09 91 23 - Painting.

3.2 INSTALLATION

- .1 Fasten trim straight, plumb, aligned lengths nailed through sheathing and into framing at solid blocking or stud, using 75 mm long finishing head nails. Note: nails must penetrate solid wood to 38 mm depth.
- .2 Fasten trim boards to framing or solid wood backing using 75 mm long casing nails. Set exposed nail heads 0.5 mm below surface. Install flush to adjoining materials with hairline joints. Caulk joins between adjoining work and trim. Caulking concealed in final assembly.
- .3 Install trim in longest lengths practical. Cut butt joints at 45°. Trim at corners mitred tight. Seal cut surfaces.

END OF SECTION

1 General

1.1 RELATED WORK

- .1 Section 06 10 11 - Rough Carpentry for wood nailers, blocking and backing.
- .2 Section 07 62 00 - Metal Flashing.

1.2 REFERENCES

- .1 Factory Mutual (FM Global) - Approval Guide.
 - .1 Factory Mutual Standard 4470 - Approval Standard for Class 1 Roof Covers.
- .2 Underwriters Laboratories (UL) - Roofing Systems and Materials Guide (TGFU R1306).
- .3 American Society for Testing and Materials (ASTM International)
 - .1 ASTM C 1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
 - .2 ASTM E-96 - Standard Test Methods for Water Vapor Transmission of Materials.
 - .3 ASTM D1204 - Standard Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature.
 - .4 ASTM D-471 - Standard Test Method for Rubber Property Effect of Liquids.
 - .5 ASTM D-1149 - Standard Test Methods for Rubber Deterioration Cracking in an Ozone Controlled Environment.
 - .6 ASTM C-1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
 - .7 ASTM C-1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers
 - .8 ASTM E 903 Standard Test Method for Solar Absorptance, Reflectance, and Transmission of Materials Using Integrating Spheres.
 - .9 ccc

1.3 PERFORMANCE REQUIREMENTS

- .1 Provide an installed roofing membrane and base flashing system that does not permit the passage of water, and will withstand the design pressures calculated in accordance with the most current revision of ASCE 7.
- .2 provide all primary roofing materials that are physically and chemically compatible when installed in accordance with manufacturers current application requirements.

1.4 DESCRIPTION OF SYSTEM

- .1 Furnish and install a TPO roofing system and related roofing accessories in strict accordance with specifications and details approved by the manufacturer. Adhere TPO membrane sheets over insulation and seam together using an automatic heat welder. Membrane retainer system to meet wind uplift loads for locality to NBCC2010 requirements.

1.5 SUBMITTALS

- .1 Submit current membrane manufacturer installation instructions and detail drawings being used on this project.
- .2 Submit shop drawings and plans to membrane manufacturer for warranty approval. Pay costs for this work.

1.6 DELIVERY, STORAGE & HANDLING

- .1 Deliver all roofing materials in original, unopened containers, complete with labels indicating brand name, contents, usage instructions and safety precautions.
- .2 Protect membranes from cuts, abrasion or other abuse that might adversely affect performance in service.
- .3 WHMIS safety bulletins on all hazardous products are to be readily available to the work crew at all times.
- .4 Adhesives, sealants and flashing accessories are to be stored in a clean, dry area at a temperature between 5°C and 27°C. If exposed to a lower temperature, restore to an acceptable level before using.
- .5 Do not work during periods of rain, fog, sleet, snow or cold temperatures (below -5°C).

1.7 WARRANTY

- .1 For the reroofing work of this Section 07 52 00, Single Ply TPO Roofing including; insulation assembly and metal flashing, the 12 month warranty period, specified in General Conditions R2830D GC3 - Execution and Control of the Work subsection GC3.13, is extended to 120 months.
- .2 Provide Departmental Representative with an *RCABC 10 Year Guarantee*, in accordance with General Conditions stating the extended warranty time period indicated in the preceding paragraph. Provide roof inspection service and include costs.
- .3 Provide 15 year roof membrane manufacturer's material warranty.

1.8 QUALIFY ASSURANCE

- .1 Installation of TPO Single Ply Roofing to be performed only by journeyman applicators holding either a *provincial Certificate of Qualification* or be registered as an apprentice in province for roofing. Installers must be manufacturer certified for installation of this type of membrane assembly.
 - .2 Perform Work in accordance with RCABC Roofing Specification Manual and manufacturer's written instructions.
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2 Products

2.1 VAPOUR RETARDER & INSULATION

- .1 Vapour Retarder: Self-adhering or adhesive-applied SBS modified bituminous membrane minimum 1.5 mm thickness reinforced with material for application over primed substrate; of steel, aluminium, galvanized steel, gypsum board and plywood, conforming to the following:
 - .1 Tensile strength: 150 n/5 cm.
 - .2 Air permeance: less than 0.01 l/m sq. at 75 Pa pressure difference.
 - .3 Sheet membrane: conforming to CGSB 37-GP-56M.
 - .4 Non-slip surface.

- .2 Insulation: polyisocyanurate rigid insulation to meet CAN/ULC-S704 and CAN/ULC S-770 with a LTTR (Long Term Thermal Resistance) of R6 (RSI 0.85), with fibrous glass facer conforming to or exceeding the requirements of ASTM C 1289 / FS HHI-1972. Thickness: 140 mm, two layers, staggered pattern.
 - .1 Overlayment board: of cellulose fiber conforming to or exceeding the requirements of FS LLL-I-535, Class C, ANSI/ASTM C 208, with the following characteristics:
 - .1 Board Thickness: 13 mm.
 - .2 Thermal Resistance: 2.5 C/W.
 - .2 Plates and Fasteners:
 - .1 HD Screws: Heavy gauge alloy steel fastener with CR-10 coating with a 6.2 mm diameter thread. Factory Mutual Standard 4470 Approved, #3 Phillips truss head for use on wood decks.
 - .2 Insulation Plates: Galvalume, 76 m diameter, suitable for use with Standard and HD screws.
 - .3 Insulation adhesive: as recommended by insulation manufacturer.

2.2 ROOFING MEMBRANE SYSTEM

- .1 Roofing and Flashing Membrane: smooth surface, polyester scrim reinforced thermoplastic polyolefin membrane with a nominal 2.0 mm thickness (80 mil), for use as a single ply roofing membrane. Meets or exceeds the minimum requirements of ASTM D-6878. Roll width 3.1 m by 30.5 m roll length, weighing 191 kg.

TABLE 1: TPO Membrane Specification		
PROPERTY	A.S.T.M. TEST METHOD	SPECIFICATION
Thickness, nominal	ASTM D751	2.03 mm (80 mils)
Elongation at Break	ASTM D751	30%
Breaking Strength Grab method	ASTM D751	360 lbf x 340 lbf
Factory Seam Strength	ASTM D751	140 lbf (membrane failure)
Heat Aging	ASTM D753 retention of Breaking Strength and Elongation at Break	100%
Puncture Resistance	FTM 101C, Mtd 2031	> 350 lbs

Tear Strength, min.	ASTM D751 8"x8" sample	160 lbf x 150 lbf
Cold Brittleness	ASTM D2137	-40C
Vapour Transmission	ASTM E-96	Proc. B 0.070 Perms
Dimensional Change	ASTM D1204 @158 F, 6 hours	0.4%
Water Absorption	ASTM D471 @158 F, 1 week	0.7%
Hydrostatic Resistance	ASTM D751 Method D	> 450 psi
Ozone Resistance	ASTM D1149	No visible deterioration @7 x magnification
Reflectivity	ASTM C1549	0.76

- .2 Low VOC solvent based primer for preparing surfaces to receive butyl based adhesive tapes.
- .3 Commercial grade roofing sealant: Meeting the performance criteria of ASTM D412, ASTM D2196, ASTM D1475 and ASTM D1644. Suitable for sealing the upper lip of exposed termination bars and penetrations and around clamping rings and comes with a 20 yr ltd warranty against leaks caused by manufacturing defects.
- .4 Solvent based seam cleaner for exposed or contaminated seam prior to heat welding
- .5 Cut edge membrane sealant: Solvent based liquid, required to protect field cut edges of TPO membranes, applied Directly from a squeeze bottle.
- .6 Perimeter securement fasteners for steel decks: Lexgrip XHD Membrane Fasteners (pre-assembled or loose), treated with Cx-5 coating and complete with 50 mm diameter barbed Lap Plate. Fastener must be of sufficient length to penetrate plate, membrane, insulation, vapour retarder, steel roof deck a minimum of 13 mm ; wood blocking a minimum of 38 mm.
- .7 Bonding adhesive: low VOC solvent-based, rubberized adhesive approved by manufacturer for use with TPO membranes.
- .8 Pourable sealant: 100 percent solids epoxy based two-part sealant suitable for filling sealant pans at irregularly-shaped penetrations. Epoxy is part A. Polyamide is part B.

2.3 ACCESSORIES

- .1 Pipe flashing: Flash - Tite™ Wire / Conduit / Pipe pre-formed metal flashing, appropriate for the protrusion.
- .2 TPO Coated Metal: 0.6 mm sheet steel with 0.64 mm thick TPO based film laminated to metal gravel stop and drip edge profiles, metal base and curb flashings, sealant pans, and scupper sleeves.

- .3 TPO Pourable Sealer Pocket 1.9 mm thickness molded TPO membrane sized to accommodate most common pipe and conduits, (25 to 150 mm diameter pipes), including square tube. Hot-air welded directly to TPO membrane and supplied with stainless steel clamping rings.

3 Execution

3.1 GENERAL

- .1 Comply with current manufacturer's published installation instructions and details throughout the roofing membrane installation.

3.2 INSPECTION

- .1 Ensure all wood blocking is installed where required. Ensure roof membrane is clean, dry and free from debris that might be detrimental to the performance of the insulation or membrane.
- .2 Verify that the surfaces, site conditions and deck:
 - .1 Are ready to receive work.
 - .2 Is supported and secured.
 - .3 Is clean and smooth, free of depressions, waves, or projections, and properly sloped to drains, valleys, eaves, scuppers or gutters.
 - .4 Are dry and free of ice or snow.
 - .5 All roof openings or penetrations through the roof are solidly set, and that all flashings are tapered.

3.3 DECK PREPARATION

- .1 Apply peel and stick vapour barrier membrane over primed wood deck surfaces in accordance with manufacturer's instructions.

3.4 INSULATION INSTALLATION

- .1 Multiple layers of insulation of the same, non-tapered insulation material may be simultaneously mechanically fastened with overlayment board, with approved fasteners and plates through the top layer of insulation to the structural deck. Individual layers of insulation shall not exceed 76 mm in thickness nor total thickness of all layers to not exceed 127 mm without written approval from the manufacturer.
- .2 Fasten insulation panels, in two layers with staggered joints in one direction, directly to plywood roof sheathing in accordance with manufacturer's instructions using screw and plates to RCABC requirements.
- .3 Miter and fill the edges of the insulation boards at changes in plane to prevent open joints or irregular surfaces. Avoid breaking or crushing of the insulation at the corners.
- .4 Do not install any more insulation than will be completely waterproofed each day.

3.5 MEMBRANE INSTALLATION: FULLY ADHERED

- .1 Installation of TPO membrane to manufacturer's instructions. The following paragraphs are a guideline for installation.
-

- .2 Place membrane so that wrinkles and buckles are not formed. Remove any wrinkles or buckles from the sheet prior to permanent attachment. Roof membrane is fully adhered immediately after it is rolled out, followed by welding to adjacent sheets.
 - .3 Overlap roof membrane a minimum of 150 mm for side laps and end laps.
 - .4 Install membrane with the side laps running across the roof slope lapped towards drainage points.
 - .5 All exposed sheet corners: rounded a minimum of 25 mm.
 - .6 Use full width rolls in the field and perimeter region of roof and appropriate bonding adhesive for substrate surface, applied with a solvent-resistant roller, brush or squeegee.
 - .7 Apply bonding adhesive to the substrate surface at rate specified by the manufacturer for either the Solvent Based or the Water Based adhesive. A greater quantity of bonding adhesive may be required based upon the substrate surface condition.
 - .8 Avoid seam contamination by keeping the adhesive application 50 mm back from the seam area.
 - .9 Adhere approximately one half of the membrane sheet at a time. Fold one half of the sheet's length back in turn to allow for adhesive application. Lay membrane into adhesive once the bonding adhesive is tacky to the touch.
 - .10 Roll membrane with a weighted roller to ensure complete bonding between adhesive and membrane.
 - .11 Membrane laps shall be heat-welded together. All welds shall be continuous, without voids or partial welds. Welds shall be free of burns and scorch marks.
 - .12 Weld shall be a minimum of 38 mm width for automatic machine welding and a minimum 50 mm width for hand welding.
 - .13 All cut edges of reinforced membrane must be sealed with TPO cut edge sealant.
 - .14 Supplemental membrane attachment is required at the base of all walls and curbs, and where the angle of the substrate changes by more than five (5) degrees (1 in 12). Secure roofing membrane to the structural deck with appropriate screws and plates spaced every 300 mm o.c. The screws and plates must be installed no less than 50 mm from the membrane edge. Alternatively, the roofing membrane may be turned up the vertical plane a minimum of 75 mm and secured with screws and termination bar. Fastener spacing is the same as is used for in-lap attachment. The termination bar must be installed within 38 to 50 mm of the plane of the roof membrane, with a minimum of 25 mm of membrane extending above the termination bar.
 - .15 Supplemental membrane attachment to the structural deck is required at all penetrations unless the insulation substrate is fully adhered to the deck. Secure roofing membrane to the deck with appropriate screws and plates.
 - .16 Fasteners must be installed to achieve the proper embedment depth. Install fasteners without lean or tilt.
-

- .17 Install fasteners so that the plate or termination bar is drawn down tightly to the membrane surface. Properly installed fasteners will not allow the plate or termination bar to move (underdriving), but will not cause wrinkling of the membrane (overdriving).

3.11 CLEAN-UP

1. Remove all cut pieces, wrappings, waste and debris from the job site.

3.12 WARRANTY INSPECTION

1. Upon completion of the roofing system, an authorized membrane manufacturer representative will make an inspection of the installation for warranty acceptance. Include costs for this work.

END OF SECTION

1 General

1.1 RELATED WORK

- .1 Section 06 10 11 - Rough Carpentry for wood nailers, blocking and backing.
- .2 Section 07 46 13 - Metal Wall Cladding Assembly.
- .3 Section 07 52 00 - Single Ply TPO Roofing System.
- .4 Section 07 92 10 Joint Sealing.

1.2 REFERENCES

- .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 Canadian General Standards Board (CGSB)
 - .1 CGSB 37-GP-5Ma-83 Cement, Plastic, Cutback, Asphalt.
 - .2 CAN/CGSB-51.32-M77 Sheathing, Membrane, Breather Type.
 - .3 CAN/CGSB-93.1-M85 Sheet, Aluminum Alloy, Prefinished, Residential.

1.3 SUBMITTALS

- .1 Submit shop drawings in accordance with Section 01 01 50, - General Instructions for Shop Drawings, Product Data, Samples and Mock-ups clause.
- .2 Submit 50 x 50 mm samples of each type of sheet metal material, colour and finish.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 01 50 - General Instructions for Construction/Demolition Waste Management And Disposal clause.
 - .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.
 - .4 Place materials defined as hazardous or toxic in designated containers.
 - .5 Ensure emptied containers are sealed and stored safely for disposal away from children.
 - .6 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.
 - .7 Unused sealant material must be disposed of at an official hazardous material collections site as approved by Departmental Representative.
 - .8 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.
-

- .9 Fold up metal banding, flatten and place in designated area for recycling.

2 Products

2.1 SHEET METAL MATERIALS

- .1 Zinc coated steel sheet: 0.6 mm thickness, commercial quality to ASTM A 653/A653M, with Z275 designation zinc coating.
- .2 Aluminum sheet: proprietary utility sheet, plain pattern, prefinished in baked enamel coating to CAN/CGSB 93.1.

2.2 PREFINISHED STEEL SHEET

- .1 Finish: to para 2.1.1 of Section 07 46 13 Metal Wall Cladding Assembly, in colour(s) selected by Departmental Representative from manufacturer's standard range.
- .2 Thickness specified for prefinished steel sheet applies to base metal.

2.3 ACCESSORIES

- .1 Isolation coating: alkali resistant bituminous paint.
- .2 Plastic cement: to CGSB 37-GP-5Ma.
- .3 Underlay for metal flashing: dry sheathing to CAN/CGSB-51.32, except as recommended by membrane manufacturer.
- .4 Sealants: to Section 07 92 10.
- .5 Cleats: of same material, and temper as sheet metal, minimum 50 mm wide. Thickness same as sheet metal being secured.
- .6 Fasteners: of same material as sheet metal, self drilling, self tapping screws with neoprene washers.
- .7 Touch-up paint: as recommended by metal flashing and trim manufacture.

2.4 FABRICATION

- .1 Fabricate metal flashings and other sheet metal work in accordance with applicable RCABC specifications and as indicated.
 - .2 Form pieces in 2400 mm maximum lengths. Make allowance for expansion at joints.
 - .3 Hem exposed edges on underside 12 mm. 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 in contact with pressure treated wood.
-

2.5 METAL FLASHING

- .1 Form flashing and trim to profiles indicated of 0.6 mm thick galvanized prefinished steel.

2.6 VENT FLASHING

- .1 Provide all fabricated and proprietary flashing, of size to accommodate roof penetrations. Prefinished where exposed in final assembly and described as follows:
 - .1 Plumbing stack vents: insulated, spun aluminum, with vandal proof caps, size to suit plumbing vents. See Section 07 52 00.
 - .2 Electrical wiring: purpose made for electrical wiring, size to suit conduit or wiring, UL listed and CSA Certified for wet locations. Acceptable Product: Lexcor Flash-tite conduit post flashing. See Section 07 52 00.
 - .2 Supply and exhaust air duct penetrations through roof: to Division 23.

3 Execution

3.1 INSTALLATION

- .1 Install sheet metal work in accordance with RCABC specifications and as detailed.
- .2 Use concealed fastenings except where approved before installation.
- .3 Provide dry sheathing under sheet metal to RCABC requirements. Secure in place and lap joints 100 mm.
- .4 Flash joints using 50 mm lap seams with sealant.
- .5 Lock end joints and caulk with sealant.

END OF SECTION

1 General

1.1 RELATED WORK

- .1 Fire stopping and smoke seals within mechanical assemblies (i.e inside ducts, dampers) and electrical assemblies (i.e. inside cable trays) are specified in Division 22, 23, 26 and 27 respectively.

1.2 DESCRIPTION OF WORK

- .1 Apply firestop sealant and systems around all penetrations through openings in fire rated wall, floor and ceiling assemblies.
- .2 Seal around ducts and conduits penetrating fire separations.

1.3 REFERENCES

- .1 ULC-S115-2005 Standard Method of Fire Tests of Firestop Systems.

1.4 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 01 50 General Instructions - for submittals.
- .2 Submit manufacturer's product data for materials and prefabricated devices, providing descriptions are sufficient for identification at job site. Include manufacturer's printed instructions for installation.

2 Products

2.1 MATERIALS

- .1 Fire stopping and smoke seal systems: in accordance with ULC-S115.
 - .1 Systems capable of maintaining an effective barrier against flame, smoke and gases in compliance with requirements of ULC-S115 and not to exceed opening sizes for which they are intended.
 - .2 Fire stop system rating: to match wall/floor/roof assembly of one hour rating.
 - .2 Service penetration assemblies: certified by ULC in accordance with ULC-S115 and listed in ULC Guide No. 40 U19.
 - .3 Prefabricated flange units, with outer metal flange die-stamped from 0.3 mm thick 316 stainless steel, with inset of premoulded silicone elastomeric ring, factory moulded, U.L.C. or W.H. listed as a through penetration fire stop. Flange hinged for fixing over pipe and then secured tight with self-tapping screw.
 - .4 Fire-resistance rating of installed fire stopping assembly not less than the fire- resistance rating of surrounding wall assembly.
 - .5 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal; do not use cementitious or rigid seal at such locations.
-

- .6 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: prefabricated silicone elastomeric seal; do not use a cementitious or rigid seal at such locations.
- .7 Primers: to manufacturer's recommendation for specific material, substrate, and end use.

3 Execution

3.1 PREPARATION

- .1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials. 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.

3.2 INSTALLATION

- .1 Install fire stopping and smoke seal material and components in accordance with ULC certification and manufacturer's instructions.
- .2 Seal holes or voids made by through penetrations, poke-through termination devices, and openings or joints to ensure continuity and integrity of fire separation are maintained.
- .3 Tighten self-tapping screw on flange unit to ensure adequate tight and permanent seal.

3.3 INSPECTION

- .1 Notify Departmental Representative when ready for inspection and prior to concealing or enclosing fire stopping materials and service penetration assemblies.

3.4 SCHEDULE

- .1 Fire stop and smoke seal at:
 - .1 Penetrations through fire-resistance rated walls and ceilings.
 - .2 Around mechanical and electrical assemblies penetrating fire separations.
 - .3 Rigid ducts: greater than 129 cm²: fire stopping to consist of bead of fire stopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

3.5 CLEAN UP

- .1 Remove excess materials and debris and clean adjacent surfaces immediately after application.

END OF SECTION

1 General

1.1 SUMMARY

- .1 This Section specifies caulking and sealants not specified in other Sections.
- .2 Refer to other sections for other caulking and sealants.

1.2 REFERENCES

- .1 ASTM International:
 - .1 ASTM C 919-02, Standard Practice for Use of Sealants in Acoustical Applications.
- .2 Canadian General Standards Board (CGSB):
 - .1 CAN/CGSB-19.13-M87 Sealing Compound, One-component, Elastomeric, Chemical Curing.
 - .2 CAN/CGSB-19.17-M90 One-Component Acrylic Emulsion Base Sealing Compound.
 - .3 CAN/CGSB-19.24-M90 Multi-component, Chemical Curing Sealing Compound.

1.3 SUBMITTALS

- .1 Submit duplicate samples of each type of material and colour to be used in accordance with Section 01 01 50 General Instructions for submittals.

1.4 ENVIRONMENTAL AND SAFETY 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 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 Sealant and substrate materials to be minimum 5°C.
- .4 Should it become necessary to apply sealants below 5°C, consult sealant manufacturer and follow their recommendations.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal; packaging material 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 Engineer.
- .8 Empty plastic joint sealer containers are not recyclable. Do not dispose of empty containers with plastic materials destined for recycling.

1.6 PROJECT CONDITIONS

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

2 Products

2.1 SEALANT MATERIALS

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

2.2 SEALANT MATERIAL DESIGNATIONS

- .1 Urethanes One Part.
 - .1 Self-Leveling to CAN/CGSB-19.13, Type 1, colour as selected.
 - .2 Urethanes One Part.
 - .1 Non-Sag to CAN/CGSB-19.13, Type 2, MCG-2-40, colour as selected.
-

- .3 Silicones One Part.
 - .1 To CAN/CGSB-19.13.
 - .2 Sealant type: one-part, acetoxy silicone sealant, cures to a flexible rubber when exposed to moisture present in the air, containing a fungicide, suitable for use in bathrooms, spas and similar applications where joints need protection against fungi and bacteria.
- .4 Acoustical Sealant.
 - .1 To ASTM C 919, Single component, non-skinning, non-hardening synthetic rubber, dark gray colour, designed for use in gypsum board partitions to inhibit air movement and buffer vibration.
- .5 Acrylic Latex One Part.
 - .1 To CAN/CGSB-19.17.
- .6 Preformed Compressible and Non-Compressible back-up materials.
 - .1 Polyethylene, Urethane, Neoprene or Vinyl Foam.
 - .1 Extruded closed cell foam backer rod.
 - .2 Size: oversize 30 to 50%.
 - .2 Neoprene or Butyl Rubber.
 - .1 Round solid rod, Shore A hardness 70.
 - .3 High Density Foam.
 - .1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m³ density, or neoprene foam backer, size as recommended by manufacturer.
 - .4 Bond Breaker Tape.
 - .1 Polyethylene bond breaker tape which will not bond to sealant.

2.3 SEALANT SELECTION

- .1 Perimeters of exterior openings where frames meet exterior facade of building: Sealant type: one component urethane, non-sag.
 - .2 Coping joints and coping-to facade joints: Sealant type: one component urethane, non-sag.
 - .3 Interior control and expansion joints in floor surfaces: Sealant type: one component urethane self leveling.
 - .4 Perimeter of bath fixtures and countertops (e.g. sinks, showers, urinals, basins, vanities): one-part, acetoxy silicone sealant.
 - .5 Exposed interior control joints in drywall: Sealant type: acrylic latex.
 - .6 Concealed joints in sound attenuated walls and ceilings: acoustic Sealant.
 - .7 Colour of sealants: selected by Engineer from manufacturer's standard range to match adjacent surfaces.
-

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 Execution

3.1 PROTECTION

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

3.2 PREPARATION OF JOINT SURFACES

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

3.3 PRIMING

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

3.4 BACKUP MATERIAL

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

3.5 MIXING

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

3.6 APPLICATION

- .1 Sealant.
 - .1 Apply sealant in accordance with manufacturer's written instructions.
 - .2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
 - .3 Apply sealant in continuous beads.
 - .4 Apply sealant using gun with proper size nozzle.
 - .5 Use sufficient pressure to fill voids and joints solid.
 - .6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
 - .7 Tool exposed surfaces before skinning begins to give slightly concave shape.
 - .8 Remove excess compound promptly as work progresses and upon completion.

- .2 Curing.
 - .1 Cure sealants in accordance with sealant manufacturer's instructions.
 - .2 Do not cover up sealants until proper curing has taken place.

- .3 Cleanup.
 - .1 Clean adjacent surfaces immediately and leave work neat and clean.
 - .2 Remove excess and droppings, using recommended cleaners as work progresses.
 - .3 Remove masking tape after initial set of sealant.

END OF SECTION

1 General

1.1 RELATED WORK

- .1 Section 07 92 10 - Joint Sealing; caulking of joints between frames and other building components.
- .2 Section 08 71 10 - Door Hardware, including weatherstripping.
- .3 Section 08 80 50 - Glazing.
- .4 Section 09 91 23 - Painting.

1.2 REFERENCE STANDARDS

- .1 ASTM International:
 - .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 A 794-12 - Standard Specification for Commercial Steel (CS), Sheet, Carbon (0.16 % Maximum to 0.25 % Maximum), Cold-Rolled.
 - .3 ASTM A659/659M-12 - Standard Specification for Commercial Steel (CS), Sheet and Strip, Carbon (0.16 Maximum to 0.25 Maximum Percent), Hot-Rolled.
- .2 Canadian General Standards Board (CGSB):
 - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .3 Canadian Steel Door Manufacturers' Association, (CSDMA):
 - .1 CSDMA, Specifications for Commercial Steel Doors and Frames, 2006.
 - .2 CSDMA, Recommended Selection and Usage Guide for Commercial Steel Doors, 2009.
- .4 CSA International:
 - .1 G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CSA W59-03(R2009), Welded Steel Construction (Metal Arc Welding) (Metric Version).
- .5 Underwriters Laboratories Canada (ULC):
 - .1 CAN/ULC-S702-97, Thermal Insulation, Mineral Fibre, for Buildings.
 - .2 CAN4-S104M80, rev. 1985.
 - .3 CAN4-S105M1985 Rev 1992.
- .6 National Fire Protection Association (NFPA).
 - .1 (NFPA) 80- Standard for Fire Doors and Other Opening Protectives 2010 Edition.

1.3 REQUIREMENTS OF REGULATORY AGENCIES

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

- .2 Install labeled steel fire rated doors and frames to National Fire Protection Association (NFPA) 80, except where specified otherwise.

1.4 SUBMITTALS

- .1 Submit shop drawings and test reports in accordance with Section 01 01 50 - General Instructions for submittals.
 - .1 Clearly indicate each type of door and frame, material core thickness, mortises, reinforcements, anchorages, glazing, location of exposed fasteners and hardware arrangements.
 - .2 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and in door schedule.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 01 50 - General Instructions; Construction/Demolition Waste Management And Disposal clause.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.
- .5 Divert unused wood materials from landfill to either recycling, reuse or composting facility.

2 Products

2.1 MATERIALS

- .1 Sheet Steel (WGCS): tension leveled steel to ASTM A924, galvanized to ASTM A653 Coating designation ZF120 paintable galvanneal finish.
- .2 Hot Rolled Carbon Steel Sheet (HRCS): commercial quality, to ASTM A659/A659M, for concealed reinforcement for materials, 2.7 mm minimum thickness.
- .3 Glazing Stops: 1.2 mm base metal thickness commercial grade steel to ASTM A653M with ZF120 zinc wiped finish, screw fixed. Commercial grade steel of thickness and design listed by ULC for fire rated assemblies.
- .4 Cold rolled carbon steel sheet (CRCS) commercial quality, TO ASTM A794, shop prime coated.

2.2 COMPONENTS

- .1 Frames:
 - .1 Single door frames and interior paired door frames: 1.6 mm base thickness steel.
 - .2 Paired exterior door frames: 2 mm base thickness steel.
 - .3 Glazing frames: 1.6 mm base thickness steel (except room 140).
-

- .4 Glazing frame in Room 140: 2.0 mm base thickness steel with 25 mm glazing bite. Steel angle stops specified in Section 05 50 00.
- .2 Doors:
 - .1 Interior doors: 1.2 mm base thickness steel.
 - .2 Exterior doors: 1.6 mm base thickness steel
- .3 Frame floor anchors and channel spreaders: minimum 1.6 mm thick base steel.
- .4 Guard boxes: minimum 0.8 mm thick base steel.
- .5 Steel frame anchors: thickness and design listed by ULC for labeled door and frame assemblies. Twist in stud anchor with base anchor for door frames in stud walls.
- .6 Hinge, lock, strike, flush bolt and surface applied hardware reinforcing: 3.5 mm minimum base metal thickness.
- .7 Door bumpers: black neoprene single stud.
- .8 Reinforcing channel: to CAN/CSA G40.21, Type 300 W.
- .9 Primer: to CAN/CGSB-1.181, zinc rich.
- .10 Top caps: galvanized steel for all exterior doors, 0.9 mm base metal thickness.

2.3 DOOR TYPES

- .1 (HCM) Doors: flush steel with full honeycomb core of 25 mm size bonded resin - impregnated kraft reinforcement, longitudinal edges mechanically locked and adhered, top and bottom edges with 1.6 mm projection welded channel, with reinforcement and prepared for hardware.
- .2 (SCM) Doors: vertically stiffened with 0.9 mm interlocking steel stiffeners at 150 mm oc and welded to each face at 150 mm oc, all voids filled with semi-rigid fibrous insulation minimum density 24 kg/m³ conforming to CAN/ULC S702, Type 1, with all steel hardware reinforcements, steel top cap for exterior doors, prepared for hardware.

2.4 FABRICATION

- .1 Fabricate doors and frames as detailed; in accordance with Canadian Steel Door and Frame Manufacturer's Association (CSDFMA), "Canadian Manufacturing for Steel Doors and Frames"; for hollow steel construction; ULC requirements, reviewed shop drawings and specified standards, except where specified otherwise. Fabricate frames for glazing in similar manner as for door frames.
 - .2 Mortise, reinforce, drill and tap doors and frames and reinforcements to receive hardware using templates provided by finish hardware supplier. Refer to Section 08 71 10 for mounting heights.
 - .3 Touch up galvanized finish damaged during fabrication.
 - .4 Attach accredited labels to doors and frames indicated in Door Schedule as fire rated.
-

- .5 Locate screw fixed glazing stops to secure side of glazed screens and side lights using Robertson head fasteners on secure side of wall.
- .6 Prepare doors for cylinder, thumbturn lever where mortised doors are scheduled.

2.5 FRAMES - WELDED

- .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, 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. Provide for anchorage of ULC frames to floor.
- .7 Reinforce head of frames wider than 1200 mm; reinforce exterior frame assemblies to resist wind loading.
- .8 Frame face reinforcement for all exterior single door frames: weld 6 mm thick x 25 mm wide x 925 mm long to interior of frame face on latch side and centered on latch. Tack weld at ends and along each side at 150 mm oc.
- .9 Install 3 bumpers on strike jamb for each single door and 2 bumpers at head for pairs of door.
- .10 Fill frames in exterior walls and frames in insulated interior walls, with mineral fibre insulation.

2.6 DOORS

- .1 Assemble components using spot or arc welding.
 - .2 Doors: swing type, flush, with provision for glass and/or louvre openings as indicated.
 - .3 Glazing Stops:
 - .1 Glazed screens: 1.2 mm base metal thickness commercial grade steel, screw fixed.
 - .2 Interior doors: 1 mm cold rolled steel, primed, with provision for 6 mm glazing.
 - .3 Exterior doors: 1 mm cold rolled steel, primed, with provision for 22 mm thermal glazing.
 - .4 Spot weld longitudinal door edges, fill continuously and grind smooth to conceal edge seams. Lock seam exposed edges are permissible for HCM doors.
 - .5 Equip exterior doors with flush steel top caps to prevent water accumulation.
-

- .6 Astragals specified in Section 08 71 10.
- .7 Touch up doors with primer where galvanized finish damaged during fabrication.

3 Execution

3.1 FRAME INSTALLATION

- .1 Set frames plumb, square, level and at correct elevation. Install door frames anchored to steel stud framed walls accordance with reviewed shop drawings.
- .2 Secure anchorages and connections to adjacent construction.
- .3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreaders at third points of door opening to maintain frame width. Remove temporary spreaders after frames are built-in.
- .4 Make allowance for deflection to ensure structural loads are not transmitted to frames.
- .5 Install fire rated door and frame assemblies in accordance with National Fire Codes, Volume 4, produced by NFPA 80.
- .6 Fill frames with fibreglass insulation for all exterior door/frame assemblies specified with weatherstripping and interior frames in sound rated walls.
- .7 Caulk perimeter of frames between frame and adjacent material in accordance with Section 07 92 10.
- .8 Maintain continuity of air/vapour barrier at exterior door frames.

3.2 DOOR INSTALLATION

- .1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions.
- .2 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows.
 - .1 Hinge side: 1.0 mm.
 - .2 Latch side and head: 1.5 mm.
 - .3 Finished floor: 13 mm.
- .3 Adjust operable parts for correct function.
- .4 Install louvers, glass and steel glazing stops.

END OF SECTION

1 General

1.1 RELATED WORK

- .1 Section 08 71 10 - Door Hardware and mounting heights.
- .2 Section 09 91 23 - Painting.

1.2 REFERENCE STANDARDS

- .1 WDMA – Window and Door Manufacturer’s Association, “I.S.1A-04 *Industry Standard for Architectural Wood Flush Doors.*”
- .2 AWI/AWMAC – Architectural Woodwork Standards, 1st Edition, 2009.
- .3 CAN/CSA O132.2 Series-90(R2003), Wood Flush Doors.

1.3 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 01 50.

1.4 DELIVERY, STORAGE AND PROTECTION

- .1 Section 01 01 50: General Instructions for Transport, handle, store, and protect products.
- .2 Remove doors from wrappings or coverings upon receipt on site and inspect for damage.
- .3 Deliver, store, handle and protect products at site under provisions of WDMA publication “How to Store, Handle, Finish, Install and Maintain Wood Doors”.

2 Products

2.1 MATERIALS

- .1 Door materials: to CAN/CSA-O132.2, minimum.

2.2 INTERIOR FLUSH DOORS

- .1 Flush SCW solid core door: fabricate interior flush doors to WDMA bonded sanded core/frame assembly, Architectural grade:
 - .1 Faces for clear finish: ANSI/AHA A135.4, type S2S, White Birch, rotary cut veneer surface, slip matched.
 - .2 Core construction: solid particle board core to WDMA PC-7.
 - .3 Door vertical edges: to AWI/AWMAC No. 3 edge to manufacturer’s standard.
 - .4 Door thickness: 44 mm.
 - .5 Guarantee: 36 months.
 - .2 Adhesives (facing): Type 1 waterproof.
-

2.3 FABRICATION

- .1 Fabricate doors and panels in accordance with AWI/AWMAC Standards for institutional doors.
- .2 Vertical edge strips to match face veneer.

3 Execution

3.1 INSTALLATION

- .1 Install doors and hardware in accordance with manufacturer's instructions.
- .2 Adjust hardware for correct function.

3.2 ADJUSTMENT

- .1 Re-adjust doors and hardware just before completion of building to function freely and properly.

END OF SECTION

1 General

1.1 RELATED WORK

- .1 Section 01 01 50 - General Instructions: Submittal Procedures, Construction/Demolition Waste and Disposal, Closeout Submittals.
- .2 Section 05 50 00 - Metal Fabrication.

1.2 REFERENCES

- .1 Aluminum Association (AA).
 - .1 DAF 45-03, Designation System for Aluminum Finishes.
 - .2 American Architectural Manufacturers Association (AAMA).
 - .1 AAMA 609.1-02, Voluntary Guide Specification for Cleaning and Maintenance of Architectural Anodized Aluminum.
- .2 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A 653/A653M-10, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-coated (Galvannealed) by the Hot-Dip Process.
- .3 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-1.38-2000, Interior Enamel Undercoat.
 - .2 CAN/CGSB-1.213-95, Etch Primer (Pretreatment Coating) for Steel and Aluminum.

1.3 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 01 50 - General Instructions; Submittal Procedures clause.
- .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 01 50 - General Instructions; Submittal Procedures clause.
 - .2 Indicate type of coiling counter door, arrangement of hardware, operating mechanism and required clearances.
- .3 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide operation and maintenance data for overhead coiling counter doors and hardware for incorporation into manual specified in Section 01 01 50 - General Instructions; Closeout Submittal clause.
 - .2 Submit a written 2 year warranty for materials and workmanship.
-

1.5 QUALITY ASSURANCE

- .1 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Installation by factory approved installers.
- .2 Design counter doors for maximum 10 cycles per day and 10,000 cycles for life of the door. Rolling door to operate at a speed of 150 mm per second.

1.6 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 Remove from site and dispose of packaging materials at appropriate recycling facilities
- .4 Divert unused metal materials from landfill to metal recycling facility approved by Engineer.

2 Products

2.1 MATERIALS

- .1 Aluminum sheet metal: plain finish utility sheet.
- .2 Aluminum extrusions: Aluminum Association alloy AA6063-T5.
- .3 For exposed aluminum surfaces: powder coated polyester finish or clear anodized 204-R1 finish.

2.2 COILING COUNTER DOOR

- .1 Assemble coiling counter door curtain of interlocking extruded aluminum slat sections 1.4 mm thick, 12.7 deep and individually 70 mm high, with perforations to allow 25% airflow with an overall width sized to suit door opening. Slat and hood with polyester powder coating or clear anodized coating.
 - .2 Brackets: minimum 3 mm steel plate.
 - .3 Provide bottom bar of heavy extruded aluminum tubular section 1.5 mm in width and 50 mm in height equipped with safety edge bumper strip bottom bar with a thumb turn on the coil side of the shutter with provision for padlocking.
 - .4 Guides: extruded aluminum guide sections, 32 mm wide by 44 mm deep, with built-in upset shoulders to provide curtain retention and with a bell mouth to provide smooth curtain operation. Mount steel stoppers to guides to prevent roll over and travel above finished bulkhead/soffit. Fit guides with a wool pile wear strip on the outside face and a rigid P.V.C. stripping on the interior face to ensure smooth and quiet operation and reduce wear.
-

- .5 Counterbalance: constructed of standard steel pipe of adequate diameter to prevent deflection exceeding 2.4 mm per meter of door width. Pipe barrel to enclose oil tempered helical torsion springs of a design to ensure proper counterbalancing action with 25% overload factor. Provide spring tension adjustment by means of an adjusting wheel and pin on the outside of the bracket plate.
- .6 Prime paint steel barrel. Aluminum finish of 0.01 mm (10 micron) clear anodizing
- .7 Support counterbalance assembly and hood on 4.76 mm minimum thickness steel plate brackets, forming end enclosures.
- .8 Aluminum Hood: Constructed of 1 mm clear anodized aluminum sheet, press-bent to form suitable coil enclosure. Hoods are required for doors where coil is exposed below ceiling.

2.3 OPERATION

- .1 Medical room and Administration room wickets: by crank handle.

3 Execution

3.1 INSTALLATION

- .1 Install counter doors in accordance with manufacturer's printed instructions.
 - .1 Fasten guides to masonry or structural supports with concealed fasteners at max. 610 mm o.c.
- .2 Adjust door operating components to ensure smooth opening and closing of door.
- .3 Adjust operable parts for correct function and smooth operation

END OF SECTION

1 General

1.1 RELATED WORK

- .1 Section 01 01 50 - Final cleaning.
- .2 Section 06 10 11 - Rough Carpentry for frame and wood blocking at rough openings.
- .3 Section 07 46 13 - Metal Wall Cladding Assembly for flashing and trim.
- .4 Section 07 92 10 - Joint Sealing.
- .5 Section 08 80 50 - Glass and glazing.
- .6 Section 10 71 14 - Solar Shades.

1.2 REFERENCED STANDARDS

- .1 CSA International (CSA):
 - .1 CAN/CSA 12.20-M89 Structural Design of Glass for Buildings.
 - .2 CAN/CSA-A440-M00(R2005) Windows.
- .2 Canadian General Standards Board (CGSB):
 - .1 CAN/CGSB-12.1-M90 Tempered or Laminated Safety Glass.
 - .2 CAN/CGSB-12.8-M90 Insulating Glass Units.
 - .3 CGSB 19-GP-14-M76 (1984) Sealing Compound, One-Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing (Reaffirmation of April 1976)
 - .4 CAN/CGSB 79.1M91 - Insect Screens.
- .3 ASTM International (ASTM)
 - .1 ASTM C509-06(2011) Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material.
 - .2 ASTM D3656-07 - Standard Specification for Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns.
 - .3 ASTM A153/A153M-09 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

1.3 SUBMITTALS

- .1 Submit shop drawings, test reports and maintenance data in accordance with Section 01 01 50 - General Instructions for submittals.
 - .1 Indicate materials and details in scale full size 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.
 - .2 Submit test reports from approved independent testing laboratories, certifying compliance with specifications, for:
 - .1 Windows classifications.
 - .2 Anodized finish.
 - .3 Air tightness.
 - .4 Water tightness.
-

- .5 Wind load resistance.
- .6 Condensation resistance.

- .3 Provide operation and maintenance data for aluminum windows for incorporation into manual.

1.4 QUALITY ASSURANCE

- .1 Provide mockup of one Bedroom window along with other adjoining components as specified in Section 10 71 14 Solar Shades.

2 Products

2.1 MATERIALS

- .1 Materials: to CAN/CSA-A440 supplemented as follows:
 - .1 All aluminum windows by same manufacturer.
 - .2 Sash and frame: thermally broken.
 - .3 Glass and glazing materials: tempered safety Low-e glass on No2 surface, double sealed with argon fill between glass, in accordance with Section 08 80 50, Clause 2.1.3 and its paragraphs.
 - .4 Glazing seals:
 - .1 Exterior Glazing: Factory silicone glazed.
 - .5 Bedding compound: to CGSB 19-GP-14M, one compound butyl polyisobutylene polymer base, solvent curing.
 - .6 Sill flashing: 2 mm thickness aluminum sill/flashing.
 - .7 Isolation coating: alkali resistant bituminous paint.
 - .8 Sealants: in accordance with Section 07 92 10, colour selected by Departmental Representative.

2.2 WINDOW TYPE AND CLASSIFICATION

- .1 Window Types: horizontal single sliding sash and fixed units.
 - .1 Main frame: high performance commercial window of aluminum thermally broken frame section 89 mm wide with:
 - .1 Screw and spline frame corner joinery.
 - .2 integral exterior stop and removable snap in interior stops.
 - .3 Interior applied glazing bead.
 - .4 Composite adjustable tandem roller.
 - .5 Zinc die cast sweep lock and sash stops.
 - .6 Nailing fin flange.
 - .2 Acceptable Product: Kawneer IsoPort 3350.
 - .3 Insect/security screen: 16 x 16 grid stainless steel mesh mounted in heavy duty screen frame and fastened to window frame, at sliding sash, with security screws.
 - .2 Classification rating: to CAN/CSA-A440.
 - .1 Air leakage: A2 (fixed).
 - .2 Water leakage: B5.
 - .3 Wind load resistance: C3.
 - .4 Condensation resistance: Temperature Index, frame I-45, glass I-52.
-

2.3 FABRICATION

- .1 Fabricate in accordance with CAN/CSA-A440 supplemented as follows:
 - .1 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.
 - .2 Face dimensions detailed are maximum permissible sizes.
 - .3 Brace frames to maintain squareness and rigidity during shipment and installation.
 - .4 Finish steel clips and reinforcement with 380 g/m² zinc coating to ASTM A153.
- .2 Sash aluminum extrusion thickness: based on published wind load charts to meet specified wind load for locality.
- .3 Manufacturer's nameplates on windows are not acceptable.

2.4 ALUMINUM FRAME FINISHES

- .1 Anodic Oxide Treatments: processed in accordance with AAMA designations.
 - .1 Factory finish: Clear anodic oxide treatment to AA-M12C22A31, Architectural Class II designation is for #17 Clear anodized finish (0.0004).

2.5 ISOLATION COATING

- .1 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 Factory glaze windows in accordance with CAN/CSA-A440 with double sealed tempered safety glass with Low-e and Argon gas, in accordance with manufacturer's instructions.

2.7 AIR BARRIER

- .1 Caulking perimeter joint between window frame and peel and stick flashing membrane is acceptable.

3 Execution

3.1 WINDOW INSTALLATION

- .1 Install windows in accordance with CAN/CSA-A440. Install aluminum flashing at sill frame and extend to overlap wall finish.
 - .2 Arrange components to prevent abrupt variation in colour.
-

3.2 CAULKING

- .1 Seal joints at head and jambs, between window frames and metal trim/head flashing with sealant to provide weather tight seal at outside. Caulk between sill upstand and interior window frame.
- .2 Apply sealant in accordance with Section 07 92 10 - Sealants. Conceal sealant within window units except where exposed use is permitted by Departmental Representative.

END OF SECTION

1 General

1.1 RELATED WORK

- .1 Supply and installation of hardware for:
 - .1 Section 06 23 00 - Cabinet hardware.
 - .2 Section 08 50 50 - Aluminum Windows.
 - .3 Section 08 33 14 - Rolling Counter door.
- .2 Installation only of hardware for:
 - .1 Section 08 10 10 - Steel Hollow Metal Doors.
 - .2 Section 08 14 10 - Wood doors.

1.2 REFERENCE STANDARDS

- .1 Standard hardware location dimensions in accordance with the Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by the Canadian Steel Door and Frame Manufacturer's Association
- .2 BHMA - Builders Hardware Manufacturers Association, Inc.:
 - .1 ANSI/BHMA A156.1-2006, Standard for Butts and Hinges.
 - .2 ANSI/BHMA A156.3-2008, Standard for Exit Devices.
 - .3 ANSI/BHMA A156.4-2008, Standard for Door Controls (Closers).
 - .4 ANSI/BHMA A156.5-2010, Standard for Auxiliary Locks and Associated Products
 - .5 ANSI/BHMA A156.6-2010, Standard for Architectural Door Trim.
 - .6 ANSI/BHMA A156.7-2009, Standard for Template Hinge Dimensions.
 - .7 ANSI/BHMA A156.8-2010, Standard for Door Controls - overhead Stops and Closers.
 - .8 ANSI/BHMA A156.13-2005, Standard for Mortised Locks and Latches Series 1000.
 - .9 ANSI/BHMA A156.15-2006, Standard for Hardware Preparation in Steel Doors and Steel Frames.
 - .10 ANSI/BHMA A156.15-W-2006, Standard for Hardware Preparation in Wood Doors with Wood or Steel Frames.
 - .11 ANSI/BHMA A156.16-2006, Standard for Release Devices - Closer Holder, Electromagnetic and Electromechanical.
 - .12 ANSI/BHMA A156.16- 2008, Standard for Auxiliary Hardware.
 - .13 ANSI/BHMA A156.17 - 2010, Standard for Self Closing Hinges & Pivots.
 - .14 ANSI/BHMA A156.18-2006, Standard for Materials and Finishes.
 - .15 ANSI/BHMA A156.21-2009, Standard for Thresholds.
 - .16 ANSI/BHMA A156.22-2005, Standard for Door gasketing Systems.
 - .17 ANSI/BHMA A156.28-2000, Standard for Keying Systems.
 - .18 ANSI/BHMA A156.31-2007, Standard for Electrified Strikes and Frame Mounted Actuators.

1.3 SUBMITTALS

- .1 Submit one copy of product data sheets in accordance with Sections 01 01 50.
 - .2 Product data sheets to include catalogue cuts, manufacturer's name and number, finish and reference identification to specified standard.
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- .3 Submit schematic diagrams of electrical components for inclusion in maintenance manual specified in Sections 01 01 50 - General Instructions for submittals.
- .4 Submit hardware schedule in accordance with Section 01 01 50.
 - .1 Submit literature cuts, indicating hardware proposed, including make, model, base material, function, ANSI Function where ANSI used in this specification, Grade, Type, Series, BHMA finish, trim, ULC listing, UL listing, manufacturer and other pertinent information. Indicate which model or accessory is being provided where more than one model or accessory appears on a page.

1.4 MAINTENANCE DATA

- .1 Brief maintenance staff regarding proper care, cleaning and general maintenance.
- .2 Provide maintenance data, parts list, and manufacturer's instructions for each type door closers, locksets, and door holders for incorporation into maintenance manual specified in Section 01 01 50 - General Instructions for maintenance manuals.

1.5 REQUIREMENTS REGULATORY AGENCIES

- .1 Use ULC/ULI listed and labeled hardware for doors frames in fire separations and exit doors.
- .2 Only ULI listed products with the additional identifier reflecting compliance with Canadian Standards will be accepted.

1.6 MAINTENANCE MATERIALS

- .1 Supply 2 sets of wrenches for door closers in accordance with requirements specified in Section 01 01 50.

1.7 DELIVERY AND STORAGE

- .1 Store finishing hardware in locked, clean and dry area.
- .2 Package each item of hardware including fastenings separately or in like groups of hardware. Label each package as to item definition and location.
- .3 Maintain inventory list with hardware schedule.

1.8 GUARANTEE

- .1 Provide a manufacturer's written guarantee stating that the door closers specified in this Section are guaranteed against malfunction for a period of 60 months from the date of Interim Certificate of Completion.

1.9 WASTE DISPOSAL AND MANAGEMENT

- .1 Separate and recycle waste materials in accordance with Section 01 01 50 - General Instructions for Waste Management And Disposal clause.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
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- .3 Dispose of corrugated cardboard, polystyrene, plastic packaging material in appropriate on-site bin for recycling in accordance with site waste management program.

2 Products

2.1 HARDWARE ITEMS

- .1 Only door hardware meeting the requirements of specified standards are acceptable for use on this project, except as indicated otherwise.
- .2 Use one manufacturer's products only for all similar items.
- .3 Hardware material finish codes: ANSI/BHMA A156.18 as indicated.

2.2 DOOR HARDWARE

- .1 Co-ordinate door hardware listing with Door, Frame and Hardware Schedule.
 - .2 Hinges and butts:
 - .1 Hinges: to ANSI/BHMA A156.1 type, numbers and sizes listed in hardware schedule, full mortise template hinges finished to 626, exterior 630.
 - .2 Hinges on selected doors to be "NRP" Type (non-removable-pin) as scheduled.
 - .3 All hinges with minimum leaf thickness of 3.4 mm and of 5 knuckle 2 ball bearing (2BB), except where specified as plain bearing (PB) four ball bearing (4BB).
 - .3 Latch and lock sets:
 - .1 Mortise locks and latches: to ANSI/BHMA A156.13 , series 1000 mortise lock, operational grade 1, security grade 2, and ULC listed, designed for function and keyed as stated in Hardware Schedule. Acceptable product Best Access Series 45H.
 - .2 Lever handles: forged or cast, plain design with Return.
 - .3 Escutcheons: rectangular full height screwless escutcheons for locksets with deadbolts, round roses for locksets without deadbolts.
 - .4 Normal strikes: box type, lip projection not beyond jamb.
 - .5 Cylinders: 7 pin interchangeable core cylinder with concealed internal set screw for securing cylinder to lockset. Keying to paragraph 2.3.1.
 - .6 Finished to 626 for interior locks and 630 for exterior and as noted.
 - .4 Exit device: to ANSI/BHMA-A156.3, Grade 1, tested to 1.5 million cycles minimum, flat push pad type design with removable cover plates concealing mechanism and fasteners. Mechanism case with minimum average wall thickness of 3.5 mm. All internal parts zinc dichromated to resist corrosion. Internal springs - compression type. Complete with UL 437 listed cylinder. All finished to 619 and 630.
 - .5 Exit Device Trim: to ANSI/BHMA-A156.6-2010, lever style to match lock trim with functions noted, finished to 619 and 630.
 - .6 Power supply for exit device: ULC approved, rated for and compatible with Electric Latch Retraction Exit Device, Electric Strike, etc. All complete with minimum 5AH battery back-up.
 - .7 Key switch for exit device: rated for and compatible with Exit Device.
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- .8 Electric strikes: to ANSI/BHMA-A156.5 and ANSI/BHMA-A156.31, Grade 1, fail secure, UL10B rated for fire, 4.8 mm horizontal adjustment capability, dual monitor switches, silent operation, E59321 - Mortised: latch release only, with deadbolt pocket, stainless steel.
 - .9 Power transfer: non-load bearing, concealed in both door and frame when door closed, UL listed for Fire, Burglary Protection and Class 1 low voltage installation, rated for and compatible with power supply and electric latch, ten 0.511 mm dia. wires, 24 V DC, 1 ampere.
 - .10 Push Button: momentary contact buttons for electric strike release at door 249. Refer to Electrical drawings for wiring diagram and coordinate with Division 26 and 27.
 - .11 Door pull: to ANSI/BHMA-A156.6, type J401 straight, through bolt mounted. 381 mm CTC and 25 mm diameter with 50 mm rosettes, finished in 630.
 - .12 Push plate: to ANSI/BHMA-A156.6, type J301, rectangular, square 90° corners, bevelled edges, 127 mm wide x 610 mm high x 0.50 mm thick, 3M tape mounted, finished in 630.
 - .13 Closers: provide adjustable backcheck for 90° to 180° opening. Finish to be 628 satin aluminum, powder coated finish.
 - .1 Surface mounted overhead door closers: to ANSI/BHMA A156.4, door mounted, top jamb or parallel mounted, non-handed, non-sized with site adjustable spring tension from size 2-6, with heavy duty forged steel arms, full rack and pinion hydraulic action, adjustable closing speed, adjustable back-checking action, high strength cast iron cylinder walls with stable hydraulic fluid to make winter/summer adjustments unnecessary.
 - .2 Provide through bolts for attachment to doors. Closer housing of smooth rectangular design approximately 90 mm high.
 - .3 Finish to C28 in lacquer or polyester powder coat finish.
 - .4 Provide closers with the following accessories as noted in schedule.
 - .1 CS: Cushion stop arm.
 - .2 HO: Hold open arm.
 - .3 PA: Parallel arm.
 - .4 TJ: Top jamb arm
 - .5 Products with universal mounting and adjustments to take into account changing door configurations.
 - .14 Cylinders: to match mortise door lock cylinders, for installation in special doors as listed in hardware schedule, 626 finish.
 - .15 Overhead door stop/holder: to ANSI/BHMA A156.8 surface mounted type with shock absorber and hold open device to degree noted.
 - .16 Surface bolts, top and bottom of door: ANSI/BHMA A156.16 steel, 626 finish, 200 mm long with mortise bolt keepers.
 - .17 Weatherstripping:
 - .1 Door bottom seal: weather seal with drip cap of 32 mm high aluminum frame and replaceable nylon brush weather seal, surface mounted on exterior door as indicated in schedule.
 - .2 Jamb seals: adjustable trim of aluminum extrusion minimum 20 x 6 mm with EPDM sponge insert.
-

- .3 Thresholds: to indicated width x full width of door opening, aluminum extruded mill finish, fluted surface, fitted to door frame opening size and profile, with thermal break, maximum 12 mm rise, one or two piece.
- .18 Sound seals:
 - .1 Seals tested to ASTM E1408-91.
 - .2 For jamb frame: aluminum frame and replaceable vinyl bulb stripping, adjustable, purpose made for reducing sound transmission. Acceptable Product: Pemko# 322SN or 350R with Pemko S88 BL seals adhered to frame.
 - .3 Door bottom seal: recess/flush mounted assembly to door bottom, with automatic drop strip, adjustable to door undercut, purpose made to reduce sound transmission. Acceptable Product: Pemko # 430L, 4301 or 412. Use recess mounted door bottom seal for wood doors.
 - .4 Threshold for Sound Attenuated doors, size 4.8 mm rise x 50 to 75 mm wide, smooth surface. Acceptable Product: Pemko 173.
- .19 Astragals:
 - .1 Security astragal for scheduled paired doors of primed steel flat bar, 50 mm wide x 3 mm thickness, full length of door, sex-bolt mounted (or exposed security Torx head screws) with Pemko S88 seals at meeting style.
- .20 Latch Guard:
 - .1 Heavy gauge formed steel plate cover to protect lock strike area, 300 mm high, Through bolt mounting formed to suit mortised locksets with standard strikes.
- .21 Padlocks: keyed heavy duty brass padlocks with hardened steel shackle, with six-pin key core cylinders to match locksets and keying system specified.
- .22 Architectural door trim:
 - .1 Door stops: to ANSI/BHMA A156.16, L02141 floor mounted, L02101 wall mounted concealed fastening and for exterior doors 75 mm high stops with two fasteners, 626 or 630 finish.
 - .2 Kick plates: to ANSI/BHMA A156.6, stainless steel, 1.2 mm thick x 250 x 865 mm or 250 x 825 mm to suit door width, installed both sides of door, No 4 finish.
 - .3 Door pulls and plate: to ANSI/BHMA A156.6, stainless steel materials, 25 ϕ x 250 mm long pull with concealed mounting, 100 x 400 plate size, with through-bolt mounting.
 - .4 Door push plate: to ANSI/BHMA A156.6, stainless steel materials, 100 x 400 plate size, with through-bolt mounting.

2.3 KEYING

- .1 Order all permanent cylinders for all locksets and special doors. Order key cylinders and keys from Stanley BEST ACCESS SYSTEMS, 7-pin removable core system to match keyway for FVI Institution. Deliver permanent cylinders to Departmental Representative at site. Key cylinders will be keyed and installed in locksets by Institution Security Officer after substantial completion of Contract. Include three key blanks with each permanent cylinder.
 - .1 Provide specified locksets for exterior doors with removable core construction cylinders or provide temporary locksets. Key all construction cores alike. Provide three keys to operate construction cores or temporary locksets.

2.4 DOOR SCHEDULE

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

Item	Door No.	Rm to Rm	Door Type	Frame Type	Label	Hardware Description
Main Floor						
1	100a	Rm 100 to Stair A1	HCM	PS	³ / ₄ Hr	1 ½ pr butts 2 BB 114 x 102 1 panic exit device, passage 1 lever and escutcheon 1 door closer, PA 1 door stop floor mtd 1 kickplate x 900 h 1 narrow threshold 1 auto door bottom sound seal 1 set sound seals
2	100b	Rm 100 to Rm 117	HCM	PS		1 ½ pr butts 2 BB 114 x 102 1 pull with plate 1 push plate 1 door closer, PA 1 door stop wall mtd 1 kickplate 1 narrow threshold 1 auto door bottom sound seal 1 set sound seals
3	101 102 103 104 105 106 107 108 109 110	Rm 114 to Rm 101 Rm 114 to Rm 102 Rm 114 to Rm 103 Rm 114 to Rm 104 Rm 114 to Rm 105 Rm 115 to Rm 106 Rm 115 to Rm 107 Rm 116 to Rm 108 Rm 116 to Rm 109 Rm 116 to Rm 110	HCM	PS		1 ½ pr butts 2 BB 114 x 102 1 mortised lockset Best D function 1 kick plate 1 door stop wall mtd
4	101a 103a 106a	Rm 101 to Rm 102 Rm 103 to Rm 104 Rm 106 to Rm 107	HCM	PS		1 ½ pr butts 2 BB 114 x 102 1 mortised lockset Best G function 1 kick plate 1 door stop wall mtd 1 set sound seals (frame) 1 door bottom auto drop strip 1 narrow threshold

Item	Door No.	Rm to Rm	Door Type	Frame Type	Label	Hardware Description
4	112	Exterior to Rm 112	SCM	PS		1 ½ pr butts 2 BB 114 x 102 NRP 1 mortised lockset Best TD Function 1 latch guard 1 door closer, TJ - stop arm 1 threshold 1 auto door bottom seal 1 set weatherstripping
5	113	Rm 117 to rm 113	SCW	PS		1 ½ pr butts PB 114 x 102 1 mortised lockset Best N- Function 1 kickplate 1 door closer PA 1 door stop wall mtd
6	119	Rm 114 to Rm 119	SCW	PS		1 ½ pr butts PB 114 x 102 1 mortised lockset Best L Function 1 kickplate 1 door stop wall mtd
7	120	Rm 115 to Rm 120	SCW	PS		1 ½ pr butts PB 114 x 102 1 mortised lockset Best L Function 1 kickplate 1 door stop wall mtd
8	131a	Exterior to Rm 131	SCM	PS		1 ½ pr butts 4BB 114 x 102 NRP 1 panic exit device Elect Latch retract 1 power transfer device 1 cylinder 1 exterior lever and escutcheon 1 power door operator 1 kickplate x 900h 1 threshold 1 auto door bottom seal 1 set weatherstripping
9	131b	Rm 131 to Rm 132	HCM	PS		1 ½ pr butts 4BB 114 x 102 1 panic exit device Elect Latch retract 1 power transfer device 1 cylinder 1 exterior lever and escutcheon 1 power door operator 1 kickplate 1 threshold 1 auto door bottom seal 1 set weatherstripping
10	133	Rm 134 to Rm 133	SCW	PS		1 ½ pr butts 2 BB 114 x 102 1 mortised lockset Best A Function 1 door closer, PA 1 door stop wall mtd

Item	Door No.	Rm to Rm	Door Type	Frame Type	Label	Hardware Description
11	133a	Rm 133 to Rm 133a	SCW	PS		1 ½ pr butts 2BB 114 x 102 NRP 1 mortised lockset Best D Function 1 door stop wall mtd
12	134a	Rm 132 to Rm 134	SCW	PS		1 ½ pr butts 2BB 114 x 102 1 mortised lockset Best AT Function 1 door closer PA 1 kickplate 1 door stop wall mtd
13	135	Rm 134 to Rm 135	SCW	PS		1 ½ pr butts PB 114 x 102 1 mortised lockset Best L Function 1 kickplate 1 door stop wall mtd
14	136	Rm 134 to Rm 136	HCM	PS		1 ½ pr butts 2 BB 114 x 102 NRP 1 mortised lockset Best R Function 1 door stop wall mtd
15	137	Rm 134 to Rm 137	HCM	PS	¾ Hr	1 ½ pr butts 2BB 114 x 102 1 mortised lockset Best D Function 1 door closer PA 1 door stop wall mtd
16	138	Rm 134 to Rm 138	HCM	PS	¾ Hr	1 ½ pr butts 2BB 114 x 102 1 mortised lockset Best D Function 1 door closer PA 1 door stop wall mtd
17	139	Rm 141 to Rm 139	SCW	PS		1 ½ pr butts PB 114 x 102 1 mortised lockset Best L Function 1 kickplate 1 door stop wall mtd
18	140	Rm 134 to Rm 140	SCM	PS		1 ½ pr butts 2 BB 114 x 102 1 mortised lockset Best TD Function 1 latch guard 1 door closer PA 1 door stop wall mtd
19	142	Rm 148 to Rm 142	SCW	PS		1 ½ pr butts 2BB 114 x 102 1 mortised lockset Best R Function 1 door stop wall mtd 1 set sound seals 1 door bottom drop strip 1 narrow threshold 1 kick plate
20	143	Rm 141 to rm 143				1 ½ pr butts PB 114 x 102 1 mortised lockset Best L Function 1 kickplate 1 door stop wall mtd

Item	Door No.	Rm to Rm	Door Type	Frame Type	Label	Hardware Description
21	144	Rm 141 to Rm 144	SCW	PS		1 ½ pr butts 2 BB 114 x 102 1 mortised lockset Best D Function 1 door closer PA 1 door stop floor mtd
22	145	Rm 148 to Rm 145	SCW	PS		1 ½ pr butts 2BB 114 x 102 1 mortised lockset Best R Function 1 set sound seals 1 door bottom drop strip 1 narrow threshold 1 kick plate 1 door stop wall mtd
23	145a	RM 145 to Rm 145a	SCW pair	PS		3 pr butts 2 BB 114 x 102 1 mortised lockset Best D Function 1 pr surface bolts 1 'T' astragal 2 door stops overhead type Ho 100°
24	145a1 145a2	Ext. to Room 145	SCM	PS		1 ½ pr butts 2 BB 114 x 102 NRP 1 mortised lockset Best TD Function 1 latch guard 1 door closer, TJ - stop arm 1 threshold 1 auto door bottom seal 1 set weatherstripping
25	146	Rm 148 to Rm 146	SCW	PS		1 ½ pr butts 2BB 114 x 102 1 mortised lockset Best R Function 1 set sound seals 1 door bottom drop strip 1 narrow threshold 1 kick plate 1 door stop wall mtd
26	146a	RM 146 to Rm 146a	SCW pair	PS		3 pr butts 2 BB 114 x 102 1 mortised lockset Best D Function 1 pr surface bolts 1 'T' astragal 2 door stops overhead type HO 100°
27	147	Rm 148 to Rm 147	SCW	PS		1 ½ pr butts 2BB 114 x 102 1 mortised lockset Best R Function 1 set sound seals 1 door bottom drop strip 1 narrow threshold 1 kick plate 1 door stop wall mtd

Item	Door No.	Rm to Rm	Door Type	Frame Type	Label	Hardware Description
28	147a	RM 147 to Rm 147a	SCW pair	PS		3 pr butts 2 BB 114 x 102 1 mortised lockset Best D Function 1 pr surface bolts 1 'T' astragal 2 door stops overhead type HO 100°
29	149	Exterior to Rm 149	SCM	PS		1 ½ pr butts 4BB 114 x 102 NRP 1 panic exit device 1 cylinder 1 exterior lever 1 kickplate x 900 h 1 threshold 1 auto door bottom seal 1 set weatherstripping
30	148	Rm 148 to Rm 149	HCM	PS		1 ½ pr butts PB 114 x 102 1 mortised latchset Best N Function 1 door closer PA 1 kickplate 1 door stop wall mtd
31	150	Ext. To Rm 150	SCM pair			3 pr butts 2 BB 114 x 102 NRP 1 mortised lockset Best TD Function 1 pr surface bolts 1 astragal w/ weatherstrip 2 door closers, TJ - HO & stop arm 1 door coordinator 1 threshold 1830 2 auto door bottom seal 2 sets weatherstripping
32	150a	Rm 150 to Rm 150a	HCM pair		³ / ₄ Hr	3 pr butts 2 BB 114 x 102 1 mortised lockset Best D Function 1 pr surface bolts 1 astragal 2 door closers, PA 1 door coordinator
33	151	Rm 145 to Rm 151	HCM pair		³ / ₄ Hr	3 pr butts 2 BB 114 x 102 1 mortised lockset Best D Function 1 pr surface bolts 1 astragal 2 door closers, PA 1 door coordinator

Item	Door No.	Rm to Rm	Door Type	Frame Type	Label	Hardware Description
34	A1a B1a	Exterior to Stair A1 Exterior to Stair B1	SCM	PS		1 ½ pr butts 4BB 114 x 102 NRP 1 panic exit device 1 cylinder 1 lever and escutcheon 1 kickplate x 900 h 1 threshold 1 auto door bottom seal 1 set weatherstripping
35	A1b	Rm 132 to Stair A1				1 ½ pr butts 4BB 114 x 102 NRP 1 mortised lockset Best TD Function 1 kickplate x 900 h 1 door closer, P/ stop arm
36	B1b	Rm 114 to Stair B1	HCM	PS	³ / ₄ Hr	1 ½ pr butts 2 BB 114 x 102 1 panic exit device, passage 1 lever and escutcheon 1 door closer, PA 1 door stop floor mtd 1 kickplate x 900 h 1 narrow threshold 1 auto door bottom sound seal 1 set sound seals
Second Floor						
37	A2 B2	Rm 232 ro Stair A2 Rm 214 ro Stair B2	HCM	PS	³ / ₄ Hr	1 ½ pr butts 2 BB 114 x 102 1 panic exit device, lever, 1 cylinder 1 lever and escutcheon 1 door closer, PA 1 door stop floor mtd 1 kickplate x 900 h
38	200a	Rm 200 to Stair A2	HCM	PS	³ / ₄ Hr	1 ½ pr butts 2 BB 114 x 102 1 panic exit device, lever, passage 1 door closer, PA 1 door stop floor mtd 1 kickplate x 900 h 1 narrow threshold 1 auto door bottom sound seal 1 set sound seals

Item	Door No.	Rm to Rm	Door Type	Frame Type	Label	Hardware Description
39	200b	Rm 200 to Rm 217	HCM	PS		1 ½ pr butts 2 BB 114 x 102 1 pull with plate 1 push plate 1 door closer, PA 1 door stop wall mtd 1 kickplate 1 narrow threshold 1 auto door bottom sound seal 1 set sound seals
40	201 202 203 204 205 206 207 208 209 210	Rm 214 to Rm 201 Rm 214 to Rm 202 Rm 214 to Rm 203 Rm 214 to Rm 204 Rm 214 to Rm 205 Rm 215 to Rm 206 Rm 215 to Rm 207 Rm 216 to Rm 208 Rm 216 to Rm 209 Rm 216 to Rm 210	HCM	PS		1 ½ pr butts 2 BB 114 x 102 1 mortised lockset Best D function 1 kick plate 1 door stop wall mtd
41	212	Rm 233 to Rm 212	HCM	PS	³ / ₄ Hr	1 ½ pr butts 2 BB 114 x 102 1 mortised lockset Best D Function 1 door closer, PA 1 door stop wall mounted 1 set smoke seals
42	213	Rm 117 to rm 213	SCW	PS		1 ½ pr butts PB 114 x 102 1 mortised lockset Best N- Function 1 kickplate 1 door closer PA 1 door stop wall mtd
43	219	Rm 214 to Rm 219	SCW	PS		1 ½ pr butts PB 114 x 102 1 mortised lockset Best L Function 1 kickplate 1 door stop wall mtd
44	220	Rm 215 to Rm 220	SCW	PS		1 ½ pr butts PB 114 x 102 1 mortised lockset Best L Function 1 kickplate 1 door stop wall mtd
45	233	Rm 232 to Rm 233	SCW	PS		1 ½ pr butts 2BB 114 x 102 1 mortised lockset Best R Function 1 set sound seals 1 door bottom drop strip 1 narrow threshold 1 kick plate 1 door stop wall mtd

Item	Door No.	Rm to Rm	Door Type	Frame Type	Label	Hardware Description
46	233a	Rm 233 to Rm 233a	SCW pair	PS		3 pr butts 2 BB 114 x 102 1 mortised lockset Best D Function 1 pr surface bolts 1 'T' astragal 2 door stops overhead type Ho 100°
47	234	Rm 232 to Rm 234	SCW	PS		1 ½ pr butts PB 114 x 102 1 mortised lockset Best L Function 1 kickplate 1 door stop wall mtd
48	235	Rm 236 to Rm 235	SCW	PS		1 ½ pr butts PB 114 x 102 1 mortised lockset Best L Function 1 kickplate 1 door stop wall mtd
49	237	Rm 248 to Rm 237	SCM	PS		1 ½ pr butts 4BB 114 x 102 NRP 1 mortised lockset Best TD Function 1 kickplate x 900 h 1 door closer, PA 1 door stop wall mtd
50	238	Rm 236 to Rm 238	SCW	PS		1 ½ pr butts 2 BB 114 x 102 1 mortised lockset Best D Function 1 door closer PA 1 door stop floor mtd
51	239	Rm 236 to Rm 239	SCW	PS		1 ½ pr butts PB 114 x 102 1 mortised lockset Best L Function 1 kickplate 1 door stop wall mtd
52	240	Rm 242 to Rm 240	SCW	PS		1 ½ pr butts PB 114 x 102 1 mortised lockset Best D Function 1 kickplate 1 door stop wall mtd
53	243	Rm 242 to Rm 243	SCW	PS		1 ½ pr butts PB 114 x 102 1 mortised lockset Best AT Function 1 kickplate 1 door stop wall mtd
54	244	Rm 242 to Rm 244	SCW	PS		1 ½ pr butts PB 114 x 102 1 mortised lockset Best AT Function 1 kickplate 1 door stop wall mtd
55	245	Rm 242 to Rm 245	SCW	PS		1 ½ pr butts PB 114 x 102 1 mortised lockset Best AT Function 1 kickplate 1 door stop wall mtd

Item	Door No.	Rm to Rm	Door Type	Frame Type	Label	Hardware Description
54	246	Rm 248 to Rm 246	SCW	PS		1 ½ pr butts 2BB 114 x 102 1 mortised lockset Best R Function 1 set sound seals 1 door bottom drop strip 1 narrow threshold 1 kick plate 1 door stop wall mtd
55	247	Rm 248 to Rm 247	SCW	PS		1 ½ pr butts PB 114 x 102 1 mortised lockset Best AT Function 1 kickplate 1 door stop wall mtd
56	249	Rm 232 to Rm 249	SCW	PS		1 ½ pr butts 2BB 114 x 102 1 mortised lockset Best AT Function 1 electric strike (latch release) 1 push button 1 door closer PA 1 kickplate 1 door stop wall mtd
57	249a	Rm 249 to Rm 249a	SCW	PS		1 ½ pr butts PB 114 x 102 1 mortised lockset Best D Function 1 kickplate 1 door stop wall mtd

3 Execution

3.1 INSTALLATION

- .1 Install hardware in accordance with manufacturer's printed instructions.
- .2 Re-adjust doors and hardware to function properly just prior to interim acceptance of building.

3.2 DEMONSTRATION

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

3.3 CLEANING

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .2 Clean hardware with damp cloth and approved non-abrasive cleaner, and polish hardware in accordance with manufacture's instructions.
- .3 Remove protective material from hardware items where present.
- .4 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

1 General

1.1 RELATED WORK

- .1 Section 05 50 00 - Metal Fabrications.
- .2 Section 08 11 14 - Steel Doors and Frames.
- .3 Section 08 14 10 - Wood Doors.
- .4 Glazing of:
 - .1 Windows - Section 08 50 50 .
 - .2 Framed mirrors - Section 10 28 10.
- .5 Section 08 81 00 - Package Passer

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.
 - .2 CAN/CGSB-12.8-97 Insulating Glass Units.
 - .3 CAN/CGSB12.12-M90 Plastic Safety Glazing.
 - .4 CAN/CGSB-12.11-M90, Wired Safety Glass.
 - .5 CAN/CGSB-19.13-M87 Sealing Compound, One-Component, Silicone Base, Solvent Curing.
- .2 ASTM International:
 - .1 ASTM F1233 - 08 Standard Test Method for Security Glazing Materials And Systems.
- .3 HPW-TP-0500.03 - Transparent Materials For Use in Forced Entry or Containment Barriers.
- .4 Environmental Choice Program (ECP).
 - .1 CCD-045-95, Sealants and Caulking.
- .5 Glass Association of North America (GANA).
 - .1 GANA Glazing Manual - 50th Anniversary Edition (2008).
 - .2 Laminated Glazing Reference Manual, 2006 Edition.
- .6 ISO - International Standards Organization.
- .7 CIE - International Commission on Illumination.

1.3 SYSTEM DESCRIPTION

- .1 Performance Requirements:
 - .1 Provide continuity of building enclosure vapour and air barrier using glass and glazing materials as follows:
 - .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 acting normal to plane of glass to a design pressure for locality as measured in accordance with ANSI/ASTM E330.
 - .3 Limit glass deflection to 1/200 with full recovery of glazing materials.

1.4 SUBMITTALS

- .1 Submit shop drawings or catalogue illustrations of accessories in accordance with Section 01 01 50 - General Instructions for submittals.

- .2 Provide maintenance data for plastic glazing for incorporation into Operation and Maintenance Manual specified in Section 01 01 50 - General Instructions for closeout submittals.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 01 50 - General Instructions; Construction/Demolition Waste Management And Disposal clause.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.
- .5 Divert unused wood materials from landfill to either recycling, reuse or composting facility.

2 Products

2.1 GLASS MATERIALS

- .1 Float glass (annealed): to CAN/CGSB 12.3M, glazing quality of thickness indicated. Translucent, obscure surface where indicated.
- .2 Insulating glass units:
 - .1 Factory sealed double glazed units for doors: To CAN/CGSB 12.8M, double glazed sealed unit with two panes of 5 mm tempered safety glass to 22 mm total thickness.
 - .2 Factory sealed double glazed units for windows: nominal 22 mm overall thickness to CAN/CGSB-12.20-M, using float glass with Low-e coating on #2 surface, 13 mm separation with argon gas fill and certified with Insulated Glass Manufacturer's Association of Canada (IGMAC), glazed in accordance with manufacturer's instructions. Glass thickness to National and Local Building Code requirements and climatic conditions of project location.
 - .3 Sealed double glazed unit specified in para. 2.1.2.2 to conform to the following performance requirements, based on 6 mm glass thickness with Low E coating on #2 surface. Requirements will vary with thinner glass:
 - .1 Inter-cavity space thickness: 12 mm between inner and outer lights with low conductivity spacers.
 - .2 Inert gas fill: argon.
 - .3 U Factor (argon gas) Winter: 1.8 W/m² °K (0.29); Summer: 1.6 W/m² °K, (0.28).
 - .4 Visible light transmission: 68%.
 - .5 Visible light reflectance out: 11%.
 - .6 Visible light reflectance in: 12%.
- .3 Safety glass:
 - .1 To CAN2 12.1M, Type 2, tempered, Class B float of minimum 6 mm thickness, category I.
- .4 Wired glass: to CAN/CGSB 12.11M, type 1, square wire mesh style, 6 mm thick.
- .5 Silvered glass mirrors: to CAN/CGSB 12.5M, silvered, Type 1B (blue label), clear, 6.0 mm thick, unframed ground and polished edges and supported with tamperproof concealed fasteners. Mirror sizes as indicated.

- .6 Medical Storage Room 140 reception window glazing:
 - .1 Laminated security glazing: glass-clad polycarbonate, clear inner and outer lites of 3mm heat strengthened glass with a multiple polycarbonate core. Overall nominal thickness 20 mm, complying with the following standards:
 - .1 HPW-TP-0500, Forced Entry Level 3 and Ballistics Level B, .9mm (ballistics stoppage spall penetration).
 - .2 WMFL 30-Minute Attack Resistance.
 - .2 Package Pass-Thru: Specified in Section 08 81 00.
 - .3 Speaking port to para 2.3.1.
- .7 Admin Area 249 reception window glazing:
 - .1 Laminated annealed glass to CAN2 12.1M, of minimum 11.5 mm thickness (two layers of minimum 5 mm heat strengthened glass with 1.52 (0.060") mm PVB interlayer).
 - .2 Speaking port to para 2.3.1.

2.2 GLAZING AND SEALING COMPOUND MATERIALS

- .1 Sealant compound: glazing sealant: purpose made for glazing use, compatible with hermetically sealed insulating glass units sealants, colours selected by Departmental Representative where exposed to view.
- .2 Glazing tape: Preformed macro-polyisobutylene tape with continuous integral Neoprene shim, paper release, black colour, width x thickness recommended by sash manufacturer to suit installation.
- .3 Setting blocks: Setting blocks: Neoprene or EPDM, 80-90 Shore A durometer hardness to ASTM D 2240, to suit glazing method, glass light weight and area.
- .4 Spacer shims: neoprene, 40-60 Shore "A" durometer hardness as required.

2.3 ACCESSORIES

- .1 Speaking port: through glass mounted type, consisting of two circular 152 mm outside dia. perforated 14 ga stainless steel discs, through bolted.
 - .1 Perforations: 3 mm dia. holes spaced 10 mm apart each way. Holes in back plate offset 4.8 mm from front plate.
 - .2 Finish: exposed surfaces to ANSI No. 4, satin lustre.
 - .3 Fasteners: No 8 tamper resistant Torx flat head screws on secure side of room.
 - .4 Acceptable Products:
 - .1 Model 45-115-01-SD1 available from Securingcosmos.com.
 - .2 Metal Fab Services Ltd #820-SD.

3 Execution

3.1 WORKMANSHIP

- .1 Install products using the recommendations of manufacturers of glass, sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including those in the "GANA Glazing Manual".
- .2 Remove protective coatings and clean contact surfaces with solvent and wipe dry.
- .3 Apply primer-sealer to contact surfaces.
- .4 Place setting blocks as per manufacturer's instructions.
- .5 Install glass, rest on setting blocks, ensure full contact and adhesion at perimeter.
- .6 Install removable stops, without displacing tape or sealant.

- .7 Provide edge clearance of 3 mm minimum for glass in accordance with manufacturer's instructions.
- .8 Insert spacer shims to centre glass in space. Place shims at 600 mm oc and keep 6 mm below sight line.
- .9 Apply cap bead of clear silicone sealant at exterior void and between stop and glazing.
- .10 Apply sealant to uniform and level line, flush with sight line and tooled or wiped with solvent to smooth appearance.
- .11 Do not cut or abrade laminated, heat treated and tempered glass.

3.2 INSTALLATION: INTERIOR/EXTERIOR - DRY METHOD (TAPE AND TAPE)

- .1 Perform work in accordance with IGMAC and GANA Glazing Manual for glazing installation methods.
- .2 Cut glazing tape to length; install on glazing light. Seal corners by butting tape and sealing junctions with sealant.
- .3 Place setting blocks at 1/3 points, with edge block maximum 150 mm from corners.
- .4 Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
- .5 Install removable stops without displacing glazing tape. Exert pressure for full continuous contact.
- .6 Trim protruding tape edge.
- .7 Exterior glazing: fill gaps between light and applied stop with sealant to depth equal to bite on glazing, to uniform and level line.

3.3 SECURITY GLAZING INSTALLATION

- .1 Install security laminated glass as indicated on drawings. Install using 25 x 25 x 4.8 mm steel angles specified in Section 05 50 00. Where glass is installed on secure side of rebate frame use Robertson head screws to retain removable stops. Where glass is installed on attack side of rebate frame use security head screws to retain removable stops. Install screws into stops at 200 oc.

3.4 MIRROR INSTALLATION

- .1 Install mirrors where indicated and in accordance with manufacturer's instructions using approved adhesive or concealed clips fastened to plywood backing.

3.5 SPEAKING PORT INSTALLATION

- .1 Install speaking discs on each side of glazing. Ensure hole size in glass is 120 mm.

3.6 FINISHING

- .1 Immediately remove sealant and compound droppings from finished surfaces. Remove labels after work is completed.

END OF SECTION

1 General

1.1 RELATED WORK

- .1 Section 01 01 50 - General Instructions: Submittal Procedures clause and Construction/Demolition Waste Management And Disposal.
- .2 Section 07 92 10 - Caulking between frames and adjacent building components.
- .3 Section 08 11 14 - Steel Doors and frames.

1.2 REFERENCES

- .1 CAN/CGSB12.12-M90 Plastic Glazing.
- .2 CAN/CGSB-19.13-M87 Sealing Compound, One-Component, Silicone Base, Solvent Curing.

1.3 SYSTEM DESCRIPTION

- .1 Performance Requirements:
 - .1 Bullet resisting turnstile package passer designed to meet UL 792 Level 1, with full vision through unit, revolving inner package passer permitting passage of parcels from one side to another without breaching security.
 - .2 Size 610 mm wide x 450 mm high x 470 mm deep with 500 mm diameter inner rotating section. Inside dimensions: 275 mm wide x 356 mm high x 325 mm deep.
 - .3 UL 792 Level 1 glazing: 32 mm thickness with abrasion resistant coated acrylic.

1.4 SUBMITTALS

- .1 Submit product data or catalogue illustrations of accessories in accordance with Section 01 01 50.
- .2 Provide maintenance data for plastic glazing for incorporation into Operation and Maintenance Manual specified in Section 01 01 50.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 01 50 - General Instructions; Construction/Demolition Waste Management And Disposal clause.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.
- .5 Divert unused wood materials from landfill to either recycling, reuse or composting facility.

2 Products

2.1 MATERIALS

- .1 Plastic glazing: to CAN/CGSB12.12-M, clear acrylic sheet, 32 mm thick, light transmission of 82% minimum. Abrasion resistance test to ASTM D1044, taber abrasion wheel (100 cycles) with maximum 0.8% haze.

- .2 Particle board: to CAN3-0188.1, sanded faces.
- .3 Laminated plastic for flatwork: to CAN/CSA-A172, Grade GP, Standard Duty, 1.15 mm thick for horizontal surfaces.
- .4 Aluminum sections: extruded, channel shaped to retain plastic panels.

2.2 PACKAGE PASSER

- .1 Security package passer designed to UL 792 Level 1 with 32 mm SAR coated acrylic panels forming outer box and inner rotating box. Inner box mounted to ball bearing mechanism to permit rotation of inner box and forth motion for package passer function. Acrylic glazing mounted to particle board top and bottom panel with aluminum channels. Top and bottom particle board panels laminate covered.
- .2 Acceptable Product: Insulgard Security Products Turnstile Package passer

3 Execution

3.1 WORKMANSHIP

- .1 Remove protective coatings and clean contact surfaces with approved cleaning solution and wipe dry.
- .2 Install turnstile package passer in accordance with manufacturer's instructions.
- .3 Apply cap bead of clear silicone sealant at perimeter void and between unit and wall, millwork surface.
- .4 Apply sealant to uniform and level line, flush with sightline and tooled or wiped with solvent to smooth appearance.

3.2 FINISHING

- .1 Immediately remove sealant and compound droppings from finished surfaces. Remove labels after work is completed.

END OF SECTION

1 General

1.1 RELATED WORK

- .1 Section 05 50 00 - Metal Fabricatiions.
- .2 Section 06 10 11 - Rough Carpentry, for wood blocking and backing.
- .3 Section 07 21 16 - Blanket Insulation for acoustic insulation.
- .4 Section 08 11 14 - Steel Doors and Frames.
- .5 Division 23 - Trim for recessed mechanical fixtures.

1.2 REFERENCED STANDARDS

- .1 ASTM C475 / C475M - 02(2007) Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- .2 ASTM C 754-09a, Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- .3 ASTM C840 - 08 Standard Specification for Application and Finishing of Gypsum Board.
- .4 ASTM C 919-08 Standard Practice for Use of Sealants in Acoustical Applications.
- .5 ASTM C1002 - 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 C1047 - 09 Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
- .7 ASTM C1178 / C1178M - 08 Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel.
- .8 ASTM C1396 / C1396M - 09a Standard Specification for Gypsum Board.
- .9 ASTM F1267-07, Standard Specification for Metal, Expanded, Steel.

1.3 DESIGN REQUIREMENTS

- .1 Maintain STC "Sound Transmission Class" ratings of installed partitions, as indicated on drawings.

1.4 SUBMITTALS

- .1 Submit samples and product data in accordance with Section 01 01 50 - General Instructions for Submittal Procedures.
 - .2 Submit samples and product data of corner and casing beads, insulating strip and expanded metal mesh.
-

1.5 DELIVERY, STORAGE AND HANDLING

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

1.6 SITE ENVIRONMENTAL REQUIREMENTS

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

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse, recycling, composting and anaerobic digestion in accordance with Section 01 01 50 - General Instructions for waste management.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Divert unused gypsum from landfill to gypsum recycling facility for disposal approved by Departmental Representative.
- .4 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.
- .5 Divert unused wood materials from landfill to recycling, composting facility approved by Departmental Representative.
- .6 Divert unused paint and caulking material from landfill to official hazardous material collections site approved by Departmental Representative.

2 Products

2.1 GYPSUM BOARD

- .1 Standard board: to ASTM C1396/C1396M, regular 12.7 mm and 15.9 mm thick, and type 'X' 16 mm thick, 1200 mm wide x maximum practical length, ends square cut, edges squared for bottom or base layer, beveled for top or finished layer, Ecologo certified minimum 25% recycled content.
-

- .2 Tile backing board: to ASTM C1178 composed of silicone treated gypsum core and fibreglass matte facings 13 mm thick, 1220 mm wide x 2440mm, FSR 0 and SDC 0 to CAN-ULC S102, non-combustible when tested to ASTM E 136. Acceptable Product meeting these requirements; DENS-GLASS Tile backer board.
- .3 Shaft wall liner: to ASTM C1396/C1396M, 25 mm thick gypsum board panel Type X, 600 mm wide, square edges.

2.2 FASTENINGS AND ADHESIVES

- .1 Steel screws: to ASTM C 1002, non corroding finish.
- .2 Laminating compound: to ASTM C 840, asbestos free.
- .3 Stud adhesive: to CAN/CGSB 71.25M.

2.3 ACCESSORIES

- .1 Casing beads, corner beads fill type: 0.5 mm base thickness commercial grade sheet steel to ASTM C1047 with ZF75 wiped zinc finish
- .2 Acoustic sealant: to ASTM C 919.
- .3 Paintable Sealant: acrylic base to CAN/CGSB 19.17M.
- .4 Joint compound: ASTM C 840, asbestos-free.
- .5 Insulating strip: rubberized, moisture resistant, 3 mm thick closed cell neoprene strip, 12 mm wide, with self sticking permanent adhesive on one face, lengths as required.
- .6 Metal furring runners, hangers, tie wires, inserts, anchors: to ASTM C 754.
- .7 Drywall furring channels: 0.5 mm core thickness galvanized steel channels for screw attachment of gypsum board.
- .8 Security mesh: specified in Section 05 50 00 - Metal Fabrications.

3 Execution

3.1 ERECTION

- .1 Do application and finishing of gypsum board in accordance with ASTM C 840 except where specified otherwise.
 - .2 Do application of gypsum sheathing in accordance with ASTM C 1280.
 - .3 Erect hangers and runner channels for suspended gypsum board ceilings in accordance with 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 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.
- .8 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.
- .9 Install wall furring for gypsum board wall finishes, shim furring to ensure tolerance levels are met, in accordance with ASTM C 840, except where specified otherwise.
- .10 Furr openings and around built-in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.
- .11 Furr beams, columns, pipes and exposed services where indicated.

3.2 GYP SUM BOARD APPLICATION

- .1 Do not apply gypsum board until framing and strapping, anchors, blocking, electrical and mechanical work are approved.
- .2 Apply single layer gypsum board to furring or framing using screw fasteners. Maximum spacing of screws 300 mm oc. Use double screws 30 mm apart, 300 mm oc pairs, for ceilings.
- .3 Apply type X gypsum board where indicated and for fire rated assemblies.
- .4 Apply 12 mm diameter bead of acoustic sealant to walls/ceilings, to perimeter of washrooms and rooms indicated with sound ratings, continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, ducts, pipes, in partitions where perimeter sealed with acoustical sealant. Seal butt joints and corners of panels. Seal exposed joint at perimeter of ceiling/wall junction with a paintable acrylic sealant.

3.3 ACCESSORIES

- .1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm oc.
 - .2 Install casing beads around perimeter of suspended gypsum board ceilings.
 - .3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated.
-

3.4 ACCESS DOORS

- .1 Install access doors and panels to electrical and mechanical fixtures specified in respective Sections.
- .2 Rigidly secure frames to furring or framing systems.

3.5 TAPING AND FILLING

- .1 Finish face panel joints and internal angles of exposed gypsum board with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces. Corner joints at perimeter of ceiling to be trimmed with casing bead with 10 mm joint and sealed with acrylic sealant.
- .2 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.
- .3 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with Association of the Wall and Ceiling Industries (AWCI) International Recommended Specification on Levels of Gypsum Board Finish:
 - .1 Level of finish for concealed surfaces:
 - .1 Level 1: Embed tape for joints and interior angles in joint compound. Surfaces to be free of excess joint compound; tool marks and ridges are acceptable.
 - .2 Level of finish for painted surfaces:
 - .1 Level 4: Embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges.
 - .4 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.
 - .5 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.
 - .6 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.
 - .7 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.

3.6 SCHEDULES

- .1 Construct fire rated assemblies where indicated.
- .2 Construct sound rated assemblies where indicated.

END OF SECTION

1 General

1.1 RELATED WORK

- .1 Section 01 01 50 - General instructions for Waste Management And Disposal.
- .2 Section 09 21 16 - Gypsum Board Assemblies.
- .3 Section 23 37 13 - Trim for recessed mechanical fixtures.
- .4 Section 26 50 00 - Trim for recessed light fixtures.

1.2 REFERENCE STANDARDS

- .1 ASTM C636/C636M-08 - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels
- .2 ASTM C635 / C635M - 07 Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- .3 ASTM E580 / E580M - 11b Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.
- .4 CAN-ULC S102-07 - Standard Test Method for Burning Characteristics of Building Materials and Assemblies.

1.3 DESIGN CRITERIA

- .1 Maximum deflection: 1/360th of span to ASTM C635 deflection test.
- .2 Seismic Performance: Provide acoustical ceiling system that has been engineered by an independent party and found to be compliant with the NBCC Part 4 or to 2003 International Building Code, Seismic Category D.

1.4 SAMPLES

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

1.5 MAINTENANCE MATERIALS

- .1 Deliver acoustical units for maintenance use amounting to 2% of gross ceiling area for each pattern and type required for project in accordance with Section 01 01 50. Store where directed and identify contents.
- .2 Maintenance materials to be same production run as installed materials.

1.6 WASTE MANAGEMENT AND DISPOSAL

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

- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.
- .5 Divert unused wood materials from landfill to either recycling, reuse or composting facility.

2 Products

2.1 MATERIALS

- .1 Intermediate duty system to ASTM C635.
 - .2 Basic materials for suspension system: commercial quality cold rolled steel zinc coated.
 - .3 Suspension system: non fire rated, made up as follows:
 - .1 Two directional exposed tee bar grid.
 - .4 Exposed tee bar grid components: shop painted satin sheen white. Components die cut. Main tee with double web, rectangular bulb and 25 mm rolled cap on exposed face. Cross tee with rectangular bulb; web extended to form positive interlock with main tee webs; lower flange extended and offset to provide flush intersection.
 - .5 Hanger wire: galvanized soft annealed steel wire, 2.6 mm diameter.
 - .6 Hanger inserts: purpose made.
 - .7 Accessories: splices, clips, wire ties, retainers and wall moulding flush reveal, to complement suspension system components, as recommended by system manufacturer.
 - .8 Acoustic units for suspended ceiling system, to CAN/CGSB-92.1M:
 - .1 Type 3, mineral composition with standard painted finish.
 - .2 Pattern D fissure size "F", non-directional, with tegular edge and 24 mm wide reveal across middle of tile.
 - .3 Flame spread rating of 25 or less.
 - .4 Smoke developed 50 or less.
 - .5 Noise reduction coefficient (NRC) designation of 0.50 to 0.60.
 - .6 STC rating: minimum 35.
 - .7 Light reflectance: minimum 75%.
 - .8 Edges: square.
 - .9 Colour: factory white finish.
 - .10 Size: Imperial 610 x 1220 x 19 mm thick.
 - .11 Shape: flat.
-

3 Execution

3.1 ACOUSTICAL CEILING INSTALLATION

- .1 Install suspension system to manufacturer's instructions and according to ASTM C636, and ASTM E580 for seismic restraint. Ensure that hangers do not obstruct or damage tile during removal and replacement of individual tiles.
- .2 Do not erect ceiling system until work above ceiling has been approved by Departmental Representative.
- .3 Lay out system according to reflected ceiling plan.
- .4 Ensure suspension system is co-ordinated with location of related components.
- .5 Install wall mould to provide correct level ceiling heights.
- .6 Completed suspension system to support super-imposed loads, such as lighting fixtures diffusers, grilles and speakers.
- .7 Support light fixtures diffusers with additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
- .8 Frame openings for light fixtures, air diffusers, speakers and at changes in ceiling heights.
- .9 Interlock cross members to main runners to provide rigid assembly.
- .10 Make finished ceiling systems square to adjoining walls and level to tolerance of 1:1000.
- .11 Install acoustical panels in ceiling suspension system.
- .12 Scribe acoustical units to fit adjacent work. Butt joints tight, install wall mould at junction of acoustical ceilings and other construction to entire length of such junctions.
- .13 Provide tegular edge at all edges of tile cut to size and supported by wall angles. Duplicate tegular edge, in depth and width profile, using sharp utility knife and steel straight edge. Paint exposed cut edges white to match tile finish with approved paint.

3.2 CLEANING

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

END OF SECTION

1 General

1.1 RELATED WORK

- .1 Section 01 01 50 - General Instructions: Submittal Procedures clause and Construction/Demolition Waste Management And Disposal.
- .2 Section 03 35 00 - Concrete Finishing.
- .3 Section 14 24 23 - Electric Traction Elevator.

1.2 REFERENCE STANDARDS

- .1 ASTM D2047 - 11 Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.
- .2 ASTM E648 - 10e1 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
- .3 ASTM E662 - 09 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
- .4 ASTM E682 - 92(2011) Standard Practice for Liquid Chromatography Terms and Relationships.
- .5 ASTM F710 - 11 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- .6 ASTM F970 - 07(2011) Standard Test Method for Static Load Limit.
- .7 ASTM F1303 - 04(2009) Standard Specification for Sheet Vinyl Floor Covering with Backing.
- .8 ASTM F1869 - 11 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- .9 ASTM F2034 - 08 Standard Specification for Sheet Linoleum Floor Covering.
- .10 CAN-ULC S102-07 - Standard Test Method for Burning Characteristics of Building Materials.

1.3 SUBMITTALS

- .1 Provide maintenance data for resilient flooring for incorporation into maintenance manual specified in Section 01 01 50.
 - .2 Submit duplicate 152 x 76 mm samples of resilient flooring for colour selection by Departmental Representative in accordance with Section 01 01 50.
-

1.4 ENVIRONMENTAL REQUIREMENTS

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

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 01 50 - General Instructions; Construction/Demolition Waste Management And Disposal clause.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.
- .5 Divert unused wood materials from landfill to either recycling, reuse or composting facility.

2 Products

2.1 MATERIALS

- .1 Sheet vinyl flooring (VS-): nonlayered and nonbacked homogeneous 1.83 m wide, having a nominal total thickness of 2.0 mm consisting of through-grain vinyl granules with pattern and color uniformly distributed throughout entire thickness. The pattern shall merge subtle color accents with a detailed terrazzo-like visual providing a monolithic appearance. Vinyl sheet flooring to meet wear-layer gauge and composition, flexibility, indentation, and solvent resistance requirements of Federal Specification L-F-475a(3), Type II, Grade A. Flooring to consist of pvc resins, plasticisers, stabilizers, and fillers formulated to resist wear, chemical attack and scuffing; conforming to the following additional minimum requirements.
 - .1 Full load limit: 151 kg.
 - .2 Static load limit to ASTM F970: 363 kg/cm² short term and 57 kg/cm² long term.
 - .3 Gloss: 60° specular, 16.
 - .4 Wear resistance: 58,000 cycles By Taber Abrader with H18 and 1,000 gram weight.
 - .5 Fire test data: ASTM E648-0.45 watts/cm² or more, Class 1; ASTM E662 smoke test, 450 or less;
 - .6 Slip resistance: to ASTM D2047 - Coefficient of slip resistance minimum 0.5.
 - .2 Resilient base: top set coved and toeless, 3 mm thick, rubber composition 150 mm high including premoulded end stops and premoulded external corners, of colour selected by Departmental Representative.
 - .3 Slip Resistant Sheet Vinyl Safety Flooring for rooms scheduled (VS-SR-) : To ASTM F1303, Type 2, Grade 1, sheet vinyl flooring with moisture resistant backing Class A. Static coefficient of slip resistance in excess of 0.6 when tested in accordance with ASTM D2047, colour selected by Departmental Representative. Acceptable Product: Altro Designer 25 Safety Flooring.
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- .4 Provide vinyl rod produced by the manufacturer of the resilient flooring and intended for heat welding of seams. Color compatible with field color of flooring as selected by Departmental Representative.
- .5 Colors will be selected from the range currently available from the resilient flooring manufacturer. Up to a maximum of four different colours will be selected.
- .6 Primers and adhesives: waterproof, of types recommended by resilient flooring manufacturer for specific material on applicable substrate, on grade.
- .7 Underlayment and Patching Compounds: Use only grey colored Portland cement based underlayments; patching compounds are used for filling cracks, holes and leveling. White gypsum materials are not acceptable.
- .8 Edge strips: PVC extruded, smooth, with lip to extend under floor finish, shoulder flush with top of adjacent floor finish. Provide cove former and cap seal at flash cove base.
- .9 Resilient stair treads and intermediate landing, upper and lower floors:
 - .1 Treads: rubber, 41 mm square vertical nosing, full tread depth, full tread width, 6.4 mm thick, raised diamond or radial studded surface pattern, of solid integral colour and with one or two contrasting carborundum/contrasting strips set into rubber tread as selected by Departmental Representative from manufacturer's standard range of colours.
 - .2 Landings: rubber tile to CSA A126.4, homogeneous plain pattern, raised diamond or radial studded surface design of 1 mm height, 3.5 mm thick 905 x 905 mm size, in standard colour selected by Departmental Representative .
- .10 Sealer: type recommended by resilient flooring material manufacturer for material type and location.

3 Execution

3.1 INSPECTION

- .1 Ensure floors are dry and acceptable to manufacturer's recommendations.
- .2 Perform moisture condition test in each areas. A minimum of 1 test per 100 m², prior to installation. Moisture emissions from concrete subfloors must not exceed 1.4 kg per 93 m² per 24 hours for acrylic adhesive and polyurethane adhesive via the Calcium Chloride Test Method (ASTM F1869). If subfloor moisture exceeds the allowable maximum for installing flooring, contact the flooring distributor for a solution.

3.2 SUB-FLOOR PREPARATION

- .1 Remove ridges and bumps.
 - .2 Meet ASTM F710 Standard for Concrete or other monolithic floors.
 - .3 Maintain air temperature and structural base temperature at flooring installation area between 18C and 26C for 48 hours before, during and 24 hours after installation.
-

- .4 Perform alkali tests to ensure pH levels of concrete subfloor surface do not exceed pH 9.9. Concrete must be neutralized if above pH 9.9.
- .5 Do not proceed with work until results of moisture condition and/or pH tests are acceptable.
- .6 Apply subfloor filler to low spots and cracks to achieve floor level to a tolerance of 1:1000, allow to cure. Do not install sheet flooring over gypsum-based toppings, underlayments, leveling or patching compounds.

3.3 SHEET VINYL FLOORING APPLICATION

- .1 Install sheet vinyl flooring and safety flooring in accordance with the current manufacturer's installation instructions with heat welded seams.
- .2 Apply adhesive uniformly using recommended trowel. Do not spread more adhesive than can be covered by flooring before initial set takes place.
- .3 Lay flooring in single piece with pattern parallel to building lines.
- .4 Drains: Fit sheet vinyl flooring and mechanically fasten to drain outlets to ensure a permanent, watertight installation.
 - .1 Install round flash clamping ring type drains to accommodate vinyl flooring. Install drains to fit flush with surrounding floor surface.
- .5 Cut flooring neatly around fixed objects.
- .6 Continue flooring over areas which will be under built-in furniture.
- .7 Terminate flooring at centerline of door in openings where adjacent floor finish or colour is dissimilar.
- .8 Install pvc reducer strips at unprotected or exposed edges where flooring terminates.

3.4 RUBBER TREADS AND LANDINGS

- .1 Install resilient stair treads on full width of stair tread and rubber tile on intermediate landing and upper and lower stairhall floors using polyurethane adhesive, in accordance with manufacturer's instructions.

3.5 ELEVATOR CAB

- .1 Install rubber tile floor in elevator cab.

3.6 BASE APPLICATION

- .1 Set base in adhesive tightly against wall, floor surfaces. Use lengths as long as practicable and not less than 500 mm long.
 - .2 Install straight and level to maximum variation of 1:1000.
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- .3 Scribe and fit to door frames and other obstructions. Use premoulded end pieces at flush doorframes.
- .4 Miter internal corners. Use premoulded sections or special wrap around type base for external corners.
- .5 Use coved type base as scheduled.

3.7 CLEANING AND SEALING

- .1 Cleaning: Remove temporary coverings and protection of adjacent work areas.
 - .1 Repair or replace damaged installed products.
- .2 Clean installed products in accordance with manufacturer's instructions prior to occupancy.

3.8 PROTECTION OF FINISHED WORK

- .1 Cover and protect finished installation from damage from other trades using a non-staining, temporary floor protection system, such as a reusable textured plastic sheeting.
- .2 Protection:
 - .1 Protect the newly installed flooring from foot traffic for 24 hours and heavy rolling traffic for 72 hours.
 - .2 Protect installed product and finish surfaces from damage during construction.

END OF SECTION

1 General

1.1 RELATED WORK

- .1 Section 09 65 18 - Resilient Flooring.

1.2 REFERENCES

- .1 The Carpet and Rug Institute and The Canadian Carpet Institute.
- .2 Electrostatic Propensity of Carpets, AATCC 134-2006, AATCC.
- .3 Colorfastness to Light, AATCC 16-2004, AATCC.
- .4 ASTM D1055-09, Specification for Flexible Cellular Materials - Latex Foam.
- .5 ASTM D1335-11, Test Method for Tuft Bind of Pile Floor Coverings.
- .6 ASTM D1423-02(2008), Test Method for Twist in Yarns by the Direct-Counting Method.
- .7 ASTM E84-12, Standard Method for Surface Burning Characteristics of Building Materials.
- .8 CAN/CGSB-4.2-5.2-M87, Linear density of Yarns in SI Units.
- .9 CAN/CGSB-4.2-18.3-M90/ISO 105-B02:1988, Textiles - Tests for Colour fastness - Part B02: Colourfastness to Artificial Light: Xenon Arc Fading Lamp Test.
- .10 CAN/CGSB-4.2-27.6-M91, Nov. 2004, Flame Resistance - Methenamine Tablet Test for Textile Floor Coverings.
- .11 CAN/CGSB-4.129-93, Carpet for Commercial Use.
- .12 CGSB 20-GP-23M-78, Cushion, Carpet, Flexible Polymeric Material.
- .13 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Materials.

1.3 SUBMITTALS

- .1 Submit product data sheet for each carpet tile, adhesive, concrete floor sealer and Ecologo products in accordance with Section 01 01 50.
 - .1 Indicate recycled/reclaimed content of each component of carpet tile.
 - .2 Indicate which recycling program (supplying mill or fibre producer) the carpet tile is eligible for and provide program parameters.
 - .3 For adhesives, indicate VOC in g/L during application and curing.
- .2 Submit samples to Departmental Representative for review, duplicate carpet tile samples in each colour selected in accordance with Sections 01 01 50.
- .3 Design Data, Test Reports Certificates Manufacturer's Instructions and Field Reports
 - .1 Submit a report by an independent testing laboratory verifying tuft bind meets requirements specified when tested to ASTM D1335.

.2 Submit WHMIS MSDS - Material Safety Data Sheets acceptable to Labour Canada and Health Canada for carpet adhesive. Indicate VOC content.

.4 Provide maintenance data for carpet tile for incorporation into Operation and Maintenance Manual specified in Section 01 01 50.

.1 Include information on recycling of carpet or carpet tile including manufacturer's reprocessing program. Indicate which portions of materials are recyclable.

1.4 MAINTENANCE MATERIALS

.1 Deliver 10 m² of each type, pattern and colour of carpet tile required for this project for maintenance use, unless directed otherwise by Departmental Representative. Store where directed.

.2 Maintenance materials to be full size piece of same production run as installed materials.

1.5 ENVIRONMENTAL CONDITIONS

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

1.6 ENVIRONMENTAL CHOICE PROGRAM

.1 Provide adhesive products bearing the 'Ecologo' of the Environmental Choice Program, Department of the Environment, Canadian Environmental Protection Act, Environmental Choice Product Guidelines ECP/PCE-44 for Adhesives.

1.7 GUARANTEE

.1 Provide a manufacturer's written material guarantee stating that carpet tile will remain free of manufacturing defects and deterioration for a period of fifteen years. Non-pro-rated guarantee.

2 Products

2.1 MATERIALS

.1 Carpet tile: to CAN/CGSB-4.129, except as noted.

.1 Prequalification: compliance with Health Canada regulations under "Hazardous Products (Carpet) Regulations", Part II of the Schedule, tested to CAN/ULC-S102, maximum flame spread rating 300, maximum smoke developed classification 500.

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

.3 Carpet tile: Carpet tile characteristics: minimum 55% recycled content.

.1 Size: 500 x 500 mm minimum.

.2 Type: tufted, textured loop, and/or tufted tip-sheared.

.3 Face yarn fibre type: 100% first quality, BCF branded Nylon, permanent antistatic and permanent soil hiding properties, part of a construction and performance certification program from the fibre manufacturer.

- .4 Colour fastness: AATCC - 16E, minimum L5.
 - .5 Yarn weight: 678 g/m² minimum.
 - .6 Gauge: 1/10 = 39.5/10 cm minimum.
 - .7 Density: 10.5 kilotex/cm² minimum.
 - .8 Tuft bind: 5.9 kg.
 - .9 Dimensional stability: Aachener Test - Pass.
 - .10 Backing: vinyl composite.
 - .1 Recycled content: minimum 55%.
 - .2 Mill applied adhesive.
 - .11 Permanent static control: to AATCC #134, maximum 3000 V at 20%RH and 22°C.
 - .12 Flame Spread: maximum 300.
 - .13 Smoke Developed: maximum 500.
 - .14 Toxicity: pass CRI IAQ Testing Program Green Label.
 - .15 Soil Resistance: protective anti-soil treatment heat applied by carpet mill.
 - .16 Pattern and colour: as selected by Departmental Representative.
- .4 Carpet tile adhesive: water based.
- .1 Acrylic release type: low VOC, recommended by carpet tile manufacturer.

3 Execution

3.1 WORKMANSHIP

- .1 Install carpet tile after finishing work is completed.
- .2 Finish installation to present smooth wearing surface free from raised corners or edges.
- .3 Ensure colour, pattern and texture match within any one area.

3.2 SUB-FLOOR TREATMENT

- .1 Clean floor to receive carpet tiles in accordance with carpet manufacturer's instructions.
- .2 Remove sub-floor ridges and bumps. 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. Prohibit traffic until filler cured.
- .4 Seal concrete sub-floor where required by carpet tile manufacturer's instructions.

3.3 INSTALLATION

- .1 HEPA Vacuum finished area with commercial grade vacuum with a beater bar head.
 - .2 Lay out guide lines on floor in accordance with manufacturer's instructions adhesive to entire floor areas designated for carpet tile. Install carpet tile as scheduled
 - .3 Install carpet tiles in accordance with manufacturer's strict instructions with the direction of nap running in same direction to produce a monolithic appearance.
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- .4 Lay flooring with joints parallel to building lines to produce symmetrical tile pattern. Border tiles minimum half tile width.
- .5 Lay flooring tight to non-removable built-in fixtures without interrupting floor pattern.
- .6 Terminate flooring at centerline of door in openings where adjacent floor finish is dissimilar. Install edge strips at unprotected or exposed edges where carpet tile terminates.

3.4 PROTECTION OF FINISHED WORK

- .1 Vacuum carpet tile clean.

END OF SECTION

1 General

1.1 RELATED WORK

- .1 Section 01 01 50 - Submittal Procedures, Waste Management And Disposal.
- .2 Section 05 50 00 - Metal Fabrications.
- .3 Section 06 23 00 - Architectural Woodwork and Finish Carpentry.

1.2 DESCRIPTION OF WORK

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

1.3 REFERENCES

- .1 American Society for Testing and Materials (ASTM):
 - .1 ASTM D 3960-05, Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings.
- .2 Architectural Painting Specifications Manual, Master Painters Institute (MPI).
- .3 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings) of the Environmental Protection Agency (EPA).
- .4 National Fire Code of Canada.

1.4 QUALITY ASSURANCE

- .1 Qualified journeymen who have a "Tradesman Qualification Certificate of Proficiency" shall be engaged in painting work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with trade regulations.
 - .2 Conform to latest MPI requirements for interior painting work including preparation and priming.
 - .3 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) shall be in accordance with MPI Painting Specification Manual "Approved Product" listing and shall be from a single manufacturer for each system used.
 - .4 Other paint materials such as linseed oil, shellac, turpentine, etc. 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 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Departmental Representative.
 - .6 Standard of Acceptance:
 - .1 Walls: No defects visible from a distance of 1000 mm at 90° to surface.
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.2 Bulkheads/Ceilings: No defects visible from at 45° to surface when viewed using final lighting source.

.3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

1.5 SAMPLES

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

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

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

.4 Use 10 mm D-Fir plywood for finishes over natural wood surfaces. Use 12.5 mm gypsum board for finishes over smooth surfaces.

1.6 DELIVERY, STORAGE AND HANDLING

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

.2 Labels shall clearly indicate:

.1 Manufacturer's name and address.

.2 Type of paint or coating.

.3 Compliance with applicable standard.

.4 Colour number in accordance with established colour schedule.

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

.4 Provide and maintain dry, temperature controlled, secure storage.

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

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

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

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

.9 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Departmental Representative. After completion of operations, return areas to clean condition to approval of Consultant.

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

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

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

1.7 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

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

1.8 SITE REQUIREMENTS

- .1 Heating, Ventilation and Lighting:
 - .1 Ventilate enclosed spaces in accordance with Section 01 01 50.
 - .2 Perform no painting work unless adequate and continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above 10 ° C for 24 hours before, during and after paint application until paint has cured sufficiently.
 - .3 Where required, provide continuous ventilation for seven days after completion of application of paint.
 - .4 Coordinate use of existing ventilation system with Departmental Representative and ensure its operation during and after application of paint as required.
 - .5 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.
 - .6 Perform no painting work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted. Adequate lighting facilities is provided by General Contractor.
 - .2 Temperature, Humidity and Substrate Moisture Content Levels:
 - .1 Unless specifically pre-approved by the specifying body, Paint Inspection Agency and the applied product manufacturer, perform no painting work when:
 - .1 Ambient air and substrate temperatures are below 10 ° C.
 - .2 Substrate temperature is over 32 ° C unless paint is specifically formulated for application at high temperatures.
 - .3 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.
 - .2 Perform no painting work when the maximum moisture content of the substrate exceeds:
 - .1 15% for wood.
 - .2 12% for gypsum board.
 - .3 Conduct moisture tests using a properly calibrated electronic Moisture Meter.
 - .4 Test concrete, masonry and plaster surfaces for alkalinity as required.
 - .3 Surface and Environmental Conditions:
 - .1 Apply paint finish only in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
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- .2 Apply paint only to adequately prepared surfaces and to surfaces within moisture limits noted herein.
- .3 Apply paint only when previous coat of paint is dry or adequately cured.

.4 Additional Interior Application Requirements:

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

1.9 SCHEDULING OF WORK

- .1 Submit work schedule for various stages of painting to Departmental Representative for approval. Submit schedule minimum of 48 hours in advance of proposed operations.
- .2 Obtain written authorization form Departmental Representative for any changes in work schedule.
- .3 Schedule painting operations to prevent disruption of occupants in and about the occupied floors in building.

1.10 WASTE MANAGEMENT

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Waste Management And Disposal.
 - .2 Non-water based opaque and transparent finishes and related materials (thinners, solvents, etc.) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.
 - .3 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
 - .4 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
 - .5 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into ground the following procedures shall be strictly adhered to:
 - .1 Retain cleaning water for water-based materials to allow sediments to be filtered out.
 - .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
 - .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
 - .4 Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.
 - .5 Empty paint cans are to be dry prior to disposal or recycling (where available).
 - .6 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.
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- .7 Set aside and protect surplus and uncontaminated finish materials: Deliver to or arrange collection by employees, individuals, or organizations for verifiable re-use or re-manufacturing.
- .8 Close and seal tightly partly used sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.

2 Products

2.1 MATERIALS

- .1 Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.
- .2 Paint materials for paint systems shall be products of a single manufacturer.
- .3 Only qualified products with E2, E3 "Environmentally Friendly" rating are acceptable for use on this project.
- .4 Water-borne paints and stains, recycled water-borne surface coatings and water borne varnishes must meet a minimum "Environmentally Friendly" E2 rating.

2.2 COLOURS

- .1 Departmental Representative will provide Colour Schedule after Contract award.
- .2 Where specific products are available in a restricted range of colours, selection will be based on the limited range.
- .3 Second coat in a three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.

2.3 MIXING AND TINTING

- .1 Perform colour tinting operations prior to delivery of paint to site. On-site tinting of painting materials is allowed only with Departmental Representative's written permission.
 - .2 Paste, powder or catalyzed paint mixes shall be mixed in strict accordance with manufacturer's written instructions.
 - .3 Where thinner is used, addition shall not exceed paint manufacturer's recommendations. Do not use kerosene or any such organic solvents to thin water-based paints.
 - .4 Thin paint for spraying according in strict accordance with paint manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to Departmental Representative.
 - .5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.
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2.4 GLOSS/SHEEN RATINGS

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

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

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

2.5 INTERIOR PAINTING SYSTEMS

- .1 Hardwood plywood and solids at casework and casings:
 - .1 INT 6.4J Polyurethane varnish G4 finish.
- .2 Gypsum Board wall surfaces for Offices:
 - .1 INT 9.2A Latex G3 finish (over latex sealer).
- .3 Gypsum Board wall surfaces for Storage, Washrooms and Service rooms etc:
 - .1 INT 9.2A Latex G5 finish (over latex sealer).
- .4 Gypsum Board ceilings surfaces:
 - .1 INT 9.2A Latex G1 finish (over latex sealer).
- .5 Plywood painted wall surfaces:
 - .1 INT 6.4P - Fire retardant, pigmented G1 gloss level coating (ULC rated).
 - .2 Acceptable product:
 - .1 First layer: Sealer over plywood - Safecoat 725 Sealer/overcoater.
 - .2 Second layer: Safecoat Intumescent Coating to DFT of 5 mils minimum.
 - .3 Top layer: Sealer over plywood - Safecoat 725 Sealer/overcoater. (For cleanability)
- .6 Metal doors, PS frames, steel columns to u/s of beams and miscellaneous metal items etc.
 - .1 INT 5.1R High performance architectural latex coating G4 gloss level.
 - .2 INT 5.3B Waterborne light industrial G4 gloss level.
- .7 Exposed metal roof deck, platform floor deck, joists and beams metal items etc.
 - .1 INT 5.3F Alkyd dry fall finish.

2.6 EXTERIOR PAINTING SYSTEMS

- .1 Exterior steel doors and frames:
 - .1 EXT 5.3B - Alkyd G4 gloss level finish.
- .2 Structural Steel columns and Metal Fabrications:
 - .1 EXT 5.1D - Alkyd G4 gloss level finish (over alkyd primer).
- .3 Steel columns, O.H. door frames, misc metal items:
 - .1 EXT 5.1T - Polyurethane, pigmented finish (over self-priming epoxy).

3 Execution

3.1 GENERAL

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

3.2 EXISTING CONDITIONS

- .1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Departmental Representative damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.
- .2 Conduct moisture testing of surfaces to be painted using a properly calibrated electronic moisture meter. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.
- .3 Maximum moisture content as follows:
 - .1 Gypsum Board: 12%.
 - .2 Wood: 15%.

3.3 PROTECTION

- .1 Protect interior and exterior building surfaces not to be painted from paint spatters, markings and other damage. If damaged, clean and restore such surfaces as directed by Departmental Representative.
 - .2 Cover or mask windows and other ornamental hardware adjacent to areas being painted to prevent damage and to protect from paint drops and splatters. Use non-staining coverings.
 - .3 Protect items that are permanently attached such as Fire Labels on doors and frames.
 - .4 Protect factory finished products and equipment.
 - .5 Remove electrical cover plates, light fixtures, surface hardware on doors, accessories and other surface mounted equipment, fittings and fastenings prior to undertaking any
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painting operations by General Contractor. Securely store and re-install items after painting is completed by General Contractor.

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

3.4 CLEANING AND PREPARATION

- .1 Clean and prepare surfaces in accordance with MPI Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
 - .1 Remove dust, dirt, and other surface debris by vacuuming, wiping with dry, clean cloths.
 - .2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.
 - .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
 - .4 Allow surfaces to drain completely and allow to dry thoroughly.
 - .5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.
 - .6 Use trigger operated spray nozzles for water hoses.
 - .7 Many water-based paints cannot be removed with water once dried. However, minimize the use of kerosene or any such organic solvents to clean up water-based paints.
 - .2 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.
 - .3 Where possible, prime surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.
 - .1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas.
 - .2 Apply wood filler to nail holes and cracks.
 - .3 Tint filler to match stains for stained woodwork.
 - .4 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.
 - .5 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes, or vacuum cleaning.
 - .6 Touch up of shop primers with primer as specified in applicable section. Major touch-up including cleaning and painting of field connections, welds, rivets, nuts, washers, bolts, and damaged or defective paint and rusted areas, shall be by supplier of fabricated material.
 - .7 Do not apply paint until prepared surfaces have been accepted by Departmental Representative.
-

3.5 APPLICATION

- .1 Method of application to be as approved by Departmental Representative. Apply paint by brush, roller, airless sprayer. Conform to manufacturer's application instructions unless specified otherwise.
 - .2 Brush and Roller Application:
 - .1 Apply paint in a uniform layer using brush and/or roller of types suitable for application.
 - .2 Work paint into cracks, crevices and corners.
 - .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
 - .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces shall be free of roller tracking and heavy stipple unless approved by Consultant Departmental Representative.
 - .5 Remove runs, sags and brush marks from finished work and repaint.
 - .3 Spray application:
 - .1 Provide and maintain equipment that is suitable for intended purpose, capable of properly atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
 - .2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
 - .3 Apply paint in a uniform layer, with overlapping at edges of spray pattern.
 - .4 Brush out immediately all runs and sags.
 - .5 Use brushes 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 and only when specifically authorized by Departmental Representative.
 - .5 Apply coats of paint as a 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 Unless otherwise specified, paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as noted otherwise.
- .2 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.
- .3 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.
- .4 Do not paint over nameplates.
- .5 Keep sprinkler heads free of paint.
- .6 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matt black paint.

3.7 FIELD QUALITY CONTROL

- .1 Field inspection of painting operations to be carried out by independent inspection firm as designated by Departmental Representative.
- .2 Advise Departmental Representative when each applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.
- .3 Co-operate with inspection firm and provide access to all areas of the work.

3.8 RESTORATION

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

END OF SECTION

1 General

1.1 RELATED WORK

- .1 Section 05 55 00 - Metal Fabrications, for Fabricated metal rough-in components.

1.2 REFERENCE STANDARDS

- .1 ASTM A269-08, Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- .2 ASTM A 167-(2009), Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- .3 CSA W59-03(R2008), Welded Steel Construction (Metal Arc Welding).
- .4 ASTM A666 - 03 Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
- .5 ASTM A276-08a Standard Specification for Stainless Steel Bars and Shapes.

1.3 SUBMITTALS

- .1 Submit samples in accordance with Section 01 01 50 Section 01 01 50, General Instructions for Submittals.
- .2 Submit Product Data in accordance with Section 01 01 50, General Instructions for Submittals.
 - .1 Indicate, by large scale details, all materials, finishes, dimensions, anchorage and assembly.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Packing, Shipping, Handling and Unloading:
 - .1 Deliver, store, handle and protect materials in accordance with Section 01 01 50 - General Instructions, Common Product Requirements clause.
- .2 Storage and Protection:
 - .1 Cover exposed stainless steel surfaces with pressure sensitive heavy protection paper or apply strippable plastic coating, before shipping to job site.
 - .2 Leave protective covering in place until final cleaning of building. Provide instructions for removal of protective covering.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 01 50 - General Instructions for Construction/Demolition Waste Management And Disposal clause.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal packaging material in appropriate on-site containers for recycling in accordance with Waste Management Plan.
-

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

2 Products

2.1 MATERIALS

- .1 Sheet steel: commercial grade, stretcher levelled sheet steel to ASTM A 653/A653M with Z275 zinc coating.
- .2 Stainless steel sheet: to ASTM A666 type 302 or 304 with No. 4 finish, minimum 0.75 mm thick.
- .3 Stainless steel tubing: ASTM A 269, ANSI Type 304, commercial grade, seamless welded, 1.2 mm wall thickness.
- .4 Fasteners: screws and bolts hot dip galvanized. Expansion shields fibre, lead or rubber as recommended by fixture manufacturer for component and its intended use.

2.2 FINISHES

- .1 Stainless steel: to ANSI No. 4 satin lustre finish.

2.3 FIXTURES

- .1 Surface mounted toilet tissue dispenser: double roll type as scheduled, chrome plated steel frame with hood, capacity of 500 double ply roll; roll under spring tension for controlled delivery.
 - .2 Paper Towel dispenser: 0.7 mm thick stainless steel cabinet, universal surface mounted, dispensing 150 dia x 250 roll or single fold towels, approximately 270 long x 190 high and 150 deep, with lock.
 - .3 Grab bars: 32 mm dia x 1.2 mm wall tubing of stainless steel, 75 mm diameter wall flanges, concealed screw attachment, flanges welded to tubular bar, provided with steel back plates and all accessories. Grab bar material and anchorage to withstand downward pull of 2.2 kN. Length 900 mm on side walls and 300 mm on back walls at water closets.
 - .4 Wall mounted soap dispenser: surface mounted stainless steel rectangular tank, size 180 wide x 150 high, with 1.2 L capacity, corrosion resistant push-in valve dispenses viscous lotion soaps, synthetic detergents, vegetable oil liquid soaps and antiseptic soaps, stainless steel piston and spout assembly, locked hinged fillertop, 84 mm spout to wall dimension.
 - .5 Waste receptacles for washrooms and at counters with sinks: purpose made plastic container with hinged lid, free standing.
 - .6 Mop rail: (for Janitor Room) extruded aluminum with three (3) rubber gripper inserts.
 - .7 Coat hooks: stainless steel with 50 mm max projection, two fasteners per hook
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- .8 Mirrors: No. 1 quality 6 mm laminated float glass, electrolytically silverplated, with 10 year guarantee against silver spoilage; sizes as indicated, framed in type 304, 19 mm x 19 mm heavy gauge stainless steel angle frame, one piece roll formed type. Corners of frame heliac welded and ground and polished smooth. Provide with companion vandal-proof concealed fastening, locking fasteners and wall hangers.
 - .1 Corners: protected by friction-absorbing filler strips.
 - .2 Back: protected by full-size, shock-absorbing, water-resistant, nonabrasive, 5mm thick polyethylene padding.

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 finishes to prevent electrolysis.
- .6 Hot dip galvanize ferrous metal anchors and fastening devices to ASTM A123.
- .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 or rough-in measurements as required.
- .9 Provide steel anchor plates and components for installation on steel stud walls and building framing.

3 Execution

3.1 INSTALLATION

- .1 Install and secure fixtures 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 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.

3.2 LOCATION AND QUANTITY

- .1 Locate accessories in washrooms, Janitor rooms, at counters with sinks and where indicated. Exact locations to be determined by Departmental Representative.

END OF SECTION

1 General

1.1 RELATED WORK

- .1 Section 05 55 00 - Metal Fabrications.

1.2 REFERENCE STANDARDS

- .1 ASTM B209 - 10, Aluminum and Aluminum-Alloy Sheet and Plate.

1.3 SUBMITTALS

- .1 Submit samples in accordance with Section 01 01 50 Section 01 01 50, General Instructions for Submittals.
- .2 Submit Product Data in accordance with Section 01 01 50, General Instructions for Submittals.
 - .1 Indicate, by large scale details, all materials, finishes, dimensions, anchorage and assembly.

1.4 QUALITY ASSURANCE

- .1 Construct mock-ups in accordance with Section 01 01 50 - General Instructions for Quality Control.
 - .1 Provide mock-up of one window/wall assembly including components as follows:
 - .1 Exterior wall with aluminum window and aluminum sill, solar shade, exterior sheathing, waterproofing membrane at window opening, air barrier, wood trim and metal panel trim.
 - .2 Mock-up will be used:
 - .1 To judge workmanship, substrate preparation, integration of solar shade with window, blocking, and trims and material application.
 - .3 Locate mockup where directed by Departmental Representative.
 - .4 Mockup may be constructed as part of the building or as a separate 1800 w x 2400 high wall panel separate from building.
 - .5 Allow 48 hours for inspection of mock-up before proceeding with 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 if constructed as part of the building and make revisions to mockup as directed by Departmental Representative.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Packing, Shipping, Handling and Unloading:
 - .1 Deliver, store, handle and protect materials in accordance with Section 01 01 50 - General Instructions, Common Product Requirements clause.
 - .2 Storage and Protection:
 - .1 Cover exposed aluminum surfaces with pressure sensitive heavy protection strippable plastic coating, before shipping to job site.
 - .2 Leave protective covering in place until final cleaning of building. Provide instructions for removal of protective covering.
-

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 01 50 - General Instructions for Construction/Demolition Waste Management And Disposal clause.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal packaging material in appropriate on-site containers for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.

2 Products

2.1 MATERIALS

- .1 Aluminum plate: to ASTM B209, formable, weldable and suitable for anodized finish.
- .2 Fasteners: type 305 stainless steel #12 wood screws, self drilling/threading with countersunk heads. .

2.2 SOLAR SHADE

- .1 Custom fabricate solar shades from 6 mm plate aluminum .
- .2 Head and jamb vane and bracket leg formed as one piece with minimum radius at corners. Form bracket leg on each vane with countersunk holes to accept #12 stainless steel wood screws. Evenly space four holes on each leg. Stitch welding leg to vane is acceptable provided the anodizing appearance is not affected by the welding.
- .3 Provide solar shades with vane at head and one jamb orientated to sun direction as indicated.

2.3 FABRICATION

- .1 Form fabricated components flush and smooth. Radius all edges 2 mm.
 - .2 Wherever possible form exposed sun shade from one sheet of stock, free of joints.
 - .3 Brake form corners of sunshades with minimum (20 mm) radius bends for thickness of stock.
 - .4 Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.
 - .5 Back paint anodized sun screen at bracket leg contact surfaces, where contact is made with building finishes, to prevent electrolysis.
 - .6 Provide stainless steel wood screws for installation at each window indicated.
-

2.4 FINISHES

- .1 Anodic Oxide Treatments: processed in accordance with AAMA designations.
 - .1 Factory finish: Clear anodic oxide treatment to AA-M12C22A31, Architectural Class II designation is for #17 Clear anodized finish. Finish to match aluminum window frames.

3 Execution

3.1 INSTALLATION

- .1 Install mockup of Solar Shade prior to installation of all East and West facing vent windows.
- .2 Install thirty-five (35) solar shades at East and West windows, oriented to sun direction:
 - .1 Fasten solar shade to wood nailer using minimum 100 mm long stainless steel wood screws, through predrilled holes.
 - .2 Ensure screws are fastened into solid wood at head and jamb framing and screw heads are flush with bracket plate.

END OF SECTION

1 General

1.1 REFERENCES

- .1 ASTM D1784-11 Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

1.2 SUBMITTALS

- .1 Submit shop drawings in accordance with Section 01 01 50 - General Instructions for Product Data and Samples.
- .2 Indicate dimensions in relation to window jambs, operator details, top rail, conditions between adjacent blinds, corner conditions anchorage details, hardware and accessories details.
- .3 Submit one representative working sample of vertical louvre blind in accordance with Section 01 01 50.
- .4 Submit duplicate samples of manufacturer's standard colours, patterns and textures of specified vane and rail materials for selection by Departmental Representative.

1.3 DESIGN CRITERIA

- .1 Vanes for vertical louvre blinds to have flame-spread ratings and degree of flame resistance required by the National Fire Code 2010.
 - .1 Flame spread rating: 25 maximum.
 - .2 Degree of flame resistance: inherently flame retardant.

2 Products

2.1 MATERIALS

- .1 Toprail:
 - .1 Heavy duty.
 - .2 Extruded aluminum 6063-T5 alloy.
 - .3 Full length, one piece track with capped ends.
 - .4 Provide valance to match vanes and mounting clips.
 - .5 Size: maximum practical length as recommended by manufacturer.
 - .6 Plain top rail.
 - .7 Colour and finish: as selected by Departmental Representative.
- .2 Vanes for blinds: 90 mm wide x length to suit window assembly.
 - .1 Extruded pvc with linear striation design as selected by Departmental Representative.

2.2 COMPONENTS

- .1 Carrier trucks and wheels: heavy duty, acetal resin moulded material.
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- .2 Gears, sprocket wheels, end caps: acetal resin moulded, spur and worm gears, self lubricating with ratio recommended by manufacturer for particular unit type, replaceable shaft.
- .3 Bead chain: nickel plated brass or stainless steel.
- .4 Vane spacer links: type 301 stainless steel, flexible to space and stabilize each truck.
- .5 Brackets sized to support weight of blind plus forces applied to operate blind and designed to facilitate installation and removal of top rail, complete with hardware necessary for secure attachment of brackets to adjoining construction and to headrails.
- .6 Track: extruded aluminum 45 mm wide x 38 mm high minimum 1 mm thickness finished in matching colour as selected by Departmental Representative. Provide brackets with valence to match vanes.

2.3 OPERATION

- .1 Traversing: manual operation, free hanging to operate either left to right or, right to left for single windows or bi-parting as approved by Departmental Representative.
 - .1 Control opening and closing of blind with nylon cord, tensioned by cord weight or cord tension pulley and without binding vanes at any angle.
 - .2 Fabricate vanes to stack, uniform, in tight space allowing maximum clear window opening. Track mounted to wood casing at window head.
- .2 Rotation control: use bead chain to activate gear assembly to rotate all vanes simultaneously full 180° and hold them in fixed position until reset. Vane overlap 8 mm minimum.
- .3 Fabricate vanes to completely fill openings indicated, from top to bottom and jamb to jamb.
- .4 Locate rotation control chain and traversing cord on stack end of window.

3 Execution

3.1 INSTALLATION

- .1 Install blinds surface mounted to underside of lintel at window head at exterior walls of Offices only, in accordance with manufacturer's instructions.
- .2 Secure top rail with cadmium plated steel wood screws into wood casing at window opening.
- .3 Install blinds square, plumb, true to line with operable parts adjusted for correct function.

END OF SECTION

1 General

1.1 RELATED WORK

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

1.2 REFERENCES

- .1 Aluminum Association: Designation for Aluminum Finishes.

1.3 SUBMITTALS

- .1 Submit shop drawings in accordance with Section 01 01 50 - Product Data and Samples.
- .2 Indicate dimensions in relation to room, anchorage details, hardware and accessories details.
- .3 Submit one representative working sample of track assembly in accordance with Section 01 01 50.
- .4 Submit duplicate samples of manufacturer's standard colours, and textures of specified drapery for selection by Departmental Representative.

1.4 DESIGN CRITERIA

- .1 Drapery material to have flame-spread ratings and degree of flame resistance required by the National Fire Code 2010.
 - .1 Flame spread rating: 25 maximum.
 - .2 Degree of flame resistance: inherently flame retardant.

1.5 CLOSEOUT SUBMITTALS

- .1 Provide operation and maintenance data of track for incorporation into manual specified in Section 01 01 50 - General Instructions for Closeout Submittals.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove and dispose from site all packaging materials at appropriate recycling facilities.
- .2 Dispose of all corrugated cardboard, polystyrene packaging material in appropriate on-site bin for recycling in accordance with site waste management program.

2 Products

2.1 MATERIALS

- .1 Drapery:
 - .1 Weave fabric, 100 % Dacron or polyester resin impregnated drapery , inherently flame retardant, flexible and shape retaining.
 - .2 Provide hemmed drapes to cover door window slot opening.

- .2 Door Mounted Track: aluminum track with sliding frame to attach curtain.
 - .1 Colour and finish: as selected by Departmental Representative.
 - .2 Submit design of drapery and track to cover 115 x 600 high door glazing slot and suitable for sliding. Purpose: surveillance of occupied bedroom from corridor side.

3 Execution

3.1 INSTALLATION

- .1 Install surface mounted track to door at door glazing slot, in accordance with manufacturer's instructions.
- .2 Secure track to door with purpose made brackets and fasteners.
- .3 Install track square, plumb, true to line with accessory parts installed for correct function.

3.2 SCHEDULE

- .1 Install drapery and track at all bedroom doors with glazing slot.

END OF SECTION

1 General

1.1 SECTION INCLUDES

- .1 Electric traction passenger elevator.

1.2 RELATED SECTIONS

- .1 Section 03 30 05 - Cast-in-Place Concrete: elevator pits and shaft ceiling.
- .2 Section 04 04 99 - Masonry: Grouting door frames, setting sleeves, rail anchoring devices in concrete and masonry.
- .3 Section 05 50 00 - Metal Fabrications: hoist beam, vertical metal ladder.
- .4 Section 09 65 18 - Resilient Flooring: finished flooring in elevator car.
- .5 Section 26 05 00 - Common Work: Light outlets, convenience outlets, light switches, and conduits.
- .6 Section 26 24 17 - Panelboards Breaker Type.
- .7 Section 26 28 22 - Disconnect Switches.
- .8 Section 26 50 00 - Lighting.
- .9 Section 27 51 16 - Public Address System
- .10 Section 28 31 01 - Fire Alarm System: heat, smoke, and products of combustion sensing devices.

1.3 REFERENCES

- .1 ASME A17.1-2010/CSA B44-10 - Safety code for elevators and escalators.
- .2 CSA B44.2-10 - Maintenance requirements and intervals for elevators, dumbwaiters, escalators, and moving walks
- .3 NBC 2010, and local codes and regulations except where specified otherwise.
- .4 CAN/CSA-B651-04, Accessible Design for the Built Environment.
- .5 ISO 9001-2000 - Quality Management Systems - Requirements.

1.4 DESIGN REQUIREMENTS

- .1 Design elevator, clearances, construction, workmanship, materials, and installation, unless specified otherwise, in accordance with ASME A17.1-2010/CSA B44, handicap accessibility, NBCC 2010, and other codes having legal jurisdiction.
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- .2 Follow elevator design and manufacturing procedures certified in accordance with ISO 9001-2000 to meet product and service requirements for quality assurance for new products.
- .3 Electric gearless traction motor with a permanent magnet synchronous motor, frequency control and low-friction gearless construction, machine room-less with the hoisting machine attached to the guide rail, and all control and logic systems in a remote control closet on second floor.
- .4 Barrier-Free in accordance with CAN/CSA B651, Barrier-Free Design.

1.5 PERFORMANCE REQUIREMENTS

- .1 Select and install electric traction passenger elevator components to form complete, operating elevator system meeting the following performance characteristics:
 - .1 Drive: Non-Regenerative.
 - .2 Quantity: 1.
 - .3 Rated net capacity: 1134 kg.
 - .4 Rated speed: 0.75 m/sec.
 - .5 Travel distance (nominal): 3.8 m.
 - .6 No. of stops: 2.
 - .7 No. of openings: 2 front, 0 rear.
 - .8 Inside car dimensions: 2032 mm wide x 1295mm front to back.
 - .9 Cab Height: 2438 mm.
 - .10 Hoistway and car entrance frame opening sizes: 1067mm & left opening.
 - .11 Entrance Height: 2134 mm
 - .12 Door type: single.
- .2 Car Performance:
 - .1 Car Speed: $\pm 5\%$ of contract speed under any loading condition or direction of travel.
 - .2 Car Capacity: Safely lower, stop and hold (per code) up to 125% of rated load.
- .3 System Performance:
 - .1 Vertical Vibration (maximum): 25 mg.
 - .2 Horizontal Vibration (maximum): 25 mg.
 - .3 Jerk Rate (maximum): 1.3 ft/sec³.
 - .4 Acceleration (maximum): 1.3 ft/sec².
 - .5 In Car Noise: < 55 dB(A).
 - .6 Leveling Accuracy: ± 0.2 inches.
 - .7 Starts per hour (maximum): 120.
- .4 Seismic Design Criteria:
 - .1 Design and assemble elevator equipment and components to withstand earthquake forces in accordance with NBC 2010 requirements.
 - .2 Provide adjustable seismic trigger switches to operate elevator whenever predetermined level of seismic acceleration is detected:
 - .1 Prevent idle elevator from starting.

1.6 SUBMITTALS

- .1 Comply with Section 01 01 50 - General Instructions for - Submittal Procedures.
-

- .2 Product Data: submit manufacturer's printed product literature, specifications and data sheet:
 - .1 Cab design, dimension and layout.
 - .2 Layout, finishes, and accessories and available options.
 - .3 System capacity and performance.
 - .4 Controls, signals and operating system.
 - .5 Color selection charts for cab and entrances.

 - .3 Submit shop drawings to indicate project layout, including details and the following information:
 - .1 Clearances and travel of car.
 - .2 Clear inside hoistway and pit dimensions.
 - .3 Location and layout of equipment and Signals.
 - .4 Car, guide rails, buffers and other components in hoistway.
 - .5 Maximum rail bracket spacing.
 - .6 Maximum loads imposed on building structure.
 - .7 Hoist beam requirements.
 - .8 Location and sizes of access doors.
 - .9 Location and details of hoistway door and frames. Equipment layout and size in remote controller closet.
 - .10 Electrical characteristics and connection requirements

 - .4 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

 - .5 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

 - .6 Instructions: submit manufacturers installation instructions.

 - .7 Manufacturers Field Services: submit copies of manufacturers field reports.

 - .8 Closeout Submittals:
 - .1 Manufacturer's operation and maintenance manuals.
 - .1 Submit manufacturer/installer's operation and maintenance manual; including operation, maintenance, adjustment, and cleaning instructions; trouble shooting guide; renewal parts catalogues; and electrical wiring diagrams.
 - .2 Inspection Certificates and Permits.
 - .3 Warranty: Submit manufacturer/installer's standard warranty.
- 1.7 QUALITY ASSURANCE**
- .1 Manufacturer/Installer's Qualifications: Specialize in manufacturing and installing elevator equipment, with a minimum of 5 years successful experience.

 - .2 Pre-installation Meeting:
 - .1 Convene pre-installation meeting before start of installation of elevators.
 - .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 Ensure attendance of parties directly affecting work of this section, including Contractor, Departmental Representative, and elevator manufacturer/installer.

.3 Review examination, installation, field quality control, adjusting, cleaning, protection, and coordination with other work.

1.8 DELIVERY, STORAGE, AND HANDLING

.1 Delivery: Deliver materials to site in manufacturer/installer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer/installer.

.2 Storage: Store materials in clean, dry area indoors in accordance with manufacturer/installer's instructions.

.3 Handling: Protect materials during handling and installation to prevent damage.

1.9 PROJECT CONDITIONS

.1 Temporary Electricity:

.1 Arrange for temporary electricity to be available for installation of elevator components.

.2 Comply with Section 01 01 50 - General Instructions for Temporary Utilities.

.2 Temporary Use of Elevator:

.1 Departmental Representative will negotiate with manufacturer/installer for temporary use of elevator, if required.

.2 Temporary use of elevator: in accordance with terms and conditions of manufacturer/installer's temporary acceptance form.

1.10 SCHEDULING

.1 Coordinate elevator work with work of other trades, for proper time and sequence to avoid construction delays.

1.11 WARRANTY

.1 Provide manufacturer warranty for a period of one year. The warranty period is to begin upon Substantial Completion of the Contract. Warranty covers defects in materials and workmanship. Damage due to ordinary use, vandalism, improper or insufficient maintenance, misuse, or neglect do not constitute defective material or workmanship.

1.12 MAINTENANCE SERVICE

.1 Arrange elevator components in remote controller closet room so equipment can be removed for repairs or replaced without dismantling or removing other equipment components.

.2 Elevator maintenance service: performed by elevator manufacturer/installer.

.3 Elevator manufacturer to provide maintenance service consisting of regular examinations and adjustments of the elevator equipment for a period of 12 Months after date of substantial completion. All replacement parts produced by the original equipment manufacturer.

- .4 Perform maintenance service during regular working hours of regular working days and include regular time call back service.
- .5 Adjustments, repairs or replacement of parts due to negligence, misuse, abuse or accidents is not included in the maintenance service.

2 PRODUCTS

2.1 MANUFACTURER/INSTALLER

- .1 Elevator: installed by installers approved by elevator manufacturer.

2.2 ELEVATOR SYSTEM AND COMPONENTS

- .1 AC gearless and machine room-less Electric traction passenger elevator specified in this section is based on Kone EcoSpace. Other electric traction elevator manufacturer's are acceptable provided they meet the design and performance requirements of this specification.

2.3 EQUIPMENT: CONTROL COMPONENTS AND CONTROL SPACE

- .1 Controller: Provide microcomputer based control system to perform all of the functions:
 - .1 Controller: Provide microcomputer based control system to perform all of the functions.
 - .2 Controller: separated into two distinct halves; Motor Drive side and Control side. Route and physically segregate high voltage motor power conductors from the rest of the controller.
 - .3 Provide a serial card rack and main CPU board containing a non-erasable EPROM and operating system firmware.
 - .4 Variable field parameters and adjustments: contained in a non-volatile memory module.
- .2 Drive: Provide Variable Voltage Variable Frequency AC drive system to develop high starting torque with low starting current.
- .3 Controller Location: in room 249a.

2.4 EQUIPMENT: HOISTWAY COMPONENTS

- .1 Machine: AC gearless machine, with permanent magnet synchronous motor, direct current electro-mechanical disc brakes and integral traction drive sheave, mounted to the car guide rail at the top of the hoistway.
 - .2 Governor: Friction type over-speed governor rated for the duty of the elevator specified.
 - .3 Buffers, Car and Counterweight: Polyurethane buffer.
 - .4 Hoistway Operating Devices:
 - .1 Emergency stop switch in the pit
-

- .2 Terminal stopping switches.
- .3 Emergency stop switch on the machine

- .5 Positioning System: System consisting of magnets and proximity switches.
- .6 Guide Rails and Attachments: Steel rails with brackets and fasteners.

2.5 EQUIPMENT: HOISTWAY ENTRANCES

- .1 Hoistway Entrances:
 - .1 Sills: extruded.
 - .2 Doors: Hollow metal construction with vertical internal channel reinforcements.
 - .3 Fire Rating of entrance and doors: UL fire-rated for 1-1/2 hour.
 - .4 Entrance Finish: Brushed Stainless Steel.
 - .5 Entrance Markings Jamb Plates: Provide standard entrance jamb tactile markings on both jambs, at all floors. Plate Mounting: Refer to manufacturer drawings.

2.6 EQUIPMENT: CAR COMPONENTS

- .1 Car Frame: Provide car frame with adequate bracing to support the platform and car enclosure.
 - .2 Platform: to manufacturers standard.
 - .3 Car Guides: Provide guide-shoes mounted to top and bottom of both car and counterweight frame. Arrange each guide-shoe assembly to maintain constant contact on the rail surfaces. Provide retainers in areas with Seismic design requirements.
 - .4 Load weighing device of strain gauge type mounted to dead-end hitch attached atop the hoistway guide-rail.
 - .5 Steel Cab
 - .1 Panels: Non-removable vertical panels, plastic laminate selected from standard manufacturer's catalog of choices.
 - .2 Car Front Finish: Brushed stainless steel.
 - .3 Car Door Finish: Brushed stainless steel.
 - .6 Ceiling:
 - .1 Round LED Down Light Drop Ceiling - LF-88: Satin Finished Stainless Steel three panel suspended ceiling with two holes per panel for Round LED lights.
 - .7 Handrail
 - .1 Round tube brushed aluminum - 1.5 in.. Rails to be located on Back Wall and Side Walls of car enclosure.
 - .8 Flooring: Rubber Tile as specified in Section 09 65 18 paragraph 2.1.9.2.
 - .9 Threshold: Aluminum.
 - .10 Ventilation: fan.
-

- .11 Emergency Car Signals:
 - .1 Emergency Siren: Siren mounted on top of cab that is activated when the alarm button in the car operating panel is engaged. Siren to have rated sound pressure level of 80 dB(A) at a distance of three feet from device. Siren to respond with a delay of not more than one second after activation of alarm button.
 - .2 Emergency Car Lighting: Provide emergency power unit employing a 12-volt sealed rechargeable battery and totally static circuits shall illuminate the elevator car and provide current to the alarm bell in the event of building power failure.
 - .3 Emergency Exit Contact: provide an electrical contact on the car-top exit.

2.7 EQUIPMENT: SIGNAL DEVICES AND FIXTURES

- .1 Car Operating Panel: Provide car operating panel with all push buttons, key switches, and message indicators for elevator operation.
 - .1 Car operating panel to contain two round, mechanical, illuminated buttons marked to correspond to landings served, emergency call button, door open button, door close button, and key switches for lights, inspection, and exhaust fan. Buttons have amber illumination (halo). All buttons to have raised text and Braille marking on left hand side. Provide the car operating display panel with a 7-segment amber display. All texts, when illuminated, to be amber. The car operating panel with a brushed stainless steel finish.
 - .2 Additional features of car operating panel to include:
 - .1 Car Position Indicator within operating panel (amber).
 - .2 Elevator Data Plate marked with elevator capacity.
 - .3 Help buttons with raised markings.
 - .4 In car stop switch per local code.
 - .5 Call Cancel Button.
 - .6 Pre-programmed integrated ADA phone (complete description of krms features included as standard)
 - .7 Help Button/Communicator. Activation of help button will initiate two-way communication between car and a location inside the building, switching over to alternate location if call is unanswered, where personnel are available to take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.
 - .8 Firefighter's Phase II emergency in-car operating instructions.
- .2 Hall Fixtures: Wall mounted hall fixtures provided with necessary push button and key switches for elevator operation. Wall mounted hall fixtures with a brushed stainless steel finish.
 - .1 Hall fixtures with round, mechanical, amber illuminated buttons in raised fixture housings. Buttons flat flush in vertically mounted fixture. Hall fixtures should not be jamb-mounted.
- .3 Car Lantern and Chime: provide a directional lantern visible from the corridor in the car entrance.

2.8 EQUIPMENT: ELEVATOR OPERATION AND CONTROLLER

- .1 Elevator Operation
 - .1 Simplex Collective Operation: Using a microprocessor-based controller, automatic operation by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.
-

- .2 Standard Operating Features to include:
 - .1 Full Collective Operation
 - .2 Fan and Light Control.
 - .3 Load Weighing Bypass.
 - .4 Ascending Car Uncontrolled Movement Protection
 - .5 Top of Car Inspection Station.

- .3 Additional Operating Features to include:
 - .1 Hoistway Access Bottom Landing
 - .2 Car Secure Access.
 - .3 Provision for Card Reader in Car (Card Reader provided and Installed by others).
 - .4 Provide provisions for coaxial cable for CCTV. CCTV by others.
 - .5 Intercom Provisions

- .4 Elevator Control System for Inspections and Emergency:
 - .1 Provide devices within controller to run the elevator in inspection operation.
 - .2 Provide devices on car top to run the elevator in inspection operation.
 - .3 Provide within controller an emergency stop switch to disconnect power from the brake and prevents motor from running.
 - .4 Provide the means from the controller to mechanically lift and control the elevator brake to safely bring car to nearest available landing when power is interrupted.
 - .5 Provide the means from the controller to reset the governor over speed switch and also trip the governor.
 - .6 Provide the means from the controller to reset the emergency brake when set because of an unintended car movement or ascending car over speed.
 - .7 Provide the means for the control to reset elevator earthquake operation.

2.9 EQUIPMENT: DOOR OPERATOR AND CONTROL

- .1 Door Operator: provide a closed loop permanent magnet VVVF high-performance door operator to open and close the car and hoistway doors simultaneously. Cushion door movement at both limits of travel. Provide an electro-mechanical interlock at each hoistway entrance to prevent operation of the elevator unless all doors are closed and locked. Provide an electric contact on the car at car entrance to prevent the operation of the elevator unless the car door is closed.

 - .2 In case of interruption or failure of electric power arrange the door operator so that the doors can be readily opened by hand from within the car, in accordance with applicable code. Provide emergency devices and keys for opening doors from the landing as required by local code.

 - .3 Doors to open automatically when the car has arrived at or is leveling at the respective landings. Doors to close after a predetermined time interval or immediately upon pressing of a car button. Provide a door open button in the car. Momentary pressing of this button will reopen the doors and reset the time interval.

 - .4 Provide door hangers and tracks for car and each hoistway door. Contour tracks to match the hanger sheaves. Design the hangers for power operation with provisions for vertical and lateral adjustment. Provide the hanger sheaves with polyurethane tires and pre-lubricated sealed-for-life bearings.
-

- .5 Electronic Door Safety Device. Equip the elevator car with an electronic protective device extending the full height of the car. When activated, this sensor will prevent the doors from closing or cause them to stop and reopen if they are in the process of closing and the doors will remain open as long as the flow of traffic continues and will close shortly after the last person passes through the door opening

2.10 POWER SUPPLY

- .1 Equipment Power: 208V, 3phase, 60 Hz, alternating current normal and emergency.
- .2 Protect elevator equipment against damage or malfunction due to change to or from normal power supply and emergency power supply.

3 EXECUTION

3.1 EXAMINATION

- .1 Field measure and examine substrates, supports, and other conditions under which elevator work is to be performed.
- .2 Do not proceed with work until unsatisfactory conditions are corrected.
- .3 Prior to start of Work Verify:
 - .1 Hoistway is in accordance with shop drawings. Dimensional tolerance of hoistway from shop drawings: -0 mm +50 mm. Do not begin work of this section until dimensions are within tolerances.
 - .2 Projections greater than 50 mm (100 mm if ASME A17.1/CSA B44 2000 applies) must be beveled not less than 75 degrees from horizontal.
 - .3 Landings have been prepared for entrance sill installation. Traditional sill angle or concrete sill support shall not be required.
 - .4 Elevator pit has been constructed in accordance with requirements, is dry and reinforced to sustain vertical forces, as indicated in approved submittal. Verify that sumps or sump pumps located within pit will not interfere with installed elevator equipment.
 - .1 Control space has been constructed in accordance with requirements, with access coordinated with elevator shop drawings, including sleeves and penetrations.
- .4 Verify installation of GFCI protected 20-amp in pit and adjacent to each signal control cabinet in control closet.

3.2 PREPARATION

- .1 Coordinate installation of anchors, bearing plates, brackets and other related accessories.

3.3 INSTALLATION

- .1 Install elevators in accordance with manufacturer/installer's instructions and ASME A17.1-2010/CSA B44.
-

- .2 Install equipment, guides, controls, car and accessories in accordance with manufacturer installation methods and recommended practices.
- .3 Properly locate guide rails and related supports at locations in accordance with manufacturer's recommendations and approved shop drawings. Anchor to building structure using isolation system to minimize transmission of vibration to structure.
- .4 Securely fasten all hoistway frames to fixing angles mounted in the hoistway. Coordinate installation of sills and frames with other trades. Set entrances in vertical alignment with car openings, and aligned with plumb hoistway lines.
- .5 Lubricate operating system components in accordance with manufacturer recommendations.
- .6 Perform final adjustments, and necessary service prior to substantial completion.

3.4 CONSTRUCTION

- .1 Interface with Other Work:
 - .1 Coordinate construction of entrance walls with installation of door frames and sills. Maintain front wall opening until elevator equipment has been installed.
 - .2 Ensure adequate support for entrance attachment points at all landings.
 - .3 Coordinate wall openings for hall push buttons, signal fixtures and sleeves. Elevator requires sleeves within the hoistway wall.
 - .4 Coordinate emergency power transfer switch and power change pending signals as required for termination at the primary elevator signal control cabinet.
 - .5 Coordinate interface of elevator and fire alarm system.
 - .6 Coordinate interface of dedicated telephone line.

3.5 TESTING AND INSPECTIONS

- .1 Perform recommended and required testing in accordance with authority having jurisdiction.
- .2 Obtain required permits and provide originals to Departmental Representative.
- .3 Perform tests of elevator as required by ASME A17.1-2010/CSA B44 and governing codes.

3.6 ADJUSTING

- .1 Adjust elevators for proper operation in accordance with manufacturer/installer's instructions.
 - .2 Adjust elevators for smooth acceleration and deceleration of car so not to cause passenger discomfort.
 - .3 Adjust doors to prevent opening of doors at landing on corridor side, unless car is at rest at that landing, or is in leveling zone and stopping at that landing.
 - .4 Adjust automatic floor leveling feature at each floor to within 6 mm of landing.
-

- .5 Repair minor damages to finish in accordance with manufacturer/installer's instructions and as approved by Departmental Representative.
- .6 Remove and replace damaged components that cannot be successfully repaired as determined by Departmental Representative.

3.7 DEMONSTRATION

- .1 Prior to substantial completion, instruct CSC maintenance personnel, designated by Departmental Representative, on the proper function and required daily maintenance of elevators. Instruct personnel on emergency procedures.

3.8 CLEANING

- .1 Clean elevators promptly after installation in accordance with manufacturer/installer's instructions.
- .2 Do not use harsh cleaning materials or methods that could damage finish.

3.9 PROTECTION

- .1 Protect installed elevators from damage during construction.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 The related sections are all sections in Division 21, 22, 23 and 25.

1.2 SUBMITTALS

- .1 Submittals: in accordance with Section 01 01 50 – General Instructions.
- .2 Shop drawings; submit drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia, Canada.
- .3 Shop drawings to show:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
- .4 Shop drawings and product data accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Acoustical sound power data, where applicable.
 - .3 Points of operation on performance curves.
 - .4 Manufacturer to certify current model production.
 - .5 Certification of compliance to applicable codes.
- .5 In addition to transmittal letter referred to in Section 01 01 50- General Instructions: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.
- .6 Closeout Submittals:
 - .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 01 50- General Instructions.
 - .2 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
 - .3 Operation data to include:
 - .1 Control schematics for systems including environmental controls.
 - .2 Description of systems and their controls.
 - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
 - .4 Operation instruction for systems and component.
 - .5 Description of actions to be taken in event of equipment failure.
 - .6 Valves schedule and flow diagram.
 - .7 Colour coding chart.
 - .4 Maintenance data to include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.

- .5 Performance data to include:
 - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified.
 - .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
- .6 Approvals:
 - .1 Submit 3 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
 - .2 Make changes as required and re-submit as directed by Departmental Representative.
- .7 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .8 Site records:
 - .1 Departmental Representative will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
 - .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
 - .3 Use different colour waterproof ink for each service.
 - .4 Make available for reference purposes and inspection.
- .9 As-built drawings:
 - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
 - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
 - .3 Submit to Departmental Representative for approval and make corrections as directed.
 - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
 - .5 Submit completed reproducible as-built drawings (both AutoCAD files in a CD and 2 set of hard copies) with Operating and Maintenance Manuals.
- .10 Submit copies of as-built drawings for inclusion in final TAB report.

1.3 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 01 50- General Instructions.

- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.4 MAINTENANCE

- .1 Furnish spare parts in accordance with Section 01 01 50 – General Instructions as follows:
 - .1 One set of packing for each pump.
 - .2 One casing joint gasket for each size pump.
 - .3 One head gasket set for each heat exchanger.
 - .4 One glass for each gauge glass.
 - .5 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.
- .2 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 01 50- General Instructions.
- .3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.5 DELIVERY, STORAGE, AND HANDLING

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

Part 2 Products

2.1 Not Used

- .1 Not used.

Part 3 Execution

3.1 PAINTING REPAIRS AND RESTORATION

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

3.2 CLEANING

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

3.3 FIELD QUALITY CONTROL

- .1 Site Tests: conduct tests in accordance with Section 01 01 50 - General Instructions and submit report as described in 01 01 50 - General Instructions.

3.4 DEMONSTRATION

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

3.5 PROTECTION

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

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for wet pipe fire protection and sprinkler systems for heated areas.
 - .2 Sustainable requirements for construction and verification.

1.2 REFERENCES

- .1 National Fire Prevention Association (NFPA)
 - .1 NFPA 13-2010, Standard for the Installation of Sprinkler Systems.
 - .2 NFPA 25-2008, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN4 S543-M984, Standard for Internal Lug Quick Connect Couplings for Fire Hose.
- .4 Fire Commissioner of Canada FC 403, "Standard for Sprinkler Systems".

1.3 SAMPLES

- .1 Submit samples of following:
 - .1 Each type of sprinkler head.
 - .2 Signs.

1.4 DESIGN REQUIREMENTS

- .1 Design automatic wet pipe fire suppression sprinkler systems in accordance with required and advisory provisions of NFPA 13, by hydraulic calculations for uniform distribution of water over design area.
- .2 Include with each system materials, accessories, and equipment inside and outside building to provide each system complete and ready for use.
- .3 Design and provide each system to give full consideration to blind spaces, piping, electrical equipment, ducts, and other construction and equipment in accordance with detailed shop drawings.
- .4 Locate sprinkler heads in consistent pattern with ceiling grid, lights, and air supply diffusers.
- .5 Devices and equipment for fire protection service: ULC approved for use in wet pipe sprinkler systems.

- .6 Design systems for earthquake protection for buildings in seismic zones according to codes.
- .7 Location of Sprinkler Heads:
 - .1 Locate heads in relation to ceiling and spacing of sprinkler heads not to exceed that permitted by NFPA 13 for ordinary and extra hazard occupancy.
 - .2 Uniformly space sprinklers on branch.
- .8 Water Distribution:
 - .1 Make distribution uniform throughout the area in which sprinkler heads will open.
 - .2 Discharge from individual heads in hydraulically most remote area to be 100 % of specified density.
- .9 Density of Application of Water:
 - .1 Size pipe to provide specified density when system is discharging specified total maximum required flow.
 - .2 Application to horizontal surfaces below sprinklers shall be as per NFPA.
- .10 Sprinkler Discharge Area:
 - .1 Area: hydraulically most remote area as defined in NFPA 13.
- .11 Outside Hose Allowances:
 - .1 Include allowance in hydraulic calculations as per NFPA for outside hose streams.
- .12 Friction Losses:
 - .1 Calculate losses in piping in accordance with Hazen-Williams formula with 'C' value of 120 for steel piping, 150 for copper tubing, and 140 for cement-lined ductile-iron piping.
- .13 Water Supply:
 - .1 Base hydraulic calculations on static pressure of 586 kPa with 3785 lpm available at residual pressure of 345 kPa at junction with water distribution piping system.
 - .2 Contractor shall conduct a flow test for the volume and pressure of water supply at near the construction site to confirm the above flow data prior to hydraulic calculation and sprinkler shop drawing submission.

1.5 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 01 50- General Instructions.
 - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 01 50 - General Instructions.
- .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 01 50- General Instructions.

- .1 Shop drawings: submit drawings and hydraulic calculations stamped and signed by professional engineer registered or licensed in Province of British Columbia, Canada.
- .2 Indicate:
 - .1 Materials.
 - .2 Finishes.
 - .3 Method of anchorage
 - .4 Number of anchors.
 - .5 Supports.
 - .6 Reinforcement.
 - .7 Assembly details.
 - .8 Accessories.
- .2 Submit sprinkler system design drawings and hydraulic calculations to Departmental Representative and Fire Commissioner of Canada for review.
- .3 Quality assurance submittals: submit following in accordance with Section 01 01 50 - General Instructions.
 - .1 Test reports:
 - .1 Submit certified test reports for wet pipe fire protection sprinkler systems 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.
 - .3 Instructions: submit manufacturer's installation instructions.
 - .2 Manufacturer's Field Reports: manufacturer's field reports specified.
- .4 Closeout Submittals:
 - .1 Submit maintenance and engineering data for incorporation into manual specified in Section 01 01 50- General Instructions in accordance with NFPA 20.
 - .2 Manufacturer's Catalog Data, including specific model, type, and size for:
 - .1 Pipe and fittings.
 - .2 Alarm valves.
 - .3 Valves, including gate, check, and globe.
 - .4 Water motor alarms.
 - .5 Sprinkler heads.
 - .6 Pipe hangers and supports.
 - .7 Pressure or flow switch.
 - .8 Fire department connections.
 - .9 Excess pressure pump.
 - .10 Mechanical couplings.
 - .3 Drawings:
 - .1 Sprinkler heads and piping system layout.

- .1 Prepare detail working drawings of system layout in accordance with NFPA 13, "Working Drawings (Plans)".
- .2 Show data essential for proper installation of each system.
- .3 Show details, plan view, elevations, and sections of systems supply and piping.
- .4 Show piping schematic of systems supply, devices, valves, pipe, and fittings. Show point to point electrical wiring diagrams.
- .2 Electrical wiring diagrams.
- .4 Design Data:
 - .1 Calculations of sprinkler system design.
 - .2 Indicate type and design of each system and certify that each system has performed satisfactorily in the manner intended for not less than 18 months.
- .5 Field Test Reports:
 - .1 Preliminary tests on piping system.
- .6 Records:
 - .1 As-built drawings of each system.
 - .1 After completion, but before final acceptance, submit complete set of as-built drawings of each system for record purposes.
 - .2 Submit as-built drawings in both CADD files in a CD and a hard copy with title block similar to full size contract drawings.
- .7 Operation and Maintenance Manuals:
 - .1 Provide maintenance data for incorporation into manual specified in Section 01 01 50 - General Instructions.
 - .2 Provide detailed hydraulic calculations including summary sheet, and Material and Test Certificate for aboveground and underground piping and other documentation for incorporation into manual specified in Section 01 01 50 - General Instructions in accordance with NFPA 13.

1.6 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: company or person specializing in wet sprinkler systems with documented experience approved by manufacturer.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.7 MAINTENANCE

- .1 Extra Materials:
 - .1 Provide maintenance materials in accordance with Section 01 01 50 - General Instructions.
 - .2 Provide spare sprinklers and tools as required by NFPA 13.

1.8 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with Section 01 01 50 - General Instructions.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Storage and Protection:
 - .1 Store materials indoors in dry location.
 - .2 Store and protect materials from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.
- .3 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 01 50 - General Instructions.

Part 2 Products

2.1 ABOVE GROUND PIPING SYSTEMS

- .1 Provide fittings for changes in direction of piping and for connections.
 - .1 Make changes in piping sizes through tapered reducing pipe fittings, bushings will not be permitted.
- .2 Perform welding in shop; field welding will not be permitted.

2.2 PIPE, FITTINGS AND VALVES

- .1 Pipe:
 - .1 Ferrous: to NFPA 13.
 - .2 Copper tube: to NFPA 13.
- .2 Fittings and joints to NFPA 13:
 - .1 Ferrous: screwed, welded, flanged or roll grooved.
 - .2 Copper tube: screwed, soldered, brazed.
 - .3 Provide welded or threaded type fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are threaded.
 - .4 Plain-end fittings with mechanical couplings and fittings which use steel gripping devices to bite into pipe when pressure is applied will not be permitted.
 - .5 System piping 50 mm and smaller shall be schedule 40 and joined with threaded fitting in accordance with NFPA 13. Larger sizes shall be schedule 10 and joined by welding or grooved joining methods in accordance with NFPA 13.
 - .6 Rubber gasketed grooved-end pipe and fittings with mechanical couplings are permitted in pipe sizes 50 mm and larger.
 - .7 Fittings: ULC approved for use in wet pipe sprinkler systems.

- .8 Ensure fittings, mechanical couplings, and rubber gaskets are supplied by same manufacturer.
- .9 Side outlet tees using rubber gasketed fittings are not permitted.
- .10 Sprinkler pipe and fittings: metal.
- .3 Valves:
 - .1 ULC listed for fire protection service.
 - .2 Gate valves: open by counter clockwise rotation.
 - .3 Provide rising stem OS & Y valve beneath each alarm valve in each riser when more than one alarm valve is supplied from same water supply pipe.
 - .4 Check valves: flanged clear opening swing-check type with flanged inspection and access cover plate for sizes 10 cm and larger.
 - .5 Provide gate valve in piping protecting elevator hoistways, machine rooms, and machinery spaces.
- .4 Pipe hangers:
 - .1 ULC listed for fire protection services in accordance with NFPA.

2.3 SPRINKLER HEADS

- .1 General: to NFPA 13 and ULC listed and to the Correctional Service Canada approved for fire services of this facility application.
- .2 Sprinkler Head Type:
 - .1 Type A: upright bronze.
 - .2 Type D: recessed chrome glass bulb type with ring and cup.
 - .3 Type F: side wall chrome link and lever type.
- .3 Provide nominal 1.2 cm orifice sprinkler heads.
 - .1 Release element of each head to be of intermediate temperature rating or higher as suitable for specific application.
 - .2 Provide polished chromium-plated pendent sprinklers below suspended ceilings.
 - .3 Provide corrosion-resistant sprinkler heads and sprinkler head guards in accordance with NFPA 13.
 - .4 Provide sprinkler heads coverage to meet codes.
 - .5 Deflector: not more than 75 mm below suspended ceilings.
 - .6 Ceiling plates: not more than 25 mm deep.
 - .7 Ceiling cups: not permitted.

2.4 ALARM CHECK VALVE

- .1 Alarm check valve to NFPA 13 and ULC listed for fire service.
- .2 Provide variable pressure type alarm valve complete with retarding chamber, alarm test valve, alarm shutoff valve, drain valve, pressure gages, accessories, and appurtenances for proper operation of system.

2.5 WATER MOTOR ALARMS

- .1 Provide alarms approved weatherproof and guarded type, to sound locally on flow of water in each corresponding sprinkler system.
- .2 Mount alarms on outside of outer walls of each building at location as directed.
- .3 Provide separate drain piping directly to exterior of building.

2.6 SUPERVISORY SWITCHES

- .1 General: to NFPA 13 and ULC listed for fire service.
- .2 Valves:
 - .1 Mechanically attached to valve body, with normally open and normally closed contacts and supervisory capability.
- .3 Pressure or flow switch type:
 - .1 With normally open and normally closed contacts and supervisory capability.
 - .2 Provide switch with circuit opener or closer for automatic transmittal of alarm over facility fire alarm system.
 - .3 Connect into building fire alarm system.
 - .4 Connection of switch: Section 28 31 00 - Fire Alarm Systems.
 - .5 Alarm actuating device: mechanical diaphragm controlled retard device adjustable from 10 to 60 seconds and instantly recycle.
- .4 Pressure alarm switch:
 - .1 With normally open and normally closed contacts and supervisory capability.

2.7 WATER GONG

- .1 To NFPA 13 and ULC listed for fire service. Location as indicated.

2.8 FIRE DEPARTMENT CONNECTION

- .1 Provide connections approximately 1.5 m above finish grade, location as indicated.
- .2 To NFPA 13 and ULC S543 listed, Siamese type.
- .3 Polished bronze exposed of approved two-way type with 2.5 inch National Standard female hose threads with plug, chain, and identifying fire department connection escutcheon plate.
- .4 Thread specifications: compatible with local fire department.

2.9 EXCESS PRESSURE PUMP

- .1 Provide pumps on each sprinkler piping riser.
- .2 Pumps:

- .1 Pumps: positive displacement, gear type rated at 1 lpm, integrally mounted with motor.
- .2 Double acting displacement type, open cylinder design, direct drive, ULC listed, complete with relief valve.
- .3 Pump and motor unit:
 - .1 Approved for automatic wet pipe fire extinguishing sprinkler systems; complete with pilot light panel, differential motor control switch, high pressure switch, and low pressure switch.
 - .2 EEMAC Class B squirrel cage induction 1725 rpm, continuous duty, drip proof, ball bearing, maximum temperature rise 50 degrees C, 0.25 kW, 120/1/60.
 - .3 Capacity: 7.6 L/min.
- .4 Provide electrical power supply connections for pump and pilot light panel at supply side of building service panel.
- .5 Provide separate fused safety-type switch with locked lever for each connection.
- .6 Provide pressure pump sensing piping in supply piping upstream of fire pump.
- .7 Pump operation switch: to operate excess pressure pump with pressure differential of 103 kPa.
- .8 Shut-off valve and strainer on pump inlet. Relief valve, check valve and shut-off valve on discharge connections.

2.10 PRESSURE GAUGES

- .1 ULC listed.
- .2 Maximum limit of not less than twice normal working pressure at point where installed.

2.11 BURIED WATER PIPING SYSTEM

- .1 Pipe and Fittings:
 - .1 Provide outside-coated, cement-mortar lined, ductile-iron pipe, and fittings, in accordance with NFPA 24, for piping under building and outside of building walls.
 - .2 Anchor joints in accordance with NFPA 24.
 - .3 Provide concrete thrust block at elbow where pipe turns up toward the floor, and restrain pipe riser with steel rods from elbow to flange above floor.
 - .4 Minimum pipe size: 150 mm.
 - .5 Minimum depth of cover: 1.0 metre at finish grade.
 - .6 Piping beyond 1.5 metre outside of building walls: provided under Civil work Sections.
- .2 Valves:
 - .1 In accordance with NFPA 24.
 - .2 Gate valves: ULC listed and opened by counterclockwise rotation.

- .3 Post Indicator Valves:
 - .1 Provide with operating nut located about 1.5 m above finish grade.
 - .2 Gate valves for use with indicator post, ULC listed.
 - .3 Indicator posts: ULC listed.
 - .4 Provide each indicator post with 1 coat of primer and two coats of red enamel paint.

2.12 PIPE SLEEVES

- .1 Provide pipe sleeves where piping passes through walls, and floors.
- .2 Secure sleeves in position and location during construction.
- .3 Provide sleeves of sufficient length to pass through entire thickness of walls and floors.
- .4 Provide 2.5 cm minimum clearance between exterior of piping and interior of sleeve or core-drilled hole.
 - .1 Firmly pack space with mineral wool insulation.
 - .2 Seal space at both ends of sleeve or core-drilled hole with plastic waterproof cement which will dry to firm but pliable mass, provide mechanically adjustable segmented elastomeric seal.
 - .3 In fire walls and fire floors, seal both ends of pipe sleeves or core-drilled holes with ULC listed fill, void, or cavity material.
- .5 Sleeves in Masonry and Concrete Walls, Floors, and Roofs:
 - .1 Provide hot-dip galvanized steel sleeves.
 - .2 Core drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in core-drilled hole are completely grouted smooth.
- .6 Sleeves in Other Than Masonry and Concrete Walls, Floors, and Roofs:
 - .1 Provide 0.61 mm thick galvanized steel sheet.

2.13 ESCUTCHEON PLATES

- .1 Provide one piece or split hinge type metal plates for piping passing through walls, floors, and ceilings in exposed spaces.
- .2 Provide polished chromium-plated finish on copper alloy plates in finished spaces.
- .3 Provide paint finish on metal plates in unfinished spaces.

2.14 INSPECTOR'S TEST CONNECTION

- .1 Locate inspector's test connection at hydraulically most remote part of each system, provide test connections approximately 3 m above floor for each sprinkler system or portion of each sprinkler system equipped with alarm device.
- .2 Provide test connection piping to location where discharge will be readily visible and where water may be discharged without property damage.

- .3 Provide discharge orifice of same size as corresponding sprinkler orifice.

2.15 SIGNS

- .1 Attach properly lettered and approved metal signs to each valve and alarm device to NFPA 13.
- .2 Permanently fix hydraulic design data nameplates to riser of each system.

2.16 ANTIFREEZE

- .1 Antifreeze loops to NFPA 13, locations as indicated.

2.17 SPARE PARTS CABINET

- .1 Provide metal cabinet with extra sprinkler heads and sprinkler head wrench adjacent to each alarm valve. Number and types of extra sprinkler heads as specified in NFPA 13.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install, inspect and test to acceptance in accordance with the latest edition of NFPA 13 and NFPA 25, and the Fire Commissioner of Canada FC 403, "Standard for Sprinkler Systems".
- .2 Provide a High Density 3 tier racking sprinkler system for the high racking storage areas to meet code requirements.
- .3 Provide sprinkler heads and piping at the top of the elevator hoistway as per NFPA Standard for the Installation of Sprinkler Systems (2010).

3.3 PIPE INSTALLATION

- .1 Install piping straight and true to bear evenly on hangers and supports. Do not hang piping from plaster ceilings.
- .2 Keep interior and ends of new piping and existing piping thoroughly cleaned of water and foreign matter.
- .3 Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of piping to prevent entry of water and foreign matter.
- .4 Inspect piping before placing into position.

3.4 ELECTRICAL CONNECTIONS

- .1 Provide electrical work associated with this section under Section 26 05 00 - Common Work Results - for Electrical.
- .2 Provide fire alarm system under Section 28 31 00 - Fire Alarm System.
- .3 Provide control and fire alarm wiring, including connections to fire alarm systems, in accordance with National Electrical Code.
- .4 Provide wiring in rigid metal conduit or intermediate metal conduit.

3.5 DISINFECTION

- .1 Disinfect new domestic water piping for a combined water sprinkler service line.
- .2 Fill piping systems with solution containing minimum of 50 parts per million of chlorine and allow solution to stand for minimum of 24 hours.
- .3 Flush solution from systems with clean water until maximum residual chlorine content is not greater than 0.2 part per million or residual chlorine content of domestic water supply.
- .4 Obtain at least two consecutive satisfactory bacteriological samples from piping, analyzed by certified laboratory, and submit results prior to piping being placed into service.

3.6 CONNECTIONS TO EXISTING WATER SUPPLY SYSTEMS

- .1 Notify Contracting Officer in writing at least 15 days prior to connection date.
- .2 Use tapping or drilling machine valve and mechanical joint type sleeves for connections to be made under pressure.
- .3 Bolt sleeves around main piping.
- .4 Bolt valve to branch connection. Open valve, attach drilling machine, make tap, close valve, and remove drilling machine, without interruption of service.
- .5 Furnish materials required to make connections into existing water supply systems, and perform excavating, backfilling, and other incidental labour as required.

3.7 BURIED PIPING SYSTEM

- .1 Bury tape with printed side up at depth of 30 cm below the top surface of earth or top surface of subgrade under pavements.

3.8 FIELD PAINTING

- .1 Clean, pretreat, prime, and paint new systems including valves, piping, conduit, hangers, supports, miscellaneous metalwork, and accessories.
- .2 Apply coatings to clean, dry surfaces, using clean brushes.
- .3 Clean surfaces to remove dust, dirt, rust, and loose mill scale.

- .4 Immediately after cleaning, provide metal surfaces with 1 coat of pretreatment primer applied to minimum dry film thickness of 0.3 mil, and one coat of zinc chromate primer applied to minimum dry film thickness of 1.0 mil.
- .5 Shield sprinkler heads with protective covering while painting is in progress.
- .6 Upon completion of painting, remove protective covering from sprinkler heads.
- .7 Remove sprinkler heads which have been painted and replace with new sprinkler heads.
- .8 Provide primed surfaces with following:
 - .1 Piping in Finished Areas:
 - .1 Provide primed surfaces with 2 coats of paint to match adjacent surfaces.
 - .2 Provide valves and operating accessories with 1 coat of red alkyd gloss enamel applied to minimum dry film thickness of 1.0 mil.
 - .3 Provide piping with 50 mm wide self-adhering red plastic bands spaced at maximum of 6 m intervals throughout piping systems.
 - .2 Piping in Unfinished Areas:
 - .1 Provide primed surfaces with one coat of red alkyd gloss enamel applied to minimum dry film thickness of 1.0 mil in attic spaces, spaces above suspended ceilings, crawl spaces, pipe chases, mechanical equipment room, and [spaces where walls or ceiling are not painted or not constructed of a prefinished material.
 - .2 Provide piping with 50 mm wide self-adhering red plastic bands spaced at maximum of 6 m intervals.

3.9 FIELD QUALITY CONTROL

- .1 Site Test, Inspection:
 - .1 Perform test to determine compliance with specified requirements in presence of Departmental Representative.
 - .2 Test, inspect, and approve piping before covering or concealing.
 - .3 Preliminary Tests:
 - .1 Hydrostatically test each system at 200 psig for a 24 hour period with no leakage or reduction in pressure.
 - .2 Flush piping with potable water in accordance with NFPA 13.
 - .3 Piping above suspended ceilings: tested, inspected, and approved before installation of ceilings.
 - .4 Test alarms and other devices.
 - .5 Test water flow alarms by flowing water through inspector's test connection. When tests have been completed and corrections made, submit signed and dated certificate in accordance with NFPA 13.
 - .4 Formal Tests and Inspections:
 - .1 Do not submit request for formal test and inspection until preliminary test and corrections are completed and approved.
 - .2 Submit written request for formal inspection at least 15 days prior to inspection date.

- .3 Repeat required tests as directed.
 - .4 Correct defects and make additional tests until systems comply with contract requirements.
 - .5 Furnish appliances, equipment, instruments, connecting devices for tests.
 - .6 Authority of Jurisdiction, will witness formal tests and approve systems before they are accepted.
- .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 **Site Tests:**
- .1 Field test each fire pump, driver and controllers in accordance with NFPA 20. Testing shall include:
 - .1 Verification of proper installation, system initiation, adjustment, and fine tuning.
 - .2 Verification of the sequence of operations and alarm systems.
 - .2 Testing to be witnessed by Fire Commissioner of Canada and authority having jurisdiction.
 - .3 Develop, with Departmental Representative assistance, detailed instructions for O & M of this installation.

3.10 CLEANING

- .1 Proceed in accordance with Section 01 01 50 - General Instructions.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for plumbing pumps.
 - .2 Sustainable requirements for construction and verification.
- .2 Related Sections:
 - .1 Section 01 01 50 - General Instructions.

1.2 REFERENCES

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

1.3 SUBMITTALS

- .1 Submittals in accordance with Section 01 01 50 - General Instructions.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet for fixtures and equipment.
- .3 Shop Drawings.
 - .1 Submit shop drawings to indicate:
 - .1 Equipment, including connections, fittings, control assemblies and ancillaries. Identify whether factory or field assembled.
 - .2 Wiring and schematic diagrams.
 - .3 Dimensions and recommended installation.
 - .4 Pump performance and efficiency curves.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Instructions: submit manufacturer's installation instructions.
- .6 Manufacturers' Field Reports: manufacturers' field reports specified.
- .7 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 01 50- General Instructions, include:
 - .1 Manufacturers name, type, model year, capacity and serial number.
 - .2 Details of operation, servicing and maintenance.
 - .3 Recommended spare parts list with names and addresses.

1.4 QUALITY ASSURANCE

- .1 Health and Safety:

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

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 01 50 - General Instructions.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

Part 2 Products

2.1 DOMESTIC HOT WATER CIRCULATING PUMPS

- .1 Capacity: as per Equipment Schedule.
- .2 Construction: closed-coupled, in-line centrifugal, all bronze construction, stainless steel shaft, stainless steel or bronze shaft sleeve, two oil lubricated bronze sleeves or ball bearings. Design for 861 kPa and 105 degrees C continuous service.
- .3 Motor: drip-proof, with thermal overload protection.
- .4 Supports: provide as recommended by manufacturer.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Make piping and electrical connections to pump and motor assembly and controls as indicated.
- .2 Ensure pump and motor assembly do not support piping.

3.3 FIELD QUALITY CONTROL

- .1 Site Tests/Inspection:
 - .1 Check power supply.
 - .2 Check starter protective devices.
- .2 Start-up, check for proper and safe operation.
- .3 Check settings and operation of hand-off-auto selector switch, operating, safety and limit controls, audible and visual alarms, over-temperature and other protective devices.

- .4 Adjust flow from water-cooled bearings.
- .5 Adjust impeller shaft stuffing boxes, packing glands.

3.4 START-UP

- .1 General:
 - .1 In accordance with Section 01 91 00 - Commissioning Requirements: General Requirements, supplemented as specified herein.
 - .2 Procedures:
 - .1 Check power supply.
 - .2 Check starter O/L heater sizes.
 - .3 Start pumps, check impeller rotation.
 - .4 Check for safe and proper operation.
 - .5 Check settings, operation of operating, limit, safety controls, over-temperature, audible/visual alarms, other protective devices.
 - .6 Test operation of hands-on-auto switch.
 - .7 Run-in pumps for 12 continuous hours.
 - .8 Check installation, operation of mechanical seals, packing gland type seals. Adjust as necessary.
 - .9 Adjust alignment of piping and conduit to ensure full flexibility.
 - .10 Eliminate causes of cavitation, flashing, air entrainment.
 - .11 Measure pressure drop across strainer when clean and with flow rates as finally set.
 - .12 Replace seals if pump used to degrease system or if pump used for temporary heat.
 - .13 Verify lubricating oil levels.

3.5 PERFORMANCE VERIFICATION (PV) PRESSURE BOOSTER PUMPS

- .1 General:
 - .1 In accordance with Section 01 91 00 - Commissioning: General Requirements, supplemented as specified.
- .2 Obtain manufacturer's approval, before performing PV, to ensure warranties remain intact.
- .3 Application tolerances:
 - .1 Flow: +/- 10%.
 - .2 Pressure: Plus 20%, minus 5%.
- .4 PV procedures:
 - .1 Open pump balancing valve fully.
 - .2 Measure differential pressure (DP) across pump.
 - .3 Measure amperage and voltage and compare with manufacturer's data sheets and motor nameplate data.

- .4 If suction is different size than discharge connection, add velocity head correction factor to DP.
- .5 Mark this DP on manufacturer's pump curve.
- .6 If flow rate is higher than specified, slow close balancing valve until specified DP is reached.
- .7 Repeat measurements of amps and volts. Compare with manufacturer's data sheets.
- .8 Calculate BHP and compare with nameplate data.

3.6 REPORTS

- .1 In accordance with Section 01 91 00 - Commissioning: reports, supplemented as specified.
- .2 Include:
 - .1 PV results on approved PV Report Forms.
 - .2 Product Information report forms.
 - .3 Pump performance curves (family of curves) with final point of actual performance.

3.7 TRAINING

- .1 In accordance with Section 01 91 00 - Commissioning: Training of O&M Personnel, supplemented as specified.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME)
 - .1 ANSI/ASME B16.15-06, Cast Bronze Threaded Fittings, Classes 125 and 250.
 - .2 ANSI/ASME B16.18-01, Cast Copper Alloy Solder Joint Pressure Fittings.
 - .3 ANSI/ASME B16.22-01, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 - .4 ANSI/ASME B16.24-01, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500 and 2500.
- .2 ASTM International Inc.
 - .1 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .2 ASTM A536-84(2004), Standard Specification for Ductile Iron Castings.
 - .3 ASTM B88M-05, Standard Specification for Seamless Copper Water Tube (Metric).
- .3 American National Standards Institute/American Water Works Association (ANSI)/(AWWA)
 - .1 ANSI/AWWA C111/A21.11-07, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- .4 Canadian Standards Association (CSA International)
 - .1 CSA B242-05, Groove and Shoulder Type Mechanical Pipe Couplings.
- .5 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).
- .6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .7 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).
 - .1 MSS-SP-67-02a, Butterfly Valves.
 - .2 MSS-SP-70-06, Gray Iron Gate Valves, Flanged and Threaded Ends.
 - .3 MSS-SP-71-05, Gray Iron Swing Check Valves, Flanged and Threaded Ends.
 - .4 MSS-SP-80-03, Bronze Gate, Globe, Angle and Check Valves.
- .8 National Research Council (NRC)/Institute for Research in Construction
 - .1 NRCC 38728, National Plumbing Code of Canada (NPC) - 1995.
- .9 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act, 1992, c. 34 (TDGA).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 01 50 for Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for insulation and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Closeout Submittals:
 - .1 Provide maintenance data for incorporation into manual specified in Section 01 01 50- General Instructions.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Store and manage hazardous materials in accordance with Section 01 01 50 - General Instructions.

Part 2 Products

2.1 PIPING

- .1 Domestic hot, cold and recirculation systems, within building.
 - .1 Above ground: copper tube, hard drawn, type L: to ASTM B88M.

2.2 FITTINGS

- .1 Bronze pipe flanges and flanged fittings, Class 150: to ANSI/ASME B16.24.
- .2 Cast bronze threaded fittings, Class 125: to ANSI/ASME B16.15.
- .3 Cast copper, solder type: to ANSI/ASME B16.18.
- .4 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.
- .5 NPS 2 and larger: ANSI/ASME B16.18 or ANSI/ASME B16.22 roll grooved to CSA B242.
- .6 NPS 1 1/2 and smaller : wrought copper to ANSI/ASME B16.22, cast copper to ANSI/ASME B16.18; with 301stainless steel internal components and EPDM seals. Suitable for operating pressure to 1380 kPa.

2.3 JOINTS

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

- .5 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM gasket.
- .6 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.

2.4 ESCUTCHEONS

- .1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.
- .2 Construction: one piece type with set screws.
 - .1 Chrome or nickel plated brass or type 302 stainless steel.
- .3 Sizes: outside diameter to cover opening or sleeve.
 - .1 Inside diameter to fit around pipe or outside of insulation if so provided.

2.5 GATE VALVES

- .1 NPS 2 and under, soldered:
 - .1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc as specified Section 23 05 23.01 - Valves - Bronze.
- .2 NPS 2 and under, screwed:
 - .1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc as specified Section 23 05 23.01 - Valves - Bronze.
- .3 NPS 2 1/2 and over, in mechanical rooms, flanged:
 - .1 Rising stem: to MSS-SP-70, Class 125, 860 kPa, flat flange faces, cast-iron body, OS&Y bronze trim specified Section 23 05 23.02 - Valves - Cast Iron.
- .4 NPS 2 1/2 and over, other than mechanical rooms, flanged:
 - .1 Non-rising stem: to MSS-SP-70, Class 125, 860 kPa, flat flange faces, cast-iron body, bronze trim, bolted bonnet specified Section 23 05 23.02 - Valves - Cast Iron: Gate, Globe, Check.

2.6 GLOBE VALVES

- .1 NPS2 and under, soldered:
 - .1 To MSS-SP-80, Class 125, 860 kPa, bronze body, renewable composition disc, screwed over bonnet as specified Section 23 05 23.01 - Valves - Bronze.
 - .2 Lockshield handles: as indicated.
- .2 NPS 2 and under, screwed:
 - .1 To MSS-SP-80, Class 150, 1 MPa, bronze body, screwed over bonnet, renewable composition disc as specified Section 23 05 23.01 - Valves - Bronze.
 - .2 Lockshield handles: as indicated.

2.7 SWING CHECK VALVES

- .1 NPS 2 and under, soldered:

- .1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat as specified Section 23 05 23.01 - Valves - Bronze.
- .2 NPS 2 and under, screwed:
 - .1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat as specified Section 23 05 23.01 - Valves - Bronze.
- .3 NPS 2 1/2 and over, flanged:
 - .1 To MSS-SP-71, Class 125, 860 kPa, cast iron body, flat flange faces, renewable seat, bronze disc, bolted cap specified Section 23 05 23.02 - Valves - Cast Iron: Gate, Globe, Check.

2.8 BALL VALVES

- .1 NPS 2 and under, screwed:
 - .1 Class 150.
 - .2 Bronze body, stainless steel ball, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle as specified Section 23 05 23.01 - Valves - Bronze.
- .2 NPS 2 and under, soldered:
 - .1 To ANSI/ASME B16.18, Class 150.
 - .2 Bronze body, stainless steel ball, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle, with NPT to copper adaptors as specified Section 23 05 23.01 - Valves - Bronze.

2.9 BUTTERFLY VALVES

- .1 NPS 2-1/2 and over, wafer:
 - .1 To MSS-SP-67, Class 200.
 - .2 Cast iron body, ductile iron chrome plated disc, stainless steel stem, EPT liner.
 - .3 Lever operated, NPS8 and over, gear operated.
- .2 NPS 2-1/2 and over, grooved ends:
 - .1 Class 300 psig CWP, bubble tight shut-off, bronze body EPDM coated ductile iron disc with integrally cast stem.
 - .2 Operator:
 - .1 NPS 4 and under: lever handle.
 - .2 NPS 6 and over: gear operated.

Part 3 Execution

3.1 APPLICATION

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

3.2 INSTALLATION

- .1 Install in accordance with NPC, Province of British Columbia Plumbing Code and local authority having jurisdiction.
- .2 Install pipe work in accordance with Section 23 05 05 - Installation of Pipework, supplemented as specified herein.
- .3 Assemble piping using fittings manufactured to ANSI standards.
- .4 Install CWS piping below and away from HWS and HWC and other hot piping so as to maintain temperature of cold water as low as possible.
- .5 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.
- .6 Buried tubing:
 - .1 Lay in well compacted washed sand in accordance with AWWA Class B bedding.
 - .2 Bend tubing without crimping or constriction. Minimize use of fittings.

3.3 VALVES

- .1 Isolate equipment, fixtures and branches with gate and ball valves.
- .2 Balance recirculation system using lockshield globe valves. Mark settings and record on as-built drawings on completion.

3.4 PRESSURE TESTS

- .1 Conform to requirements of Section 21 05 01 - Common Work Results for Mechanical.
- .2 Test pressure: greater of 1.5 times maximum system operating pressure or 860 kPa.

3.5 FLUSHING AND CLEANING

- .1 Flush entire system for 8 h. Ensure outlets flushed for 2 hours. Let stand for 24 hours, then draw two samples off longest run. Submit to testing laboratory to verify that system is clean copper to Federal potable water guidelines. Let system flush for additional 2 hours, then draw off another sample for testing.

3.6 PRE-START-UP INSPECTIONS

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

3.7 DISINFECTION

- .1 Flush out, disinfect and rinse system to requirements of authority having jurisdiction approval of Departmental Representative.
- .2 *Coordinate with Section 33 11 16- Site Water Utility Distribution Piping and Section 33 11 16.01 - Incoming Site Water Utility Distribution Piping.*
- .3 Upon completion, provide laboratory test reports on water quality for Departmental Representative approval.

3.8 START-UP

- .1 Timing: start up after:
 - .1 Pressure tests have been completed.
 - .2 Disinfection procedures have been completed.
 - .3 Certificate of static completion has been issued.
 - .4 Water treatment systems operational.
- .2 Provide continuous supervision during start-up.
- .3 Start-up procedures:
 - .1 Establish circulation and ensure that air is eliminated.
 - .2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.
 - .3 Bring HWS storage tank up to design temperature slowly.
 - .4 Monitor piping HWS and HWC piping systems for freedom of movement, pipe expansion as designed.
 - .5 Check control, limit, safety devices for normal and safe operation.
- .4 Rectify start-up deficiencies.

3.9 PERFORMANCE VERIFICATION

- .1 Scheduling:
 - .1 Verify system performance after pressure and leakage tests and disinfection are completed, and Certificate of Completion has been issued by authority having jurisdiction.
- .2 Procedures:
 - .1 Verify that flow rate and pressure meet Design Criteria.
 - .2 TAB HWC in accordance with Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
 - .3 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.
 - .4 Sterilize HWS and HWC systems for Legionella control.
 - .5 Verify performance of temperature controls.
 - .6 Verify compliance with safety and health requirements.

- .7 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor or re-charge air chambers. Repeat for outlets and flush valves.
- .8 Confirm water quality consistent with supply standards, and ensure no residuals remain as result of flushing or cleaning.
- .3 Reports:
 - .1 In accordance with Section 01 91 00 - Commissioning: Reports, using report forms as specified in Section 01 91 00 - Commissioning: Report Forms and Schematics.
 - .2 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

3.10 OPERATION REQUIREMENTS

- .1 Co-ordinate operation and maintenance requirements including, cleaning and maintenance of specified materials and products with Section 23 05 05 - Installation of Pipework.
- .2 Operational requirements include:
 - .1 Cleaning materials and schedules.
 - .2 Repair and maintenance materials and instructions.

3.11 CLEANING

- .1 Clean in accordance with Section 01 01 50- General Instructions.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 01 50- General Instructions.

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 ASTM International Inc.
 - .1 ASTM B32-08, Standard Specification for Solder Metal.
 - .2 ASTM B306-02, Standard Specification for Copper Drainage Tube (DWV).
 - .3 ASTM C564-03a, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- .2 Canadian Standards Association (CSA International).
 - .1 CSA B67-1972(R1996), Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories.
 - .2 CAN/CSA-B70-06, Cast Iron Soil Pipe, Fittings and Means of Joining.
 - .3 CAN/CSA-B125.3-05, Plumbing Fittings.
- .3 Green Seal Environmental Standards (GSES)
 - .1 Standard GS-36-00, Commercial Adhesives.
- .4 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 01 50 for Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 01 50- General Instructions.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

Part 2 Products**2.1 COPPER TUBE AND FITTINGS**

- .1 Above ground sanitary, storm and vent Type DWV to: ASTM B306.
 - .1 Fittings.
 - .1 Cast brass: to CAN/CSA-B125.3.
 - .2 Wrought copper: to CAN/CSA-B125.3.

- .2 Solder: lead free, to ASTM B32.

2.2 CAST IRON PIPING AND FITTINGS

- .1 Buried sanitary, storm and vent minimum NPS 3, to: CAN/CSA-B70, with one layer of protective coating.
 - .1 Joints:
 - .1 Mechanical joints:
 - .1 Neoprene or butyl rubber compression gaskets: to ASTM C564 or CAN/CSA-B70.
 - .2 Stainless steel clamps.
 - .2 Hub and spigot:
 - .1 Caulking lead: to CSA B67.
 - .2 Cold caulking compounds.
 - .2 Above ground sanitary, storm and vent: to CAN/CSA-B70.
 - .1 Joints:
 - .1 Hub and spigot:
 - .1 Caulking lead: to CSA B67.
 - .2 Mechanical joints:
 - .1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.

Part 3 Execution

3.1 APPLICATION

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

3.2 INSTALLATION

- .1 In accordance with Section 23 05 01 - Use of HVAC Systems During Construction.
- .2 Install in accordance with National Plumbing Code, British Columbia Plumbing Code and local authority having jurisdiction.

3.3 TESTING

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

3.4 PERFORMANCE VERIFICATION

- .1 Cleanouts:
 - .1 Ensure accessible and that access doors are correctly located.

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

3.5 CLEANING

- .1 Clean in accordance with Section 01 01 50 - General Instructions.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 01 50 - General Instructions.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American National Standards Institute/Canadian Standards Association (ANSI/CSA)
 - .1 ANSI Z21.10.1-2004/CSA 4.1-2004, Gas Water Heaters - Volume I, Storage Water Heaters With Input Ratings of 75,000 Btu Per Hour or Less.
 - .2 ANSI Z21.10.1A-2006/CSA 4.1A-2006, Addenda 1 to ANSI Z21.10.1-2004/CSA 4.1-2004, Gas Water Heaters Volume I, Storage Water Heaters With Input Ratings of 75,000 Btu Per Hour or Less.
 - .3 ANSI Z21.10.1b-2006/CSA 4.1b-2006, Addenda 2 to ANSI Z21.10.1-2004/CSA 4.1-2004, Gas Water Heaters - Volume I, Storage Water Heaters With Input Ratings of 75,000 Btu Per Hour or Less.
 - .4 ANSI Z21.10.3A-2007/CSA 4.3-2007, Gas Water Heaters - Volume III - Storage Water Heaters, with Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA B51-03(R2007), Boiler, Pressure Vessel, and Pressure Piping Code.
 - .2 CAN/CSA-B149.1-05, Natural Gas and Propane Installation Code.
 - .3 CAN/CSA-C309-M90(R2003), Performance Requirements for Glass-Lined Storage Tanks for Household Hot Water Service.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 01 50- General Instructions.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for domestic water heater, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Provide drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia, Canada.
 - .2 Indicate:
 - .1 Equipment, including connections, fittings, control assemblies and ancillaries, identifying factory and field assembled.

1.3 CLOSEOUT SUBMITTALS

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

1.4 DELIVERY, STORAGE AND HANDLING

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

- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, and packaging materials in accordance with Section 01 01 50- General Instructions.

1.5 WARRANTY

- .1 For the Work of this Section 22 30 05 - Domestic Water Heaters, 12 months warranty period prescribed in subsection GC 32.1 of General Conditions "C" is extended to number of years specified for each product.
- .2 Contractor hereby warrants domestic water heaters in accordance with CCDC2, but for number of years specified for each product.

Part 2 Products

2.1 GAS (POWER BURNER) WATER HEATER

- .1 To ANSI Z21.10.1/CSA 1-4.1, ANSI Z21.10.3/CSA 1-4.3 with a recovery rate of 525 L/h based on 56 degrees C rise and 35 kW input. Thermal efficiency of 94%.
- .2 Tank: 227 L, glass lined steel, 705 mm dia x 1410 mm high fibreglass insulation, enamelled steel jacket, power direct vent.
- .3 Gas burner: complete with high limit control, gas valve, gas pressure regulator, 100% safety shut-off, firepower gas burner with air distribution ring.
- .4 3 year warranty certificate. Qualify for Fortis BC certified rebate program.

2.2 TRIM AND INSTRUMENTATION

- .1 Drain valve: NPS 1 with hose end.
- .2 Thermometer: 100 mm dial type with red pointer and thermowell filled with conductive paste.
- .3 Pressure gauge: 75 mm dial type with red pointer, siphon, and shut-off cock.
- .4 Thermowell filled with conductive paste for control valve temperature sensor.
- .5 ASME rated temperature and pressure relief valve sized for full capacity of heater, having discharge terminating over floor drain and visible to operators.
- .6 Magnesium anodes adequate for 20 years of operation and located for easy replacement.

2.3 ANCHOR BOLTS AND TEMPLATES

- .1 Supply anchor bolts and templates for installation in concrete support pad.
- .2 Size anchor bolts to withstand seismic zone 4 acceleration and velocity forces.

Part 3 Execution

3.1 APPLICATION

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

3.2 INSTALLATION

- .1 Install in accordance with manufacturer's recommendations and authority having jurisdiction.
- .2 Provide structural steel for horizontal mounted tanks and for instantaneous heaters.
- .3 Provide insulation between tank and supports.
- .4 Install natural gas fired domestic water heaters in accordance with CAN/CSA-B149.1.

3.3 FIELD QUALITY CONTROL

- .1 Manufacturer's factory trained, certified Engineer to start up and commission DHW heaters.

3.4 CLEANING

- .1 Clean in accordance with Section 01 01 50 - General Instructions.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 01 50 - General Instructions.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for plumbing specialties and accessories.
 - .2 Sustainable requirements for construction and verification.
- .2 Related Sections:
 - .1 Section 01 01 50 – General Instructions.
 - .2 Section 01 35 33 - Health and Safety Requirements.
 - .3 Section 01 91 00 - Commissioning.

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM).
 - .1 ASTM A126-95(2001), Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
 - .2 ASTM B62-02, Specification for Composition Bronze or Ounce Metal Castings.
- .2 Canadian Standards Association (CSA International).
 - .1 CSA-B64 Series-01, Backflow Preventers and Vacuum Breakers.
 - .2 CSA-B79-94(R2000), Floor, Area and Shower Drains, and Cleanouts for Residential Construction.
 - .3 CSA-B356-00, Water Pressure Reducing Valves for Domestic Water Supply Systems.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .4 Plumbing and Drainage Institute (PDI).
 - .1 PDI-G101-96, Testing and Rating Procedure for Grease Interceptors with Appendix of Sizing and Installation Data.
 - .2 PDI-WH201-92, Water Hammer Arresters Standard.

1.3 SUBMITTALS

- .1 Submittals in accordance with Section 01 01 50 - General Instructions.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet for fixtures and equipment.
 - .2 Indicate dimensions, construction details and materials for specified items.
- .3 Shop Drawings:
 - .1 Submit shop drawings to indicate materials, finishes, method of anchorage, number of anchors, dimensions construction and assembly details and accessories.

- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Instructions: submit manufacturer's installation instructions.
- .6 Manufacturers' Field Reports: manufacturers' field reports specified.
- .7 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 01 50 - General Instructions, include:
 - .1 Description of plumbing specialties and accessories, giving manufacturers name, type, model, year and capacity.
 - .2 Details of operation, servicing and maintenance.
 - .3 Recommended spare parts list.

1.4 QUALITY ASSURANCE

- .1 Pre-Installation Meetings:
 - .1 Convene pre-installation meeting one week prior to beginning on-site installations.
 - .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 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 01 50 - General Instructions.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

Part 2 Products

2.1 FLOOR DRAINS

- .1 Floor Drains and Trench Drains: to CSA B79.
- .2 Type 1: general duty; cast iron body round, adjustable head, sediment basket nickel bronze strainer, integral seepage pan, and clamping collar.
- .3 Type 2: heavy duty; cast iron body, heavy duty non-tilting or hinged lacquered cast iron grate, integral seepage pan and clamping collar.

- .4 Type 3: combination funnel floor drain; cast iron body with integral seepage pan, clamping collar, nickel-bronze adjustable head strainer with integral funnel.

2.2 ROOF DRAINS

- .1 Type 1: roof gutter drain with cast iron body with cast iron dome, bottom outlet, under-deck clamp to suit roof gutter construction, clamping function, flashing clamp ring with strainer.
- .2 Unit equals to Smith Jay R. Fig 1630T.

2.3 CLEANOUTS

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

2.4 NON-FREEZE WALL HYDRANTS (NFHB)

- .1 Recessed with integral vacuum breaker, NPS 3/4 hose outlet, removable operating key. Polished bronze finish.

2.5 WATER HAMMER ARRESTORS

- .1 Stainless steel or Copper construction, bellows type: to PDI-WH201.

2.6 BACK FLOW PREVENTERS

- .1 Preventers: to CSA-B64 Series, application as indicated, reduced pressure principle type, double check valve assembly, back flow preventer with intermediate atmospheric vent or vacuum breaker.

2.7 VACUUM BREAKERS

- .1 Breakers: to CSA-B64 Series, vacuum breaker atmospheric hose connection.

2.8 PRESSURE REGULATORS

- .1 Up to NPS1-1/2 bronze bodies, screwed: to ASTM B62.
- .2 NPS2 and over, semi-steel bodies, Class 125, flanged: to ASTM A126, Class B.
- .3 Semi-steel spring chambers with bronze trim.

2.9 BACKWATER VALVES

- .1 Coated extra heavy cast iron body with bronze seat, revolving bronze flapper and threaded cover.
- .2 Access:
 - .1 Surface access.
 - .2 Access pipe with cover: maximum 300 mm depth.
 - .3 Steel housing with gasketed steel cover.
 - .4 Concrete access pit with cover, as indicated.

2.10 HOSE BIBBS AND SEDIMENT FAUCETS

- .1 Bronze construction complete with integral back flow preventer, hose thread spout, replaceable composition disc, and chrome plated in finished areas.

2.11 TRAP SEAL PRIMERS

- .1 Brass, with integral vacuum breaker, NPS1/2 solder ends, NPS1/2 drip line connection.

2.12 STRAINERS

- .1 860 kPa, Y type with 20 mesh, monel, bronze or stainless steel removable screen.
- .2 NPS2 and under, bronze body, screwed ends, with brass cap.
- .3 NPS2 1/2 and over, cast iron body, flanged ends, with bolted cap.

2.13 CLOTHES WASHER BOXES

- .1 Laundry-mate supply and drain fixture with 40 mm drain connection, 15 mm sweat union connections and service stops. Laundry Metal Washer Box, flush with wall, with RH or LH outlet as required, with level operated ball valves 19 mm, hose end outlets, with water hammer arrestors, 12.7 mm H&CW connections. Provide accessible service stops on water lines, metal drain and metal 38 mm or 50 mm P Trap to local code requirements. Trap is concealed in wall, provide access as per code requirements.

2.14 OIL INTERCEPTORS

- .1 Interceptor, tested and rated in accordance with PDI G101, complete with acid resistant interior enamel finish and steel extension for mounting flush with floor with non-skid covers complete with flow control fitting suitably vented.
- .2 Capacity: 50 GPM.

- .3 Acceptable materials: Jay R. Smith, Watts, MIFAB.
- .1 Acceptable materials: Jay R. Smith Fig. No. 8550.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install in accordance with National Plumbing Code of Canada, provincial codes, and local authority having jurisdiction.
- .2 Install in accordance with manufacturer's instructions and as specified.

3.3 CLEANOUTS

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

3.4 NON-FREEZE WALL HYDRANTS

- .1 Install 600 mm above finished grade unless otherwise indicated.

3.5 WATER HAMMER ARRESTORS

- .1 Install on branch supplies to fixtures or group of fixtures.

3.6 BACK FLOW PREVENTORS

- .1 Install in accordance with CSA-B64 Series, where indicated and elsewhere as required by code.
- .2 Pipe discharge to terminate over nearest drain.

3.7 BACKWATER VALVES

- .1 Install in main sewer lines and at weeping tile connection in pit provided at building cleanout.
- .2 Install in access pit as indicated.

3.8 HOSE BIBBS AND SEDIMENT FAUCETS

- .1 Install at bottom of risers, at low points to drain systems, and as indicated.

3.9 TRAP SEAL PRIMERS

- .1 Install for floor drains and elsewhere, as indicated.
- .2 Install on cold water supply to nearest frequently used plumbing fixture, in concealed space, to approval of Departmental Representative.
- .3 Install soft copper tubing to floor drain.

3.10 STRAINERS

- .1 Install with sufficient room to remove basket.

3.11 OIL INTERCEPTORS

- .1 Install with sufficient space, as indicated, for ease of maintenance.

3.12 START-UP

- .1 General:
 - .1 In accordance with Section 01 91 00 - Commissioning: General Requirements, supplemented as specified herein.
- .2 Timing: start-up only after:
 - .1 Pressure tests have been completed.
 - .2 Disinfection procedures have been completed.
 - .3 Certificate of static completion has been issued.
 - .4 Water treatment systems operational.
- .3 Provide continuous supervision during start-up.

3.13 TESTING AND ADJUSTING

- .1 General:
 - .1 In accordance with Section 01 91 00 - Commissioning: General Requirements, supplemented as specified.
- .2 Timing:
 - .1 After start-up deficiencies rectified.
 - .2 After certificate of completion has been issued by authority having jurisdiction.
- .3 Application tolerances:
 - .1 Pressure at fixtures: +/- 70 kPa.
 - .2 Flow rate at fixtures: +/- 20%.
- .4 Adjustments:
 - .1 Verify that flow rate and pressure meet design criteria.
 - .2 Make adjustments while flow rate or withdrawal is (1) maximum and (2) 25% of maximum and while pressure is (1) maximum and (2) minimum.

- .5 Floor drains:
 - .1 Verify operation of trap seal primer.
 - .2 Prime, using trap primer. Adjust flow rate to suit site conditions.
 - .3 Check operations of flushing features.
 - .4 Check security, accessibility, removeability of strainer.
 - .5 Clean out baskets.
- .6 Vacuum breakers, backflow preventers, backwater valves:
 - .1 Test tightness, accessibility for O&M of cover and of valve.
 - .2 Simulate reverse flow and back-pressure conditions to test operation of vacuum breakers, backflow preventers.
 - .3 Verify visibility of discharge from open ports.
- .7 Roof drains:
 - .1 Check location at low points in roof.
 - .2 Check security, removeability of dome.
 - .3 Adjust weirs to suit actual roof slopes, meet requirements of design.
 - .4 Clean out sumps.
 - .5 Verify provisions for movement of roof systems.
- .8 Access doors:
 - .1 Verify size and location relative to items to be accessed.
- .9 Cleanouts:
 - .1 Verify covers are gas-tight, secure, yet readily removable.
- .10 Water hammer arrestors:
 - .1 Verify proper installation of correct type of water hammer arrester.
- .11 Wall hydrants:
 - .1 Verify complete drainage, freeze protection.
 - .2 Verify operation of vacuum breakers.
- .12 Pressure regulators, PRV assemblies:
 - .1 Adjust settings to suit locations, flow rates, pressure conditions.
- .13 Strainers:
 - .1 Clean out repeatedly until clear.
 - .2 Verify accessibility of cleanout plug and basket.
 - .3 Verify that cleanout plug does not leak.
- .14 Oil interceptors:
 - .1 Activate, using manufacturer's recommended procedures and materials.
- .15 Hose bibbs, sediment faucets:
 - .1 Check, test and adjust according to manufacturer recommendations.

- .16 Commissioning Reports:
 - .1 In accordance with Section 01 91 00 - Commissioning: Reports, supplemented as specified.
- .17 Training:
 - .1 In accordance with Section 01 91 00 - Commissioning: Training of O&M Personnel, supplemented as specified.
 - .2 Demonstrate full compliance with Design Criteria.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-B45 Series-02(R2008), Plumbing Fixtures.
 - .2 CAN/CSA-B125.3-05, Plumbing Fittings.
 - .3 CAN/CSA-B651-04, Accessible Design for the Built Environment.
- .2 Green Seal Environmental Standards (GSES)
 - .1 Standard GS-36-00, Commercial Adhesives.
- .3 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 01 50 - General Instructions.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for washroom fixtures, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Indicate fixtures and trim:
 - .1 Dimensions, construction details, roughing-in dimensions.
 - .2 Factory-set water consumption per flush at recommended pressure.
 - .3 For water closets, urinals: minimum pressure required for flushing.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide operation and maintenance data for washroom fixtures, for incorporation into manual specified in Section 01 01 50 for Closeout Submittals.
- .2 Include:
 - .1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.
 - .2 Details of operation, servicing, maintenance.
 - .3 List of recommended spare parts.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 01 50- General Instructions.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

- .3 Packaging Waste Management: remove for reuse and return of pallets and packaging materials in accordance with Section 01 01 50 - General Instructions.

Part 2 Products

2.1 MANUFACTURED UNITS

- .1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.
- .2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.3.
- .3 Exposed plumbing brass to be chrome plated.
- .4 Number, locations: as indicated.
- .5 Fixtures in any one location to be product of one manufacturer and of same type.
- .6 Trim in any one location to be product of one manufacturer and of same type.
- .7 Acceptable fixture materials: Crane, Kohler, American Standard
- .8 Acceptable trim materials: Sloan, Crane, Delta
- .9 Water closets:

WC type	Mounting		Bowl		Flush valve		Flush tank	Handicapped
	Wall	Floor	Elong	Reg	Exp'd	Conc'd		
WC-1		X	X		X			X
WC-2		X	X		X			

- .1 WC-1: floor-mounted, flush valve, for handicapped.
 - .1 Top of seat to be between 400 mm and 460 mm from finished floor.
 - .2 Bowl: vitreous china, floor mounted, syphon jet, elongated rim, top spud for flush valve, bolt caps.
 - .3 Acceptable materials: Crane Hymont 3701
- .2 WC-2: floor-mounted, flush valve.
 - .1 Bowl: vitreous china, syphon jet, elongated rim, close-coupled combination, bowl and bolt caps.
 - .2 Acceptable materials: Crane Whirlton 3325
- .10 Water Closet Flush Valves for WC-1 and WC-2:
 - .1 Flush valve: exposed, polished chrome, externally adjustable, diaphragm type with NPS 1 screwdriver angle stop, oscillating handle, flush connection and coupling for NPS 1 1/2 top spud, wall and spud escutcheons, seat bumper and vacuum breaker. Low flush cycle: adjustable from 3.8 - 17 litres/ flush, set to 5.7 litres/flush.
- .11 Water Closet Seats.
 - .1 Seat: black, elongated, open front, moulded solid plastic, less cover, stainless steel check hinges, stainless steel insert post.

- .12 Washroom Lavatories:
 - .1 LAV-1: wall-hung, for handicapped.
 - .1 Vitreous china, low shelf, with integral back, contoured front, shallow front basin, front overflow, soap depressions, supply openings on 299 mm centres, concealed supports. Sizes: 560 x 540 mm.
 - .2 Provide pipe cover for mixing valve.
 - .3 Acceptable materials: Crane Serena 129.
 - .2 LAV-2: wall-hung, integral back.
 - .1 Vitreous china, low shelf, with integral back, contoured front, shallow front basin, front overflow, soap depressions, supply openings on 299 mm centres, concealed supports. Sizes: 483 x 432 mm.
 - .2 Acceptable materials: Crane Westmount 1320V.
- .13 Washroom Lavatory Trim for LAV-1 and LAV-2:
 - .1 Chrome plated brass, combination supply and waste fittings, mixing spout, washerless, pop-up waste, aerator, metal mini-lever handles.
 - .1 Provide accessories to limit maximum flow rate to 8.35 l/minute at 413 kPa.
 - .2 Waste fitting: pop-up.
 - .2 Wheelchair supply fitting with gooseneck spout, aerator, 150 mm blade handles with indexed buttons, bent tailpiece.
 - .1 Provide accessories to limit maximum flow rate to 8.35 l/minute at 413 kPa.
 - .3 Waste fitting: pop-up.
- .14 Fixture piping:
 - .1 Hot and cold water supplies to fixtures:
 - .1 Chrome plated rigid supply pipes with handwheel stop, reducers, escutcheon.
 - .2 Waste:
 - .1 Brass P trap with clean out on fixtures not having integral trap.
 - .2 Chrome plated in exposed places.
 - .3 Pipe cover:
 - .1 Provide pipe cover for LAV-1.
- .15 Chair carriers:
 - .1 Factory manufactured floor-mounted carrier systems for wall-mounted fixtures.

Part 3 Execution

3.1 APPLICATION

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

3.2 INSTALLATION

- .1 Mounting heights:
 - .1 Standard: to manufacturer's recommendations, measured from finished floor.
 - .2 Wall-hung fixtures: as per code, measured from finished floor.
 - .3 Barrier free: to most stringent NBCC, CAN/CSA B651.

3.3 ADJUSTING

- .1 Conform to water conservation requirements specified this section.
- .2 Adjustments:
 - .1 Adjust water flow rate to design flow rates.
 - .2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.
 - .3 Adjust flush valves to suit actual site conditions.
 - .4 Adjust urinal flush timing mechanisms.
 - .5 Set controls of automatic flush valves for WCs and urinals to prevent unnecessary flush cycles.
- .3 Checks:
 - .1 Water closets, urinals: flushing action.
 - .2 Aerators: operation, cleanliness.
 - .3 Vacuum breakers, backflow preventers: operation under all conditions.
- .4 Thermostatic controls:
 - .1 Verify temperature settings, operation of control, limit and safety controls.

3.4 CLEANING

- .1 Clean in accordance with Section 01 01 50 - General Instructions.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 01 50 - General Instructions.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-B45 Series-02(R2008), Plumbing Fixtures.
 - .2 CAN/CSA-B125.3-05, Plumbing Fittings.
 - .3 CAN/CSA-B651-04, Accessible Design for the Built Environment.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 01 50 - General Instructions.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for fixtures, and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data in accordance with Section 01 01 50- General Instructions.
- .2 Include:
 - .1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.
 - .2 Details of operation, servicing, maintenance.
 - .3 List of recommended spare parts.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 01 50 - General Instructions.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse and return of pallets and packaging materials in accordance with Section 01 01 50 - General Instructions.

Part 2 Products

2.1 MANUFACTURED UNITS

- .1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.
- .2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.
- .3 Exposed plumbing brass to be chrome plated.
- .4 Number, locations: architectural drawings to govern.

- .5 Fixtures to be product of one manufacturer.
- .6 Trim to be product of one manufacturer.
- .7 Acceptable fixture materials: Crane, Kohler, American Standard
- .8 Acceptable trim materials: Sloan, Crane, Delta, Chicago.
- .9 Laundry/Service sink: SK-3
 - .1 Sink: From 1.0 mm thick type 304, 18-10 stainless steel, self-rimming, undercoated, legs, clamps, roll rim, with 300 mm high undrilled integral back. Size: 690 x 700 x 360 mm. Acceptable materials: Kindred SL24 24-1.
 - .2 Supply fitting: with vacuum breaker, indexed cross handles, heavy cast brass spout with pail hook, aerator, brace to wall, integral stop valves. Provide accessories to limit maximum flow rate to 8.35 l/minute at 413 kPa. Acceptable materials: Chicago 521-CP.
 - .3 Waste fitting: chrome plated cast brass outlet strainer, enamelled cast iron trap standard with brass cleanout and adjustable floor flange.
 - .4 Rim guard: stainless steel, continuous on three sides.
- .10 Janitor/Mop sinks: JS-1
 - .1 Sink: acid-resisting porcelain enamelled cast iron, or moulded stone, 300 mm high undrilled integral back. Size: 910 x 610 x 254 mm. Acceptable materials: Fiat MSB-3624.
 - .2 Supply fitting: with built-in elevated vacuum breaker, indexed cross handles, 1400 mm long rubber hose, escutcheons, union inlets, heavy cast brass spout with pail hook, aerator, brace to wall, integral stop valves. Provide accessories to limit maximum flow rate to 8.35 l/minute at 413 kPa. Acceptable materials: Fiat 830-AA.
- .11 Stainless steel counter-top sinks.
 - .1 SK-1: single compartment, ledge-back.
 - .1 From 1.0 mm thick type 304, 18-10 stainless steel, self-rimming, undercoated, clamps. Overall sizes: 460 x 510 x 360 mm. Acceptable materials: Kindred LBS 8014 P-1.
 - .2 Trim: chrome plated brass, with swing spout, aerator, 50 mm metal single wing canopy handle, washerless controls, accessories to limit maximum flow rate to 8.35 litres/minute at 413 kPa, spray fitting. Acceptable materials: 1100-L9 CP.
 - .3 Waste fitting: integral stainless steel basket strainer/stopper, tailpiece, cast brass P-trap with cleanout.
 - .2 SK-2: Hair Washing Sink, ledge back:
 - .1 Excellent stain and scratch resistance, dry-process porcelain enamel finish on cast iron, triple fired to 1700 deg. F, self-rimming, undercoated, clamps. Overall sizes: 476 x 495 x 220 mm. Acceptable materials: Wella 3800 Alpha Bowl.
 - .2 Trim: 622 fixture, sprayer, strainer, bracket for wall mounting, bracket bolt, neckrest and vacuum breaker, pressure balance regulated mixing

- valve, washerless controls, accessories to limit maximum flow rate to 8.35 litres/minute at 413 kPa, spray fitting.
- .3 Waste fitting: integral stainless steel basket strainer/stopper, tailpiece, cast brass P-trap with cleanout.
- .3 SK-4: double compartment, ledge back:
 - .1 From 1.0 mm thick type 304, 18-10 stainless steel, self-rimming, undercoated, clamps. Overall sizes: 790 x 520 x 200 mm. Acceptable materials: Kindred LBD 6408 P-1.
 - .2 Trim: chrome plated brass, with swing spout, aerator, single lever handle, washerless controls, accessories to limit maximum flow rate to 8.35 litres/minute at 413 kPa, spray fitting. Acceptable materials: Delta 100-WF-10.
 - .3 Waste fitting: integral stainless steel basket strainer/stopper, tailpiece, cast brass P-trap with cleanout.
- .12 Fixture piping:
 - .1 Hot and cold water supplies to each fixture:
 - .1 Chrome plated rigid supply pipes each with handwheel stop, reducers, escutcheon.
 - .2 Waste:
 - .1 Brass P trap with clean out on each fixture not having integral trap.
 - .2 Chrome plated in all exposed places.
- .13 Chair carriers:
 - .1 Factory manufactured floor-mounted carrier systems for all wall-mounted fixtures.

Part 3 Execution

3.1 APPLICATION

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

3.2 INSTALLATION

- .1 Mounting heights:
 - .1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified.
 - .2 Wall-hung fixtures: as indicated, measured from finished floor.
 - .3 Physically handicapped: to comply with most stringent of either NBCC or CAN/CSA-B651.

3.3 ADJUSTING

- .1 Conform to water conservation requirements specified this section.
- .2 Adjustments:

- .1 Adjust water flow rate to design flow rates.
- .2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.
- .3 Checks:
 - .1 Aerators: operation, cleanliness.
 - .2 Vacuum breakers, backflow preventers: operation under all conditions.
 - .3 Wash fountains: operation of flow-actuating devices.
- .4 Thermostatic controls:
 - .1 Verify temperature settings, operation of control, limit and safety controls.

3.4 CLEANING

- .1 Clean in accordance with Section 01 01 50 - General Instructions.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 01 50 - General Instructions.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-B45 Series-02(R2008), Plumbing Fixtures.
 - .2 CAN/CSA-B125.3-05, Plumbing Fittings.
 - .3 CAN/CSA-B651-04, Accessible Design for the Built Environment.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 01 50 for Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for fixtures, and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data including monitoring requirements for incorporation into manuals specified in Section 01 01 50 for Closeout Submittals.
- .2 Include:
 - .1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.
 - .2 Details of operation, servicing, maintenance.
 - .3 List of recommended spare parts.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 01 50- General Instructions.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse of pallets and packaging materials in accordance with Section 01 01 50- General Instructions.

Part 2 Products

2.1 MANUFACTURED UNITS

- .1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.
- .2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.3.
- .3 Exposed plumbing brass to be chrome plated.
- .4 Number, locations: architectural drawings to govern.

- .5 Fixtures in any one location to be product of one manufacturer and of same type.
- .6 Trim in any one location to be product of one manufacturer and of same type.
- .7 Individual shower stall and hand showerhead (Handicapped).
 - .1 SH-1 : hand showerhead.
 - .1 Chrome plated brass, non-clog, with adjustable spray, wall/hand shower with flexible metal hose, in-line vacuum breaker, wall connection and flange, 750 mm slide bar for hand shower mounting. Limit maximum flow rate to 9.5 l/minute at 550 kPa.
 - .2 Shower supply valve:
 - .1 Pressure-balanced-actuated element, volume control, 40 degrees C maximum setting, strainer and check-stops on each inlet, dial or lever handle.
 - .3 Fibreglass shower cabinet.
 - .1 Cabinet: acrylic unit wheelchair (barrier free) reinforced with fibreglass, recessed front flange, 18 gauge 30 mm grab bar, moulded-in slip resistant bottom floor pattern.
 - .2 Sizes: as indicated 1720 x 890 x 2130 mm high.
 - .3 Base: fibreglass and polyester resin with chrome plated brass strainer and tailpiece.
 - .4 Accessories: 25 mm stainless steel shower curtain rod and shower curtain, light kit, left or right hand fold-up seat, reinforcements for hand showers, integral soap trays, 50 mm self-caulking brass center drain with stainless steel strainer.
- .8 Baths:
 - .1 SH-2: recessed tub.
 - .1 Stain-resisting, porcelain enamelled steel, with non-slip surface, integral wide rim seat, sound insulating package. Sizes 1500 x 800 x 400 mm.
 - .2 Waste: concealed pop-up waste and overflow fitting with lever-operated mechanism.
 - .3 Trim: chrome plated brass combination shower and over-rim bath supply fittings with volume control, pressure balancing mixing valve, screwdriver stops, self-returning diverter spout, chrome plated ball joint fully adjustable spray pattern shower head with bent shower arm and escutcheon. Provide accessories to limit maximum flow rate to 9.5 litres/minute at 550 kPa.
 - .4 Waste fitting: integral stainless steel basket strainer/stopper, tailpiece, cast brass P-trap with cleanout.
- .9 Fixture piping:
 - .1 Hot and cold water supplies to each fixture.
 - .1 Chrome plated rigid supply pipes each with handwheel stop, reducers, escutcheon.
 - .2 Waste:
 - .1 Brass P trap with cleanout on each fixture not having integral trap.
 - .2 Chrome plated in all exposed places.

Part 3 Execution

3.1 APPLICATION

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

3.2 INSTALLATION

- .1 Mounting heights:
 - .1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified.
 - .2 Physically handicapped: to comply with most stringent of either NBCC or CAN/CSA B651.

3.3 ADJUSTING

- .1 Conform to water conservation requirements specified this section.
- .2 Adjustments:
 - .1 Adjust water flow rate to design flow rates.
 - .2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.
- .3 Checks:
 - .1 Aerators: operation, cleanliness.
 - .2 Vacuum breakers, backflow preventers: operation under all conditions.
- .4 Thermostatic controls:
 - .1 Verify temperature settings, operation of control, limit and safety controls.

3.4 CLEANING

- .1 Clean in accordance with Section 01 01 50- General Instructions.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 01 50- General Instructions.

END OF SECTION