

SPECIFICATIONS

FOR

MAINTENANCE BUILDING RECAPITALIZATION
SIGNAL HILL NATIONAL HISTORIC SITE
NEWFOUNDLAND EAST FIELD UNIT
NEWFOUNDLAND AND LABRADOR

ISSUED FOR TENDER

PROJECT NO. PRO000449

DATE: 25 SEPTEMBER 2015

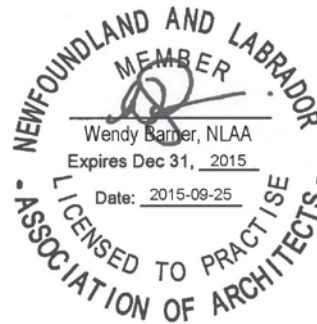
Specifications Issued for Tender

Parks Canada Agency – Newfoundland East Field Unit
Maintenance Building Recapitalization, Signal Hill National Historic Site

Stantec Project No. 140132302

PROFESSIONAL SEALS

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END OF SECTION

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END OF SECTION

Part 1 GENERAL

1.1 RELATED DOCUMENTS

- .1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- .1 Types of items described in this Section:
 - .1 Project information.
 - .2 Work covered by Contract Documents.
 - .3 Work by Owner.
 - .4 Work under separate contracts.
 - .5 Future work.
 - .6 Purchase contracts.
 - .7 Access to site.
 - .8 Coordination with occupants.
 - .9 Work restrictions.
 - .10 Specification and drawing conventions.
- .2 Types of items you will not find described in this Section:
 - .1 Limitations and procedures governing temporary use of Owner's facilities.
 - .2 Owner-furnished products.

1.3 PROJECT INFORMATION

- .1 Project Identification: Maintenance Facility Exterior Upgrades, Signal Hill National Historic Park
 - .1 Project Location: Signal Hill Road, St. John's, NL
- .2 Owner: Parks Canada
 - .1 Owner's Representative: Stantec Architecture Ltd., 141 Kelsey Drive, St. John's, NL, A1B 0L2.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- .1 The Work of the Project is defined by the Contract Documents and includes but is not limited to the following:
 - .1 Replacement of existing wood siding and weather barrier with new.
 - .2 Replacement of existing windows with new vinyl windows.
 - .3 Replacement of existing asphalt shingles with new.
 - .4 Replacement of existing doors with new steel doors.
 - .5 Replacement of existing overhead doors with new sectional steel doors.
 - .6 Associated finishing work.

- .2 Type of Contract
 - .1 Project will be constructed under a single lump sum contract.

1.5 ACCESS TO SITE

- .1 General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- .2 Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - .1 Limits: Where the Work involves site work, limit site disturbance, including earthwork and clearing of vegetation, to 12.2 m beyond building perimeter; 3 m beyond surface walkways, patios, surface parking, and utilities less than 300 mm in diameter; 4.5 m beyond primary roadway curbs and main utility branch trenches; and 7.6 m beyond constructed areas with permeable surfaces (such as pervious paving areas, stormwater detention facilities, and playing fields) that require additional staging areas in order to limit compaction in the constructed area.
 - .2 Driveways, Walkways and Entrances: For Work involving renovations to an existing building or adjacent to other buildings then keep driveways and loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - .1 Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - .2 Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- .3 Condition of Existing Building: Where the Work involves work on an existing building, Maintain portions of the existing building affected by construction operations in a weather tight condition throughout construction period. Repair damage caused by construction operations.

1.6 COORDINATION WITH OCCUPANTS

- .1 Full Owner Occupancy: Owner will occupy site and existing building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.
 - .1 Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
 - .2 Notify the Owner not less than 72 hours in advance of activities that will affect Owner's operations.

1.7 WORK RESTRICTIONS

- .1 Work Restrictions, General: Comply with restrictions on construction operations.

- .1 Comply with limitations on use of public streets and other requirements of authorities having jurisdiction.
- .2 On-Site Work Hours: Limit work in the existing building to normal business working hours of the Owner, Monday through Friday, except as otherwise indicated.
 - .1 Weekend Hours: <7:00 AM-6:00PM, coordinate with Owner prior to organizing weekend work..
 - .2 Early Morning Hours: Comply with restrictions by authorities having jurisdiction for restrictions on noisy work>.
- .3 Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 - .1 Notify Owner's Representative not less than two days in advance of proposed utility interruptions.
 - .2 Obtain Owner's Representative written permission before proceeding with utility interruptions.
- .4 Noise, Vibration, and Odours: For work in or near occupied facilities, coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
 - .1 Notify Owner's Representative not less than two days in advance of proposed disruptive operations.
 - .2 Obtain Owner's Representative's written permission before proceeding with disruptive operations.
- .5 Controlled Substances: Use of tobacco products and other controlled substances on the Project site is not permitted.
- .6 Employee Identification: Owner may provide identification tags for Contractor personnel working on the Project site. Require personnel to utilize identification tags at all times.

1.8 SPECIFICATION AND DRAWING CONVENTIONS

- .1 Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - .1 Imperative mood and streamlined language are generally used in the Specifications. The words *shall*, *shall be*, or *shall comply with*, depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - .2 Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- .2 Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- .3 Drawing Coordination: Requirements for materials and products identified on the Drawings are described in detail in the Specifications. One or more of the following are used on the Drawings to identify materials and products:

- .1 Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.

Part 2 PRODUCTS (Not Used)

Part 3 EXECUTION (Not Used)

END OF SECTION

Part 1 GENERAL

1.1 SUBMITTALS

- .1 Upon award of contract and prior to commencement of work, submit to Departmental Representative the following work management documents:
 - .1 Work Schedule as specified herein.
 - .2 Shop Drawing Submittal Schedule
 - .3 Waste Management Plan.
 - .4 Health and Safety Plan.
 - .5 Hot Work Procedures.
 - .6 Lockout Procedures.
 - .7 Dust Control Plan.
 - .8 List of workers requiring security clearance and those to be placed on Site Security Control list.

1.2 WORK SCHEDULE

- .1 Upon acceptance of bid submit:
 - .1 Detailed work schedule submitted within 7 calendar days.
- .2 Schedule to indicate all calendar dates from commencement to completion of all work within the time stated in the accepted bid.
- .3 Provide sufficient details in detailed schedule to clearly illustrate entire implementation plan, depicting efficient coordination of tasks and resources, to achieve completion of work on time and permit effective monitoring of work progress in relation to established milestones.
- .4 Detailed work schedule content to include as a minimum the following:
 - .1 Bar (GANTT) Charts, indicating all work activities, tasks and other project elements, their anticipated durations, planned dates for achieving key activities and major project milestones supported with;
 - .2 Written narrative on key elements of work illustrated in bar chart, providing sufficient details to demonstrate a reasonable implementation plan for completion of project within designated time.
 - .3 Generally Bar Charts derived from commercially available computerized project management system are preferred but not mandatory.
- .5 Schedule work in cooperation with the Departmental Representative. Incorporate within Detailed Work Schedule, items identified by Departmental Representative during review of preliminary schedule.
- .6 Completed schedule shall be approved by Departmental Representative. When approved, take necessary measures to complete work within scheduled time. Do not change schedule without Departmental Representative's approval.

- .7 Ensure that all subtrades and subcontractors are made aware of the work restraints and operational restrictions specified.
- .8 Schedule Updates:
 - .1 Submit on a monthly basis.
 - .2 Provide information and pertinent details explaining reasons for necessary changes to implementation plan.
 - .3 Identify problem areas, anticipated delays, impact on schedule and proposed corrective measures to be taken.
- .9 Departmental Representative will make interim reviews and evaluate progress of work based on approved schedule. Frequency of such reviews will be as decided by Departmental Representative. Address and take corrective measures on items identified by reviews and as directed by Departmental Representative. Update schedule accordingly.
- .10 In every instance, change or deviation from the Work Schedule, no matter how minimal the risk or impact on safety or inconvenience to tenant or public might appear, will be subject to prior review and approval by the Departmental Representative.

1.3 PROJECT PHASING

- .1 Be aware that Facility must be kept operational for the full duration of work of this contract.
- .2 Unless indicated or approved otherwise, complete all work of a particular phase prior to commencement of another phase. Obtain Departmental Representative's permission prior to moving between phases

1.4 OPERATIONAL RESTRICTIONS

- .1 Facility is operational 24/7 and contains occupied living quarters. Facility must remain fully operational throughout entire construction period. The Contractor must recognize that building occupants will be affected by implementation of this contract. The Contractor must perform the work with utmost regard to the safety and convenience of building occupants and users. All work activities must be planned and scheduled with this in mind.
- .2 Contractor to ensure locations of underground services are identified and prevent impact by heavy equipment.
- .3 Contractor to meet with the Departmental Representative on a weekly basis to identify intended work areas, activities and scheduling for the coming week.
 - .1 Workers may be in areas that allow them to look into living quarters and/or near windows that allow view of sensitive materials and information. A strict work schedule identifying areas of Work must be adhered to in order to enable Departmental Representative to inform occupants to take necessary precautions. Changes to scheduled Work areas must be submitted to the Departmental

Representative, in writing, a minimum of 48 hours in advance, and must be approved in writing by Departmental Representative.

- .4 See section 01 35 54 in regards to:
 - .1 Special security requirements which must be observed in the course of work.
- .5 Limited Maneuvering Space on Site:
 - .1 Contractor is to provide exterior access to roofs using scaffold stairs or other adequate means. Locations of exterior access to be coordinated with Departmental Representative/
 - .2 The Contractor's access to building will be limited to area of work.
 - .3 Area of work may be isolated with pass cards from rest of building.
 - .4 Control points to be relocated/ installed as part of this project.
 - .5 Contractor will be escorted by commissionaire when outside of secure zone. Prior coordination is required.
 - .6 There are physical restrictions to transporting large mechanical and electrical equipment and components slated for installation or removal in the penthouse. Material can only be accessible by the roof via double doors in the penthouse. The roof fascia also restricts the opening to the penthouse and will likely require temporary removal and reinstatement later. The Contractor is permitted to remove the fascia, penthouse door and frame and to install or remove material provided it is reinstated afterwards to the satisfaction of the Departmental Representative. The contract shall protect the roof membrane with plywood and other means necessary during the work. No material shall be placed directly on the roof.
- .6 Facility circulation maintained:
 - .1 Ensure that entrances, corridors, stairwells, fire exits and other circulation routes are maintained free and clear providing safe and uninterrupted passage for Facility users and public at all times during the entire work.
 - .2 Maintain those areas clean and free of construction materials and equipment. Provide temporary dust barriers and other suitable enclosures to ensure users are not exposed to construction activities and are protected from exposure to dust, noise, and hazardous conditions.
 - .3 Provide temporary corridors, walkways, passageways, access to offices, etc. when required due to nature of work. Such circulation routes must be constructed to barrier free requirements unless approved otherwise by Departmental Representative.
 - .4 Maintain fire escape routes accessible and fire fighting access open all times for the duration of the project.
 - .5 Do not under any circumstances block fire exit doors. Do not leave construction materials or debris in corridors, stairwells building entrances and exits.
- .7 To assure that construction work may proceed productively without risk to safety of building occupants, be aware that certain work of this contract must be carried out during "Off-Hours".

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- .8 The following work, if necessary, shall be performed during Off-Hours:
- .1 Any work undertaken in the corridor.
 - .2 Asbestos removal.
 - .3 Erection and dismantling of dust barriers, hoarding or other protective devices to separate areas of Facility occupied and under use by public and tenants from work areas;
 - .4 Erection of site enclosure fencing and temporary hoarding at building entrances and fire exits to keep them operational during work;
 - .5 Asbestos abatement;
 - .6 Demolition of any masonry or concrete inside building;
 - .7 All work involving saw cutting or boring of openings through masonry and concrete walls, floors, ceilings or roof;
 - .8 Work which requires the use of products controlled by WHMIS and for which MSDS sheets indicate toxic or hazardous materials requiring special handling and application procedures;
 - .9 Use of materials having high solvent content or other content emitting strong noxious fumes or odours;
 - .10 Painting;
 - .11 Removal of demolition debris from the building [including cleaning of premises];
 - .12 Cleaning and preparing of occupied areas for daytime use by tenants immediately following an off-hour work shift;
 - .13 Work within a tenant occupied area including corridors, stairwells and other circulation routes under use;
 - .14 Work which requires the temporary disconnection of power and communication services to occupied areas;
 - .15 Testing of fire alarms and other emergency annunciating system;
 - .16 Delivery of materials and equipment from exterior to the interior of building when access routes are located in tenant occupied spaces.
 - .17 Work which creates excessive noise or vibration creating interference with tenant operations.
- .9 Off Hours: for the purposes of this contract, "off-hours" are defined as follows:
- .1 Weeknight Hours: between the hours of 18:00 and 07:00 for each weekday Monday to Friday inclusive.
 - .2 Weekend Hours: between the hours of 18:00 Friday evening to 07:00 Monday morning.
 - .3 Dependent on the nature and location of the construction activity, the day of the week and the time of the year, "off-hours" could be subject to redefinition to start or end at adjusted time periods. Scheduling of "off-hours" work will be subject to approval by the Departmental Representative.
- .10 Safety Signage:
- .1 Provide on site, and erect as required during progress of work, proper bilingual signage, mounted on self-supporting stands, warning the public and building

- occupants of construction activities in progress and alerting need to exercise caution in proceeding through disturbed areas of the facility, and directing building occupants through any detours which may be required.
- .2 Signage to be professionally printed and mounted on wooden backing, coloured and to express messages as directed by the Departmental Representative.
 - .3 Generally maximum size of sign should be in the order of 1.0 square metres. Number of signs required will be dependent on number of areas in facility under renovation at any one time.
 - .4 Include costs for the supply and installation of these signs in the bid price.
- .11 Dust and Dirt Control:
- .1 See Section 01 50 00 and 01 74 11 for dust control and cleaning requirements.
 - .2 Effectively plan and implement dust control measures and cleaning activities as an integral part of all construction activities. Review all measures with the Departmental Representative before undertaking work, especially for major dust generating activities.
 - .3 Do not allow demolition debris and construction waste to accumulate on site and contribute to the propagation of dust.
 - .4 As work progresses, maintain construction areas in a tidy condition at all times. Remove gross dust accumulations by cleaning and vacuuming immediately following the completion of any major dust generating activity.
 - .5 Immediately remove all debris and dust from within occupied areas as generated by work therein during a given workshift.
 - .6 Disconnect and seal-off ductwork of HVAC servicing the construction area to stop spread of dust into other areas of Facility.
 - .7 Avoid situations and practices which results in dust and dirt being brought from the construction areas or from the exterior and tracked into occupied areas used by tenants and the public.
 - .8 Stop workers with soiled footwear from entering building. This includes roofing mechanics and heavy civil workers.
 - .9 Inform workers and make them sensitive to the need for dust and dirt control. Stringently enforce rules and regulations, immediately address non-compliance.
 - .10 Keep access doors to work areas closed at all times. Use only designated doors for entry or egress.
- .12 Work in Occupied Areas:
- .1 Where work must be carried out in an occupied area beyond the boundaries of the enclosed construction site, perform such work during the non-operational off-hour periods of the Facility.
 - .2 Ensure that all dust, dirt, debris, construction waste, materials, tools and equipment are completely removed at the end of each workshift. Clean and reinstate area ready for daytime use by tenant.
 - .3 Provide temporary dust barriers around immediate work areas and place fabric drop sheets over workstations, equipment and other furnishings located immediately adjacent to such work.

- .4 Conduct work in such a way as to minimize the creation of dust and to avoid contaminating areas beyond the immediate location.
 - .5 Discuss and obtain Departmental Representative's approval beforehand on the type and extent of dust barriers, protective devices and measures needed.
 - .6 Be responsible for temporarily moving office furnishings, workstations, computer equipment and other objects as needed to gain access and conduct work. Reinstall all dislocated items at end of each workshift making the area operational again.
 - .7 Disconnect and reconnect any power and communications systems feeding workstations as required.
 - .8 Clean such areas as well as those corridors and routes used to gain entry and access.
- .13 Cleaning of tenant occupied areas used by Contractor:
- .1 Clean lobbies, corridors, stairs, and other circulation routes used by workers to gain access to work by conducting cleaning, vacuuming and washing of floors, walls and other soiled surfaces.
 - .2 Meager attempts at controlling dust and ineffective unprofessional cleaning procedures will not be tolerated.
 - .3 Failure to provide effective dust control, allowing construction dust and dirt to escape beyond construction areas and contaminate occupied areas and building circulation areas will result in Contractor being ordered to immediately provide professional cleaning services without delay to remedy the situation and conduct all cleaning to the extent as determined by Departmental Representative. Alternatively, Departmental Representative may, at certain times and at own discretion; obtain the services of an independent building cleaning agency when cleaning being provided by Contractor is ineffective or tardy in response. Costs of such services will be charged against Contractor in the form of financial penalties or holdback assessments against the Contract.
- .14 Ensure that all sub-trades are made aware of and abide by the contents of this section and in particularly the work restrictions specified herein due to tenant operational requirements.

1.5 PROJECT MEETINGS

- .1 Schedule project meetings, held on a minimum monthly basis, for entire duration of work and more often when directed by Departmental Representative as deemed necessary due to progress of work or particular situation.
- .2 Prepare agenda for meetings
- .3 Notify participants in writing 4 days in advance of meeting date.
 - .1 Ensure attendance of all subcontractors.
 - .2 Departmental Representative will provide list of other attendees to be notified.
- .4 Hold meetings at project site or where approved by Departmental Representative.

- .5 Departmental Representative will preside at meetings and record minutes indicating significant proceedings and decisions. Minutes will identify action items by parties..
 - .1 Once minutes have been distributed by Departmental Representative, Contractor to provide review or recommended revisions to Departmental Representative within 3 days.

1.6 WORK COORDINATION

- .1 The General Contractor is responsible for coordinating the work of the various trades and predetermining where the work of such trades interfaces with each other.
 - .1 Designate one person from own employ having overall responsibility to review contract documents and shop drawings, plan and manage such coordination.
- .2 The General Contractor shall convene meetings between trades whose work interfaces and ensure that they are fully aware of the areas and the extent of where interfacing is required.
 - .1 Provide each trade with the plans and specs of the interfacing trade, as required, to assist them in planning and carrying out their respective work.
 - .2 Develop coordination drawings when deemed required illustrating potential interference between works of various trades and distribute to all affected parties including structural trade.
 - .1 Pay particularly close attention to overhead work above ceilings and within or near to building structural elements.
 - .2 Coordination drawings to identify all building elements, services lines, rough-in points and indicate from where various services are coming.
 - .3 Review coordination drawings at purposely called meetings. Have subcontractors sign-off on drawings and publish minutes of each meeting.
 - .4 Plan and coordinate work in such a way to minimize quantity of service line offsets.
 - .5 Submit copy of coordination drawings and meeting minutes to Departmental Representative for information purposes.
- .3 Submission of shop drawings and ordering of prefabricated equipment or prebuilt components shall only occur once coordination meeting for such items has taken place between trades and all conditions affecting the work of the interfacing trades has been made known and accounted for.
- .4 Work Cooperation:
 - .1 Ensure cooperation between trades in order to facilitate the general progress of the work and avoid situations of spatial interference.
 - .2 Ensure that each trade provides all other trades reasonable opportunity for the completion of the work and in such a way as to prevent unnecessary delays, cutting, patching and the need to remove and replace completed work.
- .5 No extra costs to the Contract will be considered by the Departmental Representative as a result of Contractor's failure to effectively coordinate all portions of the Work. Disputes between the various trades as a result of their not being informed of the areas and extent

of interface work shall be the sole responsibility of the General Contractor to be resolved at own cost.

END OF SECTION

Part 1 GENERAL

1.1 ADMINISTRATIVE

- .1 Contractor will schedule and administer project meetings throughout the progress of the work.
- .2 Distribute written notice of each meeting four days in advance of meeting date to Departmental Representative and Consultant.
- .3 Provide physical space and make arrangements for meetings.
- .4 Preside at meetings.
- .5 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.
- .6 Reproduce and distribute copies of minutes within three days after meetings and transmit to meeting participants.
- .7 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.2 PRECONSTRUCTION MEETING

- .1 Within 7 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Departmental Representative, Consultant, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.
- .3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.
- .4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .5 Agenda to include:
 - .1 Appointment of official representative of participants in the Work.
 - .2 Schedule of Work: in accordance with Section 01 14 10 – Scheduling and Management of Work
 - .3 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 50 00 - Temporary Facilities.
 - .5 Delivery schedule of specified equipment.
 - .6 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
 - .7 Departmental Representative provided products.
 - .8 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .9 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.

- .10 Take-over procedures, acceptance, warranties in accordance with Section 01 77 00 – Closeout Procedures and 01 78 00 - Closeout Submittals.
- .11 Monthly progress claims, administrative procedures, photographs, hold backs.
- .12 Appointment of inspection and testing agencies or firms.
- .13 Insurances, transcript of policies.

1.3 PROGRESS MEETINGS

- .1 During course of Work and prior to project completion, schedule progress meetings bi-weekly.
- .2 Contractor, major Subcontractors involved in Work, Departmental Representative are to be in attendance.
- .3 Notify parties minimum 5 days prior to meetings.
- .4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within 7 days after meeting.
- .5 Agenda to include the following:
 - .1 Review, approval of minutes of previous meeting.
 - .2 Review of Work progress since previous meeting.
 - .3 Field observations, problems, conflicts.
 - .4 Problems which impede construction schedule.
 - .5 Review of off-site fabrication delivery schedules.
 - .6 Corrective measures and procedures to regain projected schedule.
 - .7 Revision to construction schedule.
 - .8 Progress schedule, during succeeding work period.
 - .9 Review submittal schedules: expedite as required.
 - .10 Maintenance of quality standards.
 - .11 Review proposed changes for affect on construction schedule and on completion date.
 - .12 Other business.

Part 2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

Part 3 EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Administrative and procedural requirements for the following:
 - .1 Preconstruction photographs.
 - .2 Periodic construction photographs.
 - .2 Types of items you will not find described in this Section:
 - .1 Procedures for submitting photographic documentation.
 - .2 Procedures for submitting photographic documentation as project record documents at project closeout.
 - .3 Submitting video recordings of demonstration of equipment and training of Canada personnel.
 - .4 Photographic documentation before demolition operations commence.
 - .5 Photographic documentation before site clearing operations commence.

1.2 SUBMITTALS

- .1 Digital Photographs: Submit image files within three days of taking photographs.
 - .1 Identification: Provide the following information with submission:
 - .1 Name of Project.
 - .2 Name of Contractor.
 - .3 Date photograph was taken.
 - .4 Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

1.3 USAGE RIGHTS

- .1 Obtain and transfer copyright usage rights from photographer to Canada for unlimited reproduction of photographic documentation.

Part 2 PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

- .1 Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 6 megapixels.

Part 3 EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

- .1 Restrictions: Notwithstanding the requirements listed below, there are strict security restrictions on the use of cameras in and around the site. Departmental Representative will advise on these restrictions at the construction start up meeting.
- .2 General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
- .3 Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
 - .1 Date and Time: Include date and time in file name for each image.
 - .2 Field Office Images: Maintain one set of images accessible in any field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Departmental Representative.
- .4 Preconstruction Photographs: Before starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Departmental Representative.
 - .1 Take not less than 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
 - .2 Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- .5 Periodic Construction Photographs: Take not less than 20 photographs monthly, coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.
- .6 Departmental Representative-Directed Construction Photographs: From time to time, Departmental Representative will instruct photographer about number and frequency of photographs and general directions on vantage points. Select actual vantage points and take photographs to show the status of construction and progress since last photographs were taken.

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- .2 Types of items you will not find described in this Section:
 - .1 Requirements for submitting applications for payment and the schedule of values.
 - .2 Requirements for submitting schedules and reports, including contractor's construction schedule.
 - .3 Requirements for submitting operation and maintenance manuals.
 - .4 Requirements for submitting record drawings, record specifications, and record product data.
 - .5 Requirements for submitting video recordings of demonstration of equipment and training of Canadas personnel.

1.2 DEFINITIONS

- .1 Action Submittals: Written and graphic information and physical samples that require Departmental Representative's responsive action. Action submittals are those submittals indicated in individual Specification Sections as *action submittals*.
- .2 Informational Submittals: Written and graphic information and physical samples that do not require Departmental Representative's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as *informational submittals*.
- .3 Portable Document Format (PDF): a digital file format licensed by Adobe and other software developers and used to display and print information in a consistent format regardless of computer operating system, monitor, or printer.
- .4 Days: Days of the week, excluding Saturday, Sunday, and any statutory holidays.

1.3 ACTION SUBMITTALS

- .1 Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Departmental Representative and additional time for handling and reviewing submittals required by those corrections.

- .1 Coordinate submittal schedule with list of subcontracts, and Contractor's construction schedule.
- .2 Submit Submittal Schedule concurrently with the first complete submittal of Contractor's construction schedule.
- .3 Format: Arrange the following information in a tabular format:
 - .1 Scheduled date for first submittal.
 - .2 Specification Section number and title.
 - .3 Submittal category: Action; informational.
 - .4 Name of subcontractor.
 - .5 Description of the Work covered.
 - .6 Scheduled date for Departmental Representative's final release.
 - .7 Scheduled date of fabrication.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- .1 Digital Data Files: Electronic CAD files of the Contract Drawings are available upon request from the Departmental Representative for the Contractor's use in preparing submittals.
 - .1 Available files:
 - .1 Floor plans.
 - .2 Reflected ceiling plans.
 - .2 Departmental Representative makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - .3 Digital Format: Files will be provided in the format generated by the drawing software used to produce the drawing.
- .2 Coordination: Coordinate preparation and processing of submittals with the performance of the construction activities.
 - .1 Coordinate each submittal to accommodate time required for fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - .2 Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 - .3 Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 - .4 Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - .5 Departmental Representative reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- .3 Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Departmental Representative's receipt of

submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

- .1 Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Departmental Representative will advise Contractor when a submittal being processed must be delayed for coordination.
- .2 Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
- .3 Resubmittal Review: Allow 15 days for review of each resubmittal.
- .4 Electronic Submittals: Place a permanent label or title block on each submittal item for identification.
 - .1 Indicate name of firm or entity that prepared each submittal on label or title block.
 - .2 Include the following information for processing and recording action taken:
 - .1 Project name.
 - .2 Date.
 - .3 Name of Contractor.
 - .4 Name of subcontractor.
 - .5 Name of supplier.
 - .6 Submittal number or other unique identifier, including revision identifier.
 - .1 Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
 - .7 Number and title of appropriate Specification Section.
 - .8 Drawing number and detail references, as appropriate.
 - .9 Location(s) where product is to be installed, as appropriate.
 - .10 Other necessary identification.
- .5 Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Departmental Representative may discard submittals received from sources other than Contractor.
 - .1 Transmittal Form for Submittals: Provide locations on form for the following information:
 - .1 Project name.
 - .2 Date.
 - .3 Name of Contractor.
 - .4 Names of subcontractor, manufacturer, and supplier.
 - .5 Category and type of submittal: action or informational as indicated in the applicable Specification Section.

- .6 Specification Section number and title.
 - .7 Specification paragraph number or drawing designation and generic name for each of multiple items.
 - .8 Drawing number and detail references, as appropriate.
 - .9 Indication of full or partial submittal.
 - .10 Transmittal number, if applicable
 - .11 Submittal and transmittal distribution record.
 - .12 Remarks.
 - .13 Signature of transmitter.
- .6 Options: Identify options requiring selection by Departmental Representative.
- .7 Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Departmental Representative on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- .8 Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
- .1 Note date and content of previous submittal.
 - .2 Note date and content of revision in label or title block and clearly indicate extent of revision.
 - .3 Resubmit submittals until they are marked with approval notation from Departmental Representative's action stamp.
- .9 Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities.
- .10 Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Departmental Representative's action stamp.

Part 2 PRODUCTS

2.1 SUBMITTAL PROCEDURES

- .1 General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
- .1 Action Submittals: Submit electronic copy of each submittal unless otherwise indicated.
 - .2 Informational Submittals: Submit electronic copy of each submittal unless otherwise indicated. Departmental Representative will not return copies.

- .1 Return of Action Submittals: Departmental Representative will return a PDF of a reviewed Submittal via online Construction Contract Administration service. No paper copies will be returned.
- .2 Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - .1 If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 - .2 Mark each copy of each submittal to show which products and options are applicable.
 - .3 Include the following information, as applicable:
 - .1 Manufacturer's catalogue cuts.
 - .2 Manufacturer's product specifications.
 - .3 Standard colour charts.
 - .4 Statement of compliance with specified referenced standards.
 - .5 Testing by recognized testing agency.
 - .6 Application of testing agency labels and seals.
 - .7 Notation of coordination requirements.
 - .8 Availability and delivery time information.
 - .4 For equipment, include the following in addition to the above, as applicable:
 - .1 Wiring diagrams showing factory-installed wiring.
 - .2 Printed performance curves.
 - .3 Operational range diagrams.
 - .4 Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 - .5 Submit Product Data before or concurrent with Samples.
- .3 Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
 - .1 Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - .1 Identification of products.
 - .2 Schedules.
 - .3 Compliance with specified standards.
 - .4 Notation of coordination requirements.
 - .5 Notation of dimensions established by field measurement.
 - .6 Relationship and attachment to adjoining construction clearly indicated.
 - .7 Seal and signature of professional engineer if specified.
 - .2 Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets no larger than 11 x 17 in size.

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- .4 Samples: Submit Samples for review of kind, colour, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
 - .1 Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 - .2 Identification: Attach label on unexposed side of Samples that includes the following:
 - .1 Generic description of Sample.
 - .2 Product name and name of manufacturer.
 - .3 Sample source.
 - .4 Number and title of applicable Specification Section.
 - .5 Specification paragraph number and generic name of each item.
 - .3 Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - .1 Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - .2 Samples not incorporated into the Work, or otherwise designated as Canada's property, are the property of Contractor.
 - .4 Samples for Initial Selection: Submit manufacturer's colour charts consisting of units or sections of units showing the full range of colours, textures, and patterns available.
 - .1 Number of Samples: Submit one full set(s) of available choices where colour, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Departmental Representative will return submittal with options selected.
 - .5 Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of colour and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing colour, texture, and pattern; colour range sets; and components used for independent testing and inspection.
 - .1 Number of Samples: Submit two sets of Samples. Departmental Representative will retain one Sample set; remainder will be returned.
 - .2 Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - .3 If variation in colour, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least two sets of paired units that show approximate limits of variations.

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- .5 Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 - .1 Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 - .2 Manufacturer and product name, and model number if applicable.
 - .3 Number and name of room or space.
 - .4 Location within room or space.
 - .6 Coordination Drawing Submittals: Comply with requirements specified in Division 01 Section *Project Management and Coordination*.
 - .7 Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section *Construction Progress Documentation*.
 - .8 Application for Payment and Schedule of Values: Comply with requirements specified in Division 01 Section *Payment Procedures*.
 - .9 Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Division 01 Section *Quality Requirements*.
 - .10 Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section *Closeout Procedures*.
 - .11 Maintenance Data: Comply with requirements specified in Division 01 Section *Operation and Maintenance Data*.
 - .12 Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of design consultants and owners, and other information specified.
 - .13 Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record. Include names of firms and personnel certified.
 - .14 Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
 - .15 Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
 - .16 Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

- .17 Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- .18 Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- .19 Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- .20 Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - .1 Name of evaluation organization.
 - .2 Date of evaluation.
 - .3 Time period when report is in effect.
 - .4 Product and manufacturers' names.
 - .5 Description of product.
 - .6 Test procedures and results.
 - .7 Limitations of use.
- .21 Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- .22 Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- .23 Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- .24 Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

- .1 Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents,

provide products and systems complying with specific performance and design criteria indicated.

- .1 Submittals shall bear the seal and signature of the Contractor's design professional licensed in the jurisdiction of the project.
- .2 If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Departmental Representative.

Part 3 EXECUTION

3.1 CONTRACTOR'S REVIEW

- .1 Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Departmental Representative.
- .2 Project Closeout and Maintenance Material Submittals: See requirements in Division 01 Section *Closeout Procedures*.
- .3 Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 DEPARTMENTAL REPRESENTATIVE'S ACTION

- .1 Action Submittals: Departmental Representative will review each submittal, make marks to indicate corrections or revisions required, and return it. Departmental Representative will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- .2 Informational Submittals: Departmental Representative will review each submittal and will not return it, or will return it if it does not comply with requirements.
- .3 Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Departmental Representative.
- .4 Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- .5 Submittals not required by the Contract Documents may be returned by the Departmental Representative without action.

END OF SECTION

Part 1 GENERAL

1.1 DEFINITIONS

- .1 COSH: Canada Occupational Health and Safety Regulations made under Part II of the Canada Labour Code.
- .2 Competent Person: means a person who is:
 - .1 Qualified by virtue of personal knowledge, training and experience to perform assigned work in a manner that will ensure the health and safety of persons in the workplace, and;
 - .2 Knowledgeable about the provisions of occupational health and safety statutes and regulations that apply to the Work and;
 - .3 Knowledgeable about potential or actual danger to health or safety associated with the Work.
- .3 Medical Aid Injury: any minor injury for which medical treatment was provided and the cost of which is covered by Workers' Compensation Board of the province in which the injury was incurred.
- .4 PPE: personal protective equipment
- .5 Work Site: where used in this section shall mean areas, located at the premises where Work is undertaken, used by Contractor to perform all of the activities associated with the performance of the Work.

1.2 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00.
- .2 Submit site-specific Health and Safety Plan prior to commencement of Work.
 - .1 Submit within 5 work days of notification of Bid Acceptance. Provide 3 copies.
 - .2 Departmental Representative will review Health and Safety Plan and provide comments.
 - .3 Revise the Plan as appropriate and resubmit within 5 work days after receipt of comments.
 - .4 Departmental Representative's review and comments made of the Plan shall not be construed as an endorsement, approval or implied warranty of any kind by Canada and does not reduce Contractor's overall responsibility for Occupational Health and Safety of the Work.
 - .5 Submit revisions and updates made to the Plan during the course of Work.
- .3 Submit name of designated Health & Safety Site Representative and support documentation specified in the Safety Plan.
- .4 Submit building permit, compliance certificates and other permits obtained.

- .5 Submit copy of Letter in Good Standing from Provincial Workers Compensation or other department of labour organization.
 - .1 Submit update of Letter of Good Standing whenever expiration date occurs during the period of Work.
- .6 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .7 Submit copies of incident reports.
- .8 Submit WHMIS MSDS -Material Safety Data Sheets.

1.3 COMPLIANCE REQUIREMENTS

- .1 Comply with Occupational Health and Safety Act for Province of Newfoundland and Labrador, and Occupational Health & Safety Regulations made pursuant to the Act.
- .2 Comply with Canada Labour Code - Part II (entitled Occupational Health and Safety) and the Canada Occupational Health and Safety Regulations (COSH) as well as any other regulations made pursuant to the Act.
 - .1 The Canada Labour Code can be viewed at: [www.http://laws.justice.gc.ca/en/L-2/](http://laws.justice.gc.ca/en/L-2/)
 - .2 COSH can be viewed at: [www.http://laws.justice.gc.ca/eng/SOR-86-304/n e.html](http://laws.justice.gc.ca/eng/SOR-86-304/n e.html)
 - .3 A copy may be obtained at: Canadian Government Publishing Public Works & Government Services Canada Ottawa, Ontario, K1A OS9 Tel: (819) 956-4800 (1-800-635-7943) Publication No. L31-85/2000 E or F).
- .3 Observe construction safety measures of:
 - .1 Part 8 of National Building Code
 - .2 Municipal by-laws and ordinances.
- .4 In case of conflict or discrepancy between above specified requirements, the more stringent shall apply.
- .5 Maintain Workers Compensation Coverage in good standing for duration of Contract. Provide proof of clearance through submission of Letter in Good Standing.
- .6 Medical Surveillance: Where prescribed by legislation or regulation, obtain and maintain worker medical surveillance documentation.

1.4 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, of property and for protection of persons circulating and environment adjacent to work operations to extent that they may be affected by conduct of the Work.
- .2 Enforce compliance by all workers, sub-contractors and other persons granted access to work site with safety requirements of Contract Documents, applicable Federal,

Provincial, and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.5 SITE CONTROL AND ACCESS

- .1 Control the Work and entry points to Work Site. Approve and grant access only to workers and authorized persons. Immediately stop and remove non-authorized persons.
 - .1 Departmental Representative will provide names of those persons authorized by Departmental Representative to enter onto Work Site and will ensure that such authorized persons have the required knowledge and training on Health and Safety pertinent to their reason for being at the site, however, Contractor remains responsible for the health and safety of authorized persons while at the Work Site.
- .2 Isolate Work Site from other areas of the premises by use of appropriate means.
 - .1 Erect fences, hoarding, barricades and temporary lighting as required to effectively delineate the Work Site, stop non-authorized entry, and to protect pedestrians and vehicular traffic around and adjacent to the Work and create a safe environment. See Section 01 50 00 for minimum acceptable requirements.
 - .2 Post signage at entry points and other strategic locations indicating restricted access and conditions for access.
 - .3 Use professionally made signs with bilingual message in the 2 official languages or international known graphic symbols.
- .3 Provide safety orientation session to persons granted access to Work Site. Advise of hazards and safety rules to be observed while on site.
- .4 Ensure persons granted site access wear appropriate PPE. Supply PPE to inspection authorities who require access to conduct tests or perform inspections.
- .5 Secure Work Site against entry when inactive or unoccupied and to protect persons against harm. [Provide security guard where adequate protection cannot be achieved by other means).

1.6 PROTECTION

- .1 Give precedence to safety and health of persons and protection of environment over cost and schedule considerations for Work
- .2 Should unforeseen or peculiar safety related hazard or condition become evident during performance of Work, immediately take measures to rectify situation and prevent damage or harm. Advise Departmental Representative verbally and in writing.

1.7 FILING OF NOTICE

- .1 File Notice of Project with pertinent provincial health and safety authorities prior to beginning of Work.

- .1 Departmental Representative will assist in locating address if needed.

1.8 PERMITS

- .1 Post on site permits, licenses, compliance certificates specified in section 01 10 10.
- .2 Where particular permit or compliance certificate cannot be obtained at the required stage of work, notify Departmental Representative in writing and obtain his/her approval to proceed before carrying out that portion of work.

1.9 HAZARD ASSESSMENTS

- .1 Perform site specific health and safety hazard assessment of the Work and its site.
- .2 Carryout initial assessment prior to commencement of Work with further assessments as needed during progress of work, including when new trades and subcontractors arrive on site.
- .3 Record results and address in Health and Safety Plan.
- .4 Keep documentation on site for entire duration of the Work.

1.10 PROJECT/SITE CONDITIONS

- .1 Following are potential health, environmental and safety hazards at the site for which Work may involve contact with:
 - .1 Existing hazardous substances or contaminated building materials:
 - .1 The gun range is to be kept operational for the duration of this project. The exhaust from the gun range ventilation system may contain lead contamination. Contractor to take necessary precautions and provide necessary safety equipment to Workers while in proximity to exhaust vent. Contractor to include procedures specific to this issue in Health & Safety Plan. Provide Departmental Representative with written notice 48 hours prior to commencing Work in this area.
 - .2 Refer to attached report "Roof Sampling Program for Lead (Final)".
 - .2 Above items shall not be construed as being complete and inclusive of potential health and safety hazards encountered during Work.
 - .3 Include above items in the hazard assessment of the Work.
 - .4 MSDS Data sheets of pertinent hazardous and controlled products stored on site can be obtained from Departmental Representative.

1.11 HEALTH AND SAFETY MEETINGS

- .1 Attend pre-construction health and safety meeting, convened and chaired by Departmental Representative, prior to commencement of Work, at time, date and location determined by Departmental Representative. Ensure attendance of:

- .1 Superintendent of Work
 - .2 Designated Health & Safety Site Representative
 - .3 Subcontractors
- .2 Conduct regularly scheduled tool box and safety meetings during the Work in conformance with Occupational Health and Safety regulations.
 - .3 Keep documents on site.

1.12 HEALTH AND SAFETY PLAN

- .1 Prior to commencement of Work, develop written Health and Safety Plan specific to the Work. Implement, maintain, and enforce Plan for entire duration of Work and until final demobilization from site.
- .2 Health and Safety Plan shall include the following components:
 - .1 List of health risks and safety hazards identified by hazard assessment.
 - .2 Control measures used to mitigate risks and hazards identified.
 - .3 On-site Contingency and Emergency Response Plan as specified below.
 - .4 On-site Communication Plan as specified below.
 - .5 Name of Contractor's designated Health & Safety Site Representative and information showing proof of his/her competence and reporting relationship in Contractor's company.
 - .6 Names, competence and reporting relationship of other supervisory personnel used in the Work for occupational health and safety purposes.
- .3 On-site Contingency and Emergency Response Plan shall include:
 - .1 Operational procedures, evacuation measures and communication process to be implemented in the event of an emergency.
 - .2 Evacuation Plan: site and floor plan layouts showing escape routes, marshalling areas. Details on alarm notification methods, fire drills, location of fire fighting equipment and other related data.
 - .1 Include process to notify Workers' on roof of building to exit roof of building in the event of a fire or other emergency.
 - .3 Name, duties and responsibilities of persons designated as Emergency Warden(s) and deputies.
 - .4 Emergency Contacts: name and telephone number of officials from:
 - .1 General Contractor and subcontractors.
 - .2 Pertinent Federal and Provincial Departments and Authorities having jurisdiction.
 - .3 Local emergency resource organizations.
 - .5 Harmonize Plan with Facility's Emergency Response and Evacuation Plan. Departmental Representative will provide pertinent data including name of PWGSC and Facility Management contacts.
- .4 On-site Communication Plan:

- .1 Procedures for sharing of work related safety information to workers and subcontractors, including emergency and evacuation measures.
- .2 List of critical work activities to be communicated with Facility Manager which have a risk of endangering health and safety of Facility users.
- .5 Address all activities of the Work including those of subcontractors.
- .6 Review Health and Safety Plan regularly during the Work. Update as conditions warrant to address emerging risks and hazards, such as whenever new trade or subcontractor arrive at Work Site.
- .7 Departmental Representative will respond in writing, where deficiencies or concerns are noted and may request re-submission of the Plan with correction of deficiencies or concerns.
- .8 Post copy of the Plan, and updates, prominently on Work Site

1.13 SAFETY SUPERVISION AND INSPECTION

- .1 Employ Health & Safety Site Representative responsible for daily supervision of health and safety of the Work.
- .2 Health & Safety Site Representative may be the Superintendent of the Work or other person designated by Contractor and shall be assigned the responsibility and authority to:
 - .1 Implement, monitor and enforce daily compliance with health and safety requirements of the Work
 - .2 Monitor and enforce Contractor's site-specific Health and Safety Plan.
 - .3 Conduct site safety orientation session to persons granted access to Work Site.
 - .4 Ensure that persons allowed site access are knowledgeable and trained in health and safety pertinent to their activities at the site or are escorted by a competent person while on the Work Site.
 - .5 Stop the Work as deemed necessary for reasons of health and safety.
- .3 Health & Safety Site Representative must:
 - .1 Be qualified and competent person in occupational health and safety.
 - .2 Have site-related working experience specific to activities of the Work.
 - .3 Be on Work Site at all times during execution of the Work.
- .4 All supervisory personnel assigned to the Work shall also be competent persons.
- .5 Inspections:
 - .1 Conduct regularly scheduled safety inspections of the Work on a minimum weekly basis.
 - .2 Record deficiencies and remedial action taken.
- .6 Follow-up and ensure corrective measures are taken.

- .7 Cooperate with Facility's Occupational Health and Safety representative should one be designated by Departmental Representative.
- .8 Keep inspection reports and supervision related documentation on site.

1.14 TRAINING

- .1 Use only skilled workers on Work Site who are effectively trained in occupational health and safety procedures and practices pertinent to their assigned task
- .2 Maintain employee records and evidence of training received. Make data available to Departmental Representative upon request
- .3 When unforeseen or peculiar safety-related hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing

1.15 MINIMUM SITE SAFETY RULES

- .1 Notwithstanding the requirement to abide by federal and provincial health and safety regulations, the following safety rules shall be considered minimum requirements to be obeyed by all persons granted site access:
 - .1 Wear personnel protective equipment (PPE) appropriate to function and task on site; the minimum requirements being hard hat, safety footwear, eye protection and hearing protection.
 - .2 Immediately report unsafe activity or condition at site, near-miss accident, injury and damage.
 - .3 Maintain site and storage areas in tidy condition, free of hazards causing injury.
 - .4 Obey warning signs and safety tags.
- .2 Brief workers on site safety rules and on disciplinary measures to be taken by Departmental Representative for violation or non compliance of such rules. Post rules on site.

1.16 NON COMPLIANCE AND DISCIPLINARY MEASURES

- .1 Immediately address and correct health and safety violations and non-compliance issues identified by authority having jurisdiction or by Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Departmental Representative will stop Work if non-compliance of health and safety regulations is not corrected in a timely manner.

1.17 INCIDENT REPORTING

- .1 Investigate and report the following incidents and accidents:

- .1 Those as required by Provincial Occupational Safety and Health Act and Regulations.
 - 1) Injury requiring medical aid as defined in the Canadian Dictionary of Safety Terms-1987, published by the Canadian Society of Safety Engineers (C.S.S.E)as follows:
 - .1 Medical Aid Injury: any minor injury for which medical treatment was provided and the cost of which is covered by Workers' Compensation Board of the province in which the injury was incurred.
 - .2 Property damage in excess of \$10,000.00,
 - .3 Interruption to Facility operations with potential loss to a Federal Dept. in excess of \$5000.00,
 - .4 Those which require notification to Workers Compensation Board or other regulatory agencies as stipulated by applicable law or regulations.
- .2 Send written report to Departmental Representative for all above cases.

1.18 TOOLS AND EQUIPMENT SAFETY

- .1 Routinely check and maintain tools, equipment and machinery for safe operation.
- .2 Conduct checks as part of site safety inspections. When requested, submit proof that checks and maintenance have been carried out.
- .3 Tag and immediately remove from site items found faulty or defective.

1.19 HAZARDOUS PRODUCTS

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS).
- .2 Keep MSDS data sheets for all products delivered to site. Post on site. Submit copy to Departmental Representative upon receipt.
- .3 On building renovation projects where work is within or immediately adjacent to occupied areas, also post copy of data sheets in a public location accessible to Facility personnel.

1.20 POWDER ACTUATED DEVICES

- .1 Use powder actuated fastening devices only after receipt of written permission from Departmental Representative.

1.21 POSTING OF DOCUMENTS

- .1 Post on site safety documentation as stipulated by Authorities having jurisdiction and as specified herein. Place in a common visible location.

1.22 SITE RECORDS

- .1 Maintain on site a copy of all health and safety documentation and reports specified to be produced as part of the work and received from authorities having jurisdiction.
- .2 Upon request, make available to Departmental Representative, or authorized safety Representative, for review. Provide copy when directed by Departmental Representative.

END OF SECTION

Part 1 GENERAL

1.1 RELATED WORK

- .1 Waste Management and Disposal: Section 01 74 21.

1.2 DEFINITIONS

- .1 Hazardous Material: Product, substance, or organism that is used for its original purpose; and that is either dangerous goods or a material that may cause adverse impact to the environment or adversely affect health of persons, animals, or plant life when released into the environment.

1.3 FIRES

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

1.4 HAZARDOUS MATERIAL HANDLING

- .1 Store and handle hazardous materials in accordance with applicable federal and provincial laws, regulations, codes and guidelines. Store in location that will prevent spillage into the environment
- .2 Label containers to WHMIS requirements and keep MSDS data sheets on site for all hazardous materials.
- .3 Maintain inventory of hazardous materials and hazardous waste stored on site. List items by product name, quantity and date when storage began.
- .4 Store and handle flammable and combustible materials in accordance with National Fire Code.
- .5 Transport hazardous materials in accordance with federal Transportation of Dangerous Goods Regulations and applicable Provincial regulations.

1.5 DISPOSAL OF WASTES

- .1 Do not bury rubbish and waste materials on site. Dispose in accordance with project waste management requirements as specified in Division 01 Section Construction/Demolition Waste Management and Disposal.
- .2 Do not dispose of hazardous waste or volatile materials, such as mineral spirits, paints, thinners, oil or fuel into waterways, storm or sanitary sewers or waste landfill sites.
- .3 Dispose of hazardous waste in accordance with applicable federal and provincial laws, regulations, codes and guidelines.

1.6 DRAINAGE

- .1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
- .2 Do not pump water containing suspended materials into waterways, sewer or drainage systems.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with governing regulations and requirements.
- .4 Provide control devices such as filter fabrics, sediment traps and settling ponds to control drainage and prevent erosion of adjacent lands. Maintain in good order for duration of work.

1.7 SITE AND PLANT PROTECTION

- .1 Protect trees and plants on site and adjacent properties where indicated.
- .2 Wrap in burlap, trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m.
- .3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .4 Minimize stripping of topsoil and vegetation.
- .5 Restrict tree removal to areas indicated or designated by Departmental Representative.

1.8 WORK ADJACENT TO WATERWAYS

- .1 Do not operate construction equipment in waterways.
- .2 Do not use waterway beds for borrow material.
- .3 Do not dump excavated fill, waste material or debris in waterways.
- .4 At borrow sites, design and construct temporary crossings to minimize erosion to waterways in strict conformance with provincial and federal environmental regulations.
- .5 Do not skid logs or construction materials across waterways.
- .6 Avoid indicated spawning beds when constructing temporary crossings of waterways.
- .7 Do not blast under water or 100 m of spawning beds.
- .8 Do not refuel any type of equipment within 100 meters of a water body. Maintain equipment in good working condition with no fluid leaks, loose hoses or fittings.

1.9 POLLUTION CONTROL

- .1 Maintain temporary erosion and pollution control features installed under this contract.
- .2 Control emissions from equipment and plant to local authorities emission requirements.
- .3 Prevent sandblasting and other extraneous materials from contaminating air beyond application area, by providing temporary enclosures.
- .4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads and around entire construction site.
- .5 Have appropriate emergency spill response equipment and rapid clean-up kit on site located adjacent to hazardous materials storage area. Provide personal protective equipment required for clean-up.
- .6 Report, spills of petroleum and other hazardous materials as well as accidents having potential of polluting the environment to Federal and Provincial Department of the Environment.
 - .1 Notify Departmental Representative and submit a written spill report to Departmental Representative within 24 hours of occurrence.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES AND CODES

- .1 Perform Work in accordance with National Building Code of Canada 2010 (NBC) including 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.

1.2 BUILDING SMOKING ENVIRONMENT

- .1 Smoking is prohibited inside buildings. Obey posted restrictions elsewhere property.

Part 2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

Part 3 EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 GENERAL

1.1 INSPECTION

- .1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.

1.2 ACCESS TO WORK

- .1 Allow inspection agencies access to Work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

1.3 REJECTED WORK

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.
- .3 If in opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Departmental Representative will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Departmental Representative.

1.4 REPORTS

- .1 Submit inspection reports in PDF format to Departmental Representative.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 GENERAL

1.1 SITE ACCESS AND PARKING

- .1 The Departmental Representative will designate Contractor's access to project site as well as parking facilities for equipment and workers.

1.2 BUILDING ACCESS

- .1 Use only access doors, circulation routes, and elevators within building as designated by Departmental Representative to access interior work.

1.3 CONTRACTOR'S SITE OFFICE

- .1 Be responsible for and provide own site office, if required, including electricity, heat, lights and telephone. Locate site office as directed by Departmental Representative.

1.4 MATERIAL STORAGE

- .1 Locate site storage trailers where directed by Departmental Representative. Place in location of least interference with existing Facility operations.

1.5 PEDESTRIAN WALKWAYS AND HOARDING

- .1 Ensure maximum safety and security to facility users during the course of work.
- .2 Be responsible for and provide temporary 2.4 metre high plywood construction hoarding when work is adjacent to exterior sidewalks and circulation routes used by facility employees.
- .3 Maintain access and egress to building entrances and fire exits designated by Departmental Representative to remain in use. Provide enclosed walkways when work is adjacent to such doors as follows:
 - .1 Erect wooden pedestrian walkway complete with roof and side covers.
 - .2 Install walkways as soon as work is in the vicinity of entrance and exit doors and poses a potential danger to facility users.
 - .3 Construct to approximate size of 2.0 metre wide x 2.1 metre high x length as required to fully clear danger zone.
 - .4 Provide signage and lighting.
 - .5 Submit details of walkway size, location, layout and construction to Departmental Representative beforehand and obtain approval.
- .4 Adequately frame and brace hoarding and walkways to resist wind, and other weather or site conditions.
- .5 Erect such protective devices during Facility's non-operational off hour periods.

- .6 Obtain Departmental Representative's concurrence prior to removal of hoarding and walkways.

1.6 INTERIOR DUST CONTROL AND DUST BARRIERS

- .1 Control creation and spread of dust and dirt to building interior and in particular to areas within premises still under use by occupants.
- .2 Develop and implement a dust control plan, addressing effective measures to carry out work with least amount of dust being created and propagated.
 - .1 Carefully evaluate the type of work to be undertaken and the physical layout of each work area on site.
 - .2 Provide specifically tailored strategy for each work area.
 - .3 Pre-determine location and placement of dust barriers to confine resulting dust to immediate work areas.
 - .4 Inform Departmental Representative of the proposed dust control measures to be followed at each work area and for each major dust generating activities. Obtain Departmental Representative's approval before proceeding with work.
- .3 Dust control plan to incorporate as a minimum the following dust protection and cleaning requirements:
 - .1 Erect dustproof partitions completely around work areas to fully isolate construction from other parts of the building.
 - .2 Construct dust partitions as follows:
 - .1 Use 10 mm polyethylene installed and sealed tightly to abutting walls, ceilings and floor with continuous duct tape along all edges and seams. Support in position with 38 x 89 wood framing at 400 mm o.c. Locate seams only at framing members and overlap sheeting by minimum of 150 mm.
 - .3 Provide a "dust tight" and lockable access door(s) within dust partition or between rooms for worker entry into work area. This is of particular importance for situations where excessive dust will be generated.
 - .4 Provide additional dust barriers, placed tightly to underside of the floor/roof deck above, in locations where existing walls are used as part of the dust barrier system but simply terminate at the finished ceiling level resulting in an open space above, or other similar condition, permitting dust to migrate beyond the construction areas.
 - .5 Make all dust barriers airtight, effectively blocking and stopping all dust migration.
 - .6 Inspect dust barriers at various intervals during each work shift. Immediately fix tears, unsealed edges and maintain barriers effectively sealed for the entire work duration.
 - .7 Shut down existing ventilation system feeding construction space, or disconnect and seal-off supply and return air ducts to stop dust from contaminating other areas.
 - .8 Immediately clean areas in use by occupants and public contaminated by work.

- .1 Vacuum carpets, wash floors and walls. Remove accumulated dust from all surfaces. Clean and remove smears, scuffs and marks.
- .4 Meager attempts at controlling dust will not be tolerated. Failure to provide effective dust control during work and to perform satisfactory cleaning thereafter will result in Departmental Representative to proceed and obtain a separate cleaning service agency to perform cleaning to Departmental Representative's satisfaction with cost for such services being charged against this Contract in the form of financial holdbacks.
- .5 Obtain Departmental Representative's approval before erecting any dust partitions simply to underside of finish ceiling.
- .6 Construction of dust barriers, enclosures and placement of temporary protective devices to be performed during Facility non-operational off-hour periods.

1.7 SANITARY FACILITIES

- .1 Post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition.
- .2 Sanitary facilities are not available at the site for use by Contractor's work force. Contractor to provide portable sanitary facilities and coordinate location with the Departmental Representative.

1.8 POWER

- .1 Power supply is available and will be provided for construction usage.
 - .1 Make arrangements for the use of such services through the Departmental Representative.
 - .2 Departmental Representative will designate and approve each location of existing power source to which connections can be made to obtain temporary power service.
 - .3 Connect to existing power supply in accordance with Canadian Electrical Code.
- .2 Provide and maintain temporary lighting to conduct work. Ensure illumination level is not less than 162 lx in all locations.
- .3 Electrical power and lighting systems installed under this Contract can be used for construction requirements provided that guarantees are not affected thereby. Make good damage. Replace lamps which have been used over period of 3 months.

1.9 WATER SUPPLY

- .1 Water supply is available in existing building and will be provided for construction usage at no cost. Make arrangements for the use and transportation of such services to work area through the Departmental Representative.

1.10 SCAFFOLDING

- .1 Design, construct and maintain scaffolding in rigid, secure and safe manner in accordance with CAN/CSA-S269.2-M87(R2003).
- .2 Erect scaffolding independent of walls. Remove when no longer required. Scaffolding to be fenced in, including a lockable gate. Contractor is to provide a lock and is to lock the gate at the end of each work day. The Contractor is to provide a duplicate key to the Departmental Representative.

1.11 HEATING AND VENTILATING

- .1 Supply, install and pay for costs of temporary heat and ventilation used during construction, including costs of installation, fuel, operation, maintenance and removal of equipment. Use of direct-fired heaters discharging waste products into work areas will not be permitted.
- .2 Provide temporary heat and ventilation in enclosed areas as required to:
 - .1 Facilitate progress of work.
 - .2 Protect work and products against dampness and cold.
 - .3 Prevent moisture condensation on surfaces.
 - .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
 - .5 Provide adequate ventilation to meet health regulations for safe working environment.
- .3 Maintain minimum temperature of 10 degrees C, or higher where specified, as soon as finishing work is commenced and maintain until acceptance of structure by Departmental Representative.
 - .1 Maintain ambient temperature and humidity levels as required for comfort of office personnel.
- .4 Ventilating:
 - .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
 - .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
 - .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
 - .4 Ventilate storage spaces containing hazardous or volatile materials.
 - .5 Ventilate temporary sanitary facilities.
 - .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
- .5 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
 - .1 Conform with applicable codes and standards.

- .2 Enforce safe practices.
- .3 Prevent abuse of services.
- .4 Prevent damage to finishes.
- .5 Vent direct-fired combustion units to outside.

1.12 CONSTRUCTION SIGN AND NOTICES

- .1 Upon request by Departmental Representative, erect a self supporting project sign in location indicated.
- .2 Departmental Representative will provide a vinyl sign facing for installation by Contractor on sign framework. Sign frame to be plywood face of approximately 1200 x 2400 mm in size complete with required wood framing at 400 mm o.c and support posts.
- .3 Install sign plumb and level in neat wood framework and securely anchor in ground by posts to withstand wind pressure of 160 km/h.
- .4 Contractor or subcontractor advertisement signboards are not permitted on site.
- .5 Safety and Instruction Signs and Notices:
 - .1 Signs and notices for safety and instruction shall be in both official languages or commonly understood graphic symbols conforming to CAN/CSA-Z321-96(R2001).
- .6 Maintenance and Disposal of Site Signs:
 - .1 Maintain approved signs and notices in good condition for duration of project and dispose of off site on completion of project or earlier if directed by Departmental Representative.

1.13 REMOVAL OF TEMPORARY FACILITIES

- .1 Remove temporary facilities from site when directed by Departmental Representative.

END OF SECTION

Part 1 GENERAL

1.1 GENERAL

- .1 Use new material and equipment unless otherwise specified.
- .2 Within 7 days of written request by Departmental Representative, submit following information for any materials and products proposed for supply:
 - .1 Name and address of manufacturer.
 - .2 Trade name, model and catalogue number.
 - .3 Performance, descriptive and test data.
 - .4 Compliance to specified standards.
 - .5 Manufacturer's installation or application instructions.
 - .6 Evidence of arrangements to procure.
 - .7 Evidence of manufacturer delivery problems or unforeseen delays.
- .3 Provide material and equipment of specified design and quality, performing to published ratings and for which replacement parts are readily available.
- .4 Use products of one manufacturer for equipment or material of same type or classification unless otherwise specified.
- .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.

1.2 PRODUCT QUALITY

- .1 Contractor shall be solely responsible for submitting relevant technical data and independent test reports to confirm whether a product or system proposed for use meets contract requirements and specified standards.
- .2 Final decision as to whether a product or system meets contract requirements rest solely with the Departmental Representative in accordance with the General Conditions of the Contract.

1.3 ACCEPTABLE MATERIALS AND ALTERNATIVES

- .1 Acceptable Materials: When materials specified include trade names or trade marks or manufacturer's or supplier's name as part of the material description, select and only use one of the names listed for incorporation into the Work.
- .2 Alternative Materials: Submission of alternative materials to trade names or manufacturer's names specified must be done during the bidding period following procedures indicated in the Instructions to Bidders.

- .3 Substitutions: After acceptance of bid, substitution of a specified material will be dealt with as a change to the Work in accordance with the General Conditions of the Contract.

1.4 MANUFACTURERS INSTRUCTIONS

- .1 Unless otherwise specified, comply with manufacturer's latest printed instructions for materials and installation methods to be used. Do not rely on labels or enclosure provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Departmental Representative in writing of any conflict between these specifications and manufacturers instructions, so that Departmental Representative will designate which document is to be followed.

1.5 AVAILABILITY

- .1 Immediately notify Departmental Representative in writing of unforeseen or unanticipated material delivery problems by manufacturer. Provide support documentation as per clause 1.1.2 above.

1.6 WORKMANSHIP

- .1 Ensure quality of work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed.
- .2 Remove unsuitable or incompetent workers from site as stipulated in the General Conditions of the Contract.
- .3 Ensure cooperation of workers in laying out work. Maintain efficient and continuous supervision on site at all times.
- .4 Coordinate work between trades and subcontractors.
- .5 Coordinate placement of openings, sleeves and accessories.

1.7 FASTENINGS - GENERAL

- .1 Provide metal fastenings and accessories in same texture, colour and finish as base metal in which they occur. Prevent electrolytic action between dissimilar metals. Use non-corrosive fasteners, anchors and spacers for securing exterior work and in humid areas.
- .2 Space anchors within limits of load bearing or shear capacity and ensure that they provide positive permanent anchorage. Wood or organic material plugs not acceptable.
- .3 Keep exposed fastenings to minimum, space evenly and lay out neatly.
- .4 Fastenings which cause spalling or cracking of material to which anchorage is made, are not acceptable.
- .5 Do not use explosive actuated fastening devices unless approved by Departmental Representative. See section on Health and Safety Requirements in this regard.

1.8 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.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur and, use resilient washers with stainless steel.

1.9 STORAGE, HANDLING AND PROTECTION

- .1 Deliver, handle and store materials in manner to prevent deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled materials in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work. Provide additional cover where manufacturer's packaging is insufficient to provide adequate protection.
- .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 and 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 Immediately remove damaged or rejected materials from site.
- .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.

END OF SECTION

Part 1 GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit written request in advance of cutting or alteration which affects:
 - .1 Structural integrity of elements of project.
 - .2 Integrity of weather-exposed or moisture-resistant elements.
 - .3 Efficiency, maintenance, or safety of operational elements.
 - .4 Visual qualities of sight-exposed elements.
 - .5 Work of Owner or separate contractor.
- .3 Include in request:
 - .1 Identification of project.
 - .2 Location and description of affected Work.
 - .3 Statement on necessity for cutting or alteration.
 - .4 Description of proposed Work, and products to be used.
 - .5 Alternatives to cutting and patching.
 - .6 Effect on Work of Owner or separate contractor.
 - .7 Written permission of affected separate contractor.
 - .8 Date and time work will be executed.

1.2 MATERIALS

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

1.3 PREPARATION

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

1.4 EXECUTION

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

- .2 Fit several parts together, to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.
- .5 Remove samples of installed Work for testing.
- .6 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .7 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .8 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .9 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .10 Restore work with new products in accordance with requirements of Contract Documents.
- .11 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .12 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .13 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 GENERAL

1.1 RELATED DOCUMENTS

- .1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- .1 This Section includes procedural requirements for cutting and patching.
- .2 Related Sections include the following:
 - .1 Division 01 Section "Selective Structure Demolition" for demolition of selected portions of the building.
 - .2 Divisions 2 through 49 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
 - .3 Division 07 Section "Fire Stop Systems" for patching fire-rated construction.

1.3 DEFINITIONS

- .1 Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
- .2 Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 QUALITY ASSURANCE

- .1 Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- .2 Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that result in increased maintenance or decreased operational life or safety. Operating elements include the following:
 - .1 Primary operational systems and equipment.
 - .2 Air or smoke barriers.
 - .3 Fire-suppression systems.
 - .4 Mechanical systems piping and ducts.
 - .5 Control systems.
 - .6 Communication systems.
 - .7 Conveying systems.
 - .8 Electrical wiring systems.
- .3 Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity that results in reduc-

ing their capacity to perform as intended, or that result in increased maintenance or decreased operational life or safety. Miscellaneous elements include the following:

- .1 Water, moisture, or vapour barriers.
 - .2 Membranes and flashings.
 - .3 Exterior curtain-wall construction.
 - .4 Equipment supports.
 - .5 Piping, ductwork, vessels, and equipment.
 - .6 Noise- and vibration-control elements and systems.
- .4 Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Departmental Representative's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
 - .5 Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.5 WARRANTY

- .1 Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

Part 2 PRODUCTS

2.1 MATERIALS

- .1 General: Comply with requirements specified in other Sections.
- .2 In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - .1 If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

Part 3 EXECUTION

3.1 EXAMINATION

- .1 Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
 - .1 Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.

- .2 Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- .1 Temporary Support: Provide temporary support of Work to be cut.
- .2 Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- .3 Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- .4 Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

3.3 PERFORMANCE

- .1 General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - .1 Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- .2 Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - .1 In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - .2 Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - .3 Concrete and masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - .4 Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
 - .5 Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - .6 Proceed with patching after construction operations requiring cutting are complete.
- .3 Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as in-

visible as possible. Provide materials and comply with installation requirements specified in other Sections.

- .1 Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 - .2 Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - .1 Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - .2 Restore damaged pipe covering to its original condition.
 - .3 Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - .1 Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 - .4 Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 - .5 Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather tight condition.
- .4 Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION

Part 1 GENERAL

1.1 GENERAL

- .1 Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
- .2 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .3 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

1.2 MATERIALS

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

1.3 CLEANING DURING CONSTRUCTION

- .1 Maintain work areas in a tidy condition, free from accumulations of waste material and debris. Clean areas on a daily basis.
- .2 Keep building entrances, corridors, stairwells and occupied areas of building in a clean dust free condition at all times. Conduct thorough cleaning of these areas at end of each workshift when used by workers or affected by the Work.
- .3 Provide on-site dump type containers for collection of waste materials and debris.
- .4 Use separate collection bins, clearly marked as to purpose, for source separation and recycling of waste and debris in accordance with waste management requirements specified.
- .5 Remove waste materials, and debris from site on a daily basis.
- .6 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.
- .7 Provide dust barriers, dividers, seals on doors and employ other dust control measures as required to ensure that dust and dirt, generated by work, are not transmitted to other areas of building. Should dust migrate into tenant occupied and public areas of building employ such means as may be necessary to immediately clean all contaminated surfaces to the satisfaction of the Departmental Representative.
 - .1 See Section 01 50 00 for requirements on dust control and for erection of dust partitions.
- .8 Immediately clean all dust, dirt, smears, scuffs, and soiled surfaces in lobbies, corridors, stairwells and within tenant occupied areas resulting from the Work.

- .1 Perform cleaning, dusting and washing operations, carpet vacuuming including shampooing if deemed required by Departmental Representative and floor washing as necessary to thoroughly clean all soiled surfaces.
- .9 Remove snow and ice from access doors used by workforce

1.4 FINAL CLEANING

- .1 In preparation for acceptance of the project on an interim or final certificate of completion perform final cleaning.
- .2 Remove grease, dust, dirt, stains, labels, fingerprints, marks, and other foreign materials, from interior and exterior finished surfaces. Clean and polish surfaces including glass, mirrors, hardware, wall tile, stainless steel, chrome, baked enamel, plastic laminate, mechanical, and electrical fixtures.
- .3 Replace items with broken pieces, scratches or disfigured.
- .4 Clean lighting reflectors, lenses, and other lighting surfaces.
- .5 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .6 Wax, seal, shampoo, or prepare floor finishes as recommended by manufacturer.
- .7 Inspect finishes, fitments, and equipment. Ensure specified workmanship and operation.
- .8 Broom clean and wash exterior paved surfaces and walks; rake clean other surfaces of grounds.
- .9 Remove debris and surplus materials from crawl areas, roof areas and other accessible concealed spaces.
- .10 Clean equipment, washroom, and kitchen fixtures to a sanitary condition. Replace filters of mechanical equipment.

END OF SECTION

Part 1 GENERAL

1.1 RELATED WORK

- .1 Environment Procedures: Section 01 35 43.

1.2 GENERAL

- .1 Carry out work placing maximum emphasis on the areas of:
 - .1 Waste reduction;
 - .2 Diversion of waste from landfill and;
 - .3 Material Recycling.

1.3 WASTE MANAGEMENT PLAN

- .1 Prior to commencement of work, prepare waste Management Workplan.
- .2 Workplan to include:
 - .1 Waste audit.
 - .2 Waste reduction practices.
 - .3 Material source separation process.
 - .4 Procedures for sending recyclables to recycling facilities.
 - .5 Procedures for sending non-salvageable items and waste to approved waste processing facility or landfill site.
 - .6 Training and supervising workforce on waste management at site.
- .3 Workplan to incorporate waste management requirements specified herein and in other sections of the Specifications.
- .4 Develop Workplan in collaboration with all subcontractors to ensure all waste management issues and opportunities are addressed.
- .5 Implement and manage all aspects of Waste Management Workplan for duration of work.
- .6 Revise Plan as work progresses addressing new opportunities for diversion of waste from landfill.

1.4 WASTE AUDIT

- .1 At project start-up, conduct waste audit of:
 - .1 Site conditions identifying salvageable and non-salvageable items and waste resulting from demolition and removal work.
 - .2 Projected waste resulting from product packaging and from material leftover after installation work.

- .2 Develop written list. Record type, composition, and quantity of various salvageable items and waste anticipated reasons for waste generation and operational factors which contribute to waste.

1.5 WASTE REDUCTION

- .1 Based on waste audit, develop waste reduction program.
- .2 Structure program to prioritize actions, with waste reduction as first priority, followed by salvage and recycling effort, then disposal as solid waste.
- .3 Identify materials and equipment to be:
 - .1 Protected and turned over to Departmental Representative when indicated.
 - .2 Salvaged for resale by Contractor.
 - .3 Sent to recycling facility.
 - .4 Sent to waste processing/landfill site for their recycling effort
 - .5 Disposed of in approved landfill site.
- .4 Reduce construction waste during installation work. Undertake practices which will minimize waste and optimize full use of new materials on site, such as:
 - .1 Use of a central cutting area to allow for easy access to off-cuts;
 - .2 Use of off-cuts for blocking and bridging elsewhere.
 - .3 Use of effective and strategically placed facilities on site for storage and staging of left-over or partially cut materials (such as gypsum board, plywood, ceiling tiles, insulation etc...) to allow for easy incorporation into work whenever possible avoiding unnecessary waste.
- .5 Develop other strategies and innovative procedures to reduce waste such as minimizing the extent of packaging used for delivery of materials to site etc...

1.6 MATERIAL SOURCE SEPARATION PROCESS

- .1 Develop and implement material source separation process at commencement of work as part of mobilization and waste management at site.
- .2 Provide on-site facilities to collect, handle and store anticipated quantities of reusable, salvageable, and recyclable materials.
 - .1 Use suitable containers for individual collection of items based on intended purpose.
 - .2 Locate to facilitate deposit but without hindering daily operations of existing building tenants.
 - .3 Clearly mark containers and stockpiles as to purpose and use.
- .3 Perform demolition and removal of existing building components and equipment following a systematic deconstruction process.
 - .1 Separate materials and equipment at source, carefully dismantling, labelling and stockpiling alike items for the following purposes:

- .1 Reinstallation into the work where indicated.
 - .2 Salvaging reusable items not needed in project which Contractor may sell to other parties. Sale of such items not permitted on site.
 - .3 Sending as many items as possible to locally available recycling facility.
 - .4 Segregating remaining waste and debris into various individual waste categories for disposal in a "non-mixed state" as recommended by waste processing/landfill sites.
- .4 Isolate product packaging and delivery containers from general waste stream. Send to recycling facility or return to supplier/manufacturer.
 - .5 Send leftover material resulting from installation work for recycling whenever possible.
 - .6 Establish methods whereby hazardous and toxic waste materials, and their containers, encountered or used in the course work are properly isolated, stored on site and disposed in accordance with applicable laws and regulations from authorities having jurisdiction.
 - .7 Isolate and store existing materials and equipment identified for re-incorporation into the Work. Protect against damage.

1.7 WORKER TRAINING AND SUPERVISION

- .1 Provide adequate training to workforce, through meetings and demonstrations, to emphasize purpose and worker responsibilities in carrying out the Waste Management Plan.
- .2 Waste Management Coordinator: designate full-time person on site, experienced in waste management and having knowledge of the purpose and content of Waste Management Plan to:
 - .1 Oversee and supervise waste management during work.
 - .2 Provide instructions and directions to all workers and subcontractors on waste reduction, source separation and disposal practices.
- .3 Post a copy of Plan in a prominent location on site for review by workers.

1.8 CERTIFICATION OF MATERIAL DIVERSION

- .1 Submit to Departmental Representative, copies of certified weigh bills from authorized waste processing sites and sale receipts from recycling/reuse facilities confirming receipt of building materials and quantity of waste diverted from landfill.
- .2 Submit data at pre-determined project milestones as determined by Departmental Representative.
- .3 Compare actual quantities diverted from landfill with projections made during waste audit.

1.9 DISPOSAL REQUIREMENTS

- .1 Locations of debris chutes & dumpsters for removal of old roofing material to be approved by Departmental Representative.
- .2 Burying or burning of rubbish and waste materials is prohibited.
- .3 Disposal of waste, volatile materials, mineral spirits, oil, or paint thinner into waterways, storm, or sanitary sewers is prohibited.
- .4 Dispose of waste only at approved waste processing facility or landfill sites approved by authority having jurisdiction.
- .5 Contact the authority having jurisdiction prior to commencement of work, to determine what, if any, demolition and construction waste materials have been banned from disposal in landfills and at transfer stations. Take appropriate action to isolate such banned materials at site of work and dispose in strict accordance with provincial and municipal regulations.
- .6 Transport waste intended for landfill in separated condition, following rules and recommendations of Landfill Operator in support of their effort to divert, recycle and reduce amount of solid waste placed in landfill.
- .7 Collect, bundle and transport salvaged materials to be recycled in separated categories and condition as directed by recycling facility. Ship materials only to approved recycling facilities.
- .8 Sale of salvaged items by Contractor to other parties not permitted on site.

END OF SECTION

Part 1 GENERAL

1.1 SECTION INCLUDES

- .1 Administrative procedures preceding inspection and acceptance of Work by Departmental Representative.

1.2 RELATED SECTIONS

- .1 Section 01 78 00 - Closeout Submittals.

1.3 INSPECTION AND DECLARATION

- .1 Contractor's Inspection: Coordinate and perform, in concert with subcontractors, an inspection and check of all Work. Identify and correct deficiencies, defects, repairs and perform outstanding items as required to complete work in conformance with Contract Documents.
 - .1 Notify Departmental Representative in writing when deficiencies from Contractor's inspection have been rectified and that Work is deemed to be complete and ready for Departmental Representative's inspection of the completed work.
- .2 Departmental Representative's Inspection: Accompany Departmental Representative during all interim and final inspections of the Work.
 - .1 Address defects, faults and outstanding items of work identified by such inspections.
 - .2 Advise Departmental Representative when all deficiencies identified have been rectified.
 - .3 **Note that Departmental Representative will not issue a Certificate of Substantial Performance of the work until such time that Contractor performs following work and turns over the specified documents:**
 - .1 Project record as-built documents;
 - .2 Final Operations and Maintenance manuals;
 - .3 Maintenance materials, parts and tools;
 - .4 Compliance certificates from applicable authorities;
 - .5 Reports resulting from designated tests;
 - .6 Demonstration and training complete with user manuals;
 - .7 Manufacturer's Guarantee certificates.
 - .8 Testing, adjusting and balancing of equipment and systems complete with submission of test reports.
 - .9 Commissioning of equipment and systems specified.
- .3 Correct all discrepancies before Departmental Representative will issue the Certificate of Completion.

END OF SECTION

Part 1 GENERAL

1.1 SECTION INCLUDES

- .1 Project Record Documents.
- .2 Operations and Maintenance data.

1.2 PROJECT RECORD DOCUMENTS

- .1 Departmental Representative will provide 2 white print sets of contract drawings and 2 copies of Specifications Manual specifically for "as-built" purposes.
- .2 Maintain at site one set of the contract drawings and specifications to record actual as-built site conditions.
- .3 Maintain up-to-date, real time as-built drawings and specifications in good condition and make available for inspection by the Departmental Representative upon request.
- .4 As-Built Drawings:
 - .1 Record changes in red ink on the prints. Mark only on one set of prints and at completion of work, neatly transfer notations to second set also by use of red ink.
 - .2 Submit both sets to Departmental Representative prior to application for Certificate of Substantial Performance.
 - .3 Stamp all drawings with "As-Built Drawings". Label and place Contractor's signature and date.
 - .4 Show all modifications, substitutions and deviations from what is shown on the contract drawings or in specifications.
 - .5 Record following information:
 - .1 Depths of various elements of foundation in relation to finished first floor level.
 - .2 Horizontal and vertical location of exterior underground utilities and appurtenances referenced to permanent surface improvements.
 - .3 Horizontal and vertical location of various elements in relation to Geodetic Datum;
 - .4 Location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure;
 - .5 Field changes of dimension and detail;
 - .6 Location of all capped or terminated services and utilities.
 - .7 Chases for mechanical, electrical and other services;
 - .8 Ceiling and floor elevations;
 - .9 Reflected ceiling plan condition showing finished layout of all ceiling-mounted services and devices;

- .10 Plumbing, heating, air conditioning and ventilation, sprinkler and electrical service installation locations; all to be dimensioned and referenced to building columns or load bearing walls;
 - .11 All structural steel installations to be fully dimensioned;
 - .12 All design elevations, sections, floor plans and details dimensioned and marked-up to consistently report finished installation conditions;
 - .13 Any details produced in the course of the contract by the Departmental Representative to supplement or to change existing design drawings;
 - .14 All change orders issued over the course of the contract must be documented on the finished as-built documents, accurately and consistently depicting the changed condition as it applies to all affected drawing details.
- .5 As-built Specifications: legibly mark in red each item to record actual construction, including:
- .1 Changes made by Addenda and Change Orders.
 - .2 Mark up both copies of specifications; stamp "as-built", sign and date similarly to drawings as per above clause.
- .6 Maintain As-built documents current as the contract progresses. Departmental Representative will conduct reviews and inspections of the documents on a regular basis. Failure to maintain as-builts current and complete to satisfaction of the Departmental Representative shall be subject to financial penalties in the form of progress payment reductions and holdback assessments.

1.3 REVIEWED SHOP DRAWINGS

- .1 Provide a complete set of all shop drawings reviewed for project to incorporate into each copy of the Operations & Maintenance manuals.
- .2 Submit full sets at same time and as part of the contents of the Operation and Maintenance manuals specified.

1.4 UPDATING OF DIGITAL DRAWINGS

- .1 Be aware that beyond the requirement to provide "red marked" as-built paper documents, as specified in Clause 1.3 above, Contractor shall also provide the service of updating the digital drawings which were used to produce the contract drawings.
- .2 The Departmental Representative will provide one set of AutoCAD Release 2008 drawing files specifically for "as-built" purposes. The AutoCAD drawing files shall be updated to record same as-built information as specified in above clauses for the provision of paper as-built drawing documentation.
- .3 All "As-Built" changes to the electronic files provided shall be done following the standards as specified in the PWGSC Atlantic Region CADD Data Specification manual dated April 2002. A copy of this manual will be provided by the Departmental Representative upon request.

- .4 Make revisions to electronic files found to be in non-conformance with the CADD Data Specifications Manual as directed by Departmental Representative.
- .5 In regards to updating the digital files to reflect changes resulting from Change Orders, the change in cost of completing the As-Built documentation of changes is to be included in the amount for each Change Order issued. The amount included will constitute only the increase or decrease in CADD related costs resulting directly from the change. In determining the cost difference, full consideration will be given to the fact that other clauses of this section require As-Built CADD updates to the drawings irrespective of any Change Orders.
- .6 Deliver the digital information in same format and sequence as per contract drawings. Submit on CD diskettes.
- .7 Submit the digital as-built files at the same time as submission of the marked-up paper white prints. Supply of digital documents does not replace the requirement to provide marked-up white prints specified.
- .8 Also provide 1 set of reproducible bond plots of the updated electronic as-built CADD drawing files.

1.5 OPERATIONS & MAINTENANCE MANUAL

- .1 Definition: an organized compilation of operating and maintenance data including detailed technical information, documents and records describing operation and maintenance of individual products or systems as specified in individual sections of the specifications.
- .2 Manual Language: final manuals to be in English languages.
 - .1 Upon review and acceptance by Departmental Representative, submit 3 final copies. Interim copies are not to be considered as part of the final copies unless they have been fully revised and are identical to the final approved version.
- .3 Submission Date: submit complete operation and maintenance manual to Departmental Representative 3 weeks prior to application for Certificate of Substantial Performance of the work.
- .4 Binding:
 - .1 Assemble, coordinate, bind and index required data into Operation and Maintenance Manual.
 - .2 Use vinyl, hard covered, 3 "D" ring binders, loose leaf, sized for 215 x 280 mm paper, with spine pocket.
 - .3 Where multiple binders are needed, correlate data into related consistent groupings.
 - .4 Identify contents of each binder on spine.
 - .5 Organize and divide data following same numerical system as the section numbers of the Specification Manual.

- .6 Dividers: separate each section by use of cardboard dividers and labels. Provide tabbed fly leaf for each individual product and system and give description of product or component.
- .7 Type lists and notes. Do not hand write.
- .8 Drawings, diagrams, and manufacturers' literature must be legible. Provide with reinforced, punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- .5 Manual Contents:
 - .1 Cover sheet containing:
 - .1 Date submitted.
 - .2 Project title, location and project number.
 - .3 Names and addresses of Contractor, and all Sub-contractors.
 - .2 Table of Contents: provide full table of contents in each binder(s), clearly indicate which contents are in each binder.
 - .3 List of maintenance materials.
 - .4 List of spare parts.
 - .5 List of special tools.
 - .6 Original or certified copy of warranties and product guarantees.
 - .7 Copy of approval documents and certificates issued by Inspection Authorities.
 - .8 Copy of reports and test results performed by Contractor as specified.
 - .9 Product Information (PI Data) on materials, equipment, and systems as specified in various sections of the specifications. Data to include:
 - .1 List of equipment including manufacturer's name, supplier, local source of supplies and service depot(s). Provide full addresses and telephone numbers.
 - .2 Nameplate information including equipment number, make, size, capacity, model number and serial number.
 - .3 Parts list.
 - .4 Installation details.
 - .5 Operating instructions.
 - .6 Maintenance instructions for equipment.
 - .7 Maintenance instructions for finishes.
- .6 Shop drawings:
 - .1 Include complete set of reviewed shop drawings into each copy of the operations and maintenance manual.
 - .2 Fold and bind material professionally in a manner that corresponds with the specification section numbering system.
 - .3 When large quantity of data is submitted, place into separate binders of same size as Operation and Maintenance binders.
- .7 Equipment and Systems Data: the following list indicates the type of data and extent of information required to be included for each item of equipment and for each system:

- .1 Description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
 - .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
 - .3 Include installed colour coded wiring diagrams.
 - .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
 - .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
 - .6 Servicing and lubrication schedule, and list of lubricants required.
 - .7 Manufacturer's printed operation and maintenance instructions.
 - .8 Sequence of operation by controls manufacturer.
 - .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
 - .10 Provide installed control diagrams by controls manufacturer.
 - .11 Provide Contractor's coordination drawings, with installed colour coded piping diagrams.
 - .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
 - .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
 - .14 Include test and balancing reports.
 - .15 Additional requirements as specified in individual specification sections.
- .8 Materials and Finishes Maintenance Data:
- .1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.
 - .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
 - .3 Moisture-protection and Weather-exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
 - .4 Additional Requirements: as specified in individual specifications sections.

1.6 SPARE PARTS, TOOLS AND MAINTENANCE MATERIALS

- .1 Provide spare parts, special tools and extra materials for maintenance purposes in quantities specified in individual specification sections.

- .2 Tag all items with associated function or equipment.
- .3 Provide items of same manufacture and quality as items in Work.
- .4 Deliver to site in well packaged condition. Store in location as directed by Departmental Representative.
- .5 Clearly mark as to contents indicating:
 - .1 Part number.
 - .2 Identification of equipment or system for which parts are applicable.
 - .3 Installation instructions or intended use as applicable.
 - .4 Name, address and telephone number of nearest supplier.
- .6 Prepare and submit complete inventory list of items supplied. Include list within Maintenance Manual.

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Demolition and removal of selected portions of building or structure.
 - .2 Demolition and removal of selected site elements.
 - .3 Salvage of existing items to be reused or recycled.
- .2 Types of items you will not find described in this Section:
 - .1 Use of premises, phasing, and Facility-occupancy requirements.
 - .2 Photographic Documentation for preconstruction photographs taken before selective demolition operations.
 - .3 Temporary Facilities and Controls for temporary construction and environmental-protection measures for selective demolition operations.
 - .4 Cutting and Patching for cutting and patching procedures.
 - .5 Construction Waste Management and Disposal for disposal of demolished materials.

1.2 DEFINITIONS

- .1 Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- .2 Remove and Salvage: Detach items from existing construction and deliver them to Departmental Representative ready for reuse.
- .3 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- .4 Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 SUBMITTALS

- .1 Schedule of Selective Demolition Activities: Indicate the following:
 - .1 Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Facility's building managers and other tenants' on-site operations are uninterrupted.
 - .2 Interruption of utility services. Indicate how long utility services will be interrupted.
 - .3 Coordination for shutoff, capping, and continuation of utility services.
 - .4 Use of elevator and stairs.
 - .5 Locations of proposed dust- and noise-control temporary partitions and means of egress, including for other tenants affected by selective demolition operations.

- .6 Coordination of Facility's continuing occupancy of portions of existing building and of Facility's partial occupancy of completed Work.
- .7 Means of protection for items to remain and items in path of waste removal from building.
- .2 Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.
- .3 Predemolition Photographs or Videotapes: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by selective demolition operations. Comply with Division 01 Section *Photographic Documentation*. Submit before Work begins.
- .4 Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
 - .1 Comply with submittal requirements in Division 01 Section "*Construction Waste Management and Disposal*."

1.4 QUALITY ASSURANCE

- .1 Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- .2 Standards: Comply with ANSI A10.6, NFPA 241, NBCC, and NFCC.
- .3 Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 01 Section *Project Management and Coordination*. Review methods and procedures related to selective demolition including, but not limited to, the following:
 - .1 Inspect and discuss condition of construction to be selectively demolished.
 - .2 Review structural load limitations of existing structure.
 - .3 Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - .4 Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - .5 Review areas where existing construction is to remain and requires protection.

1.5 PROJECT CONDITIONS

- .1 Portions of building immediately adjacent to selective demolition area will be occupied. Conduct selective demolition so Facility's operations will not be disrupted.
 - .1 Comply with requirements specified in Division 01 Section *Summary*.
- .2 Conditions existing at time of inspection for bidding purpose will be maintained by Departmental Representative as far as practical.
- .3 Notify Departmental Representative of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

- .4 Hazardous Materials: It may be possible hazardous materials could be present in construction to be selectively demolished. A report on the presence of hazardous materials is attached for review and use (If report is not attached, request clarification from Departmental Representative.) Examine report to become aware of locations where hazardous materials are present.
 - .1 Hazardous material remediation is specified elsewhere in the Contract Documents.
 - .2 Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
- .5 Storage or sale of removed items or materials on-site is not permitted.
- .6 Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - .1 Maintain fire-protection facilities in service during selective demolition operations.

1.6 WARRANTY

- .1 Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

Part 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- .1 Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- .2 Standards: Comply with NBCC Part 8 *Safety Measures at Construction and Demolition Sites*, ANSI/ASSE A10.6 and NFPA 241.

Part 3 EXECUTION

3.1 EXAMINATION

- .1 Verify that utilities have been disconnected and capped.
- .2 Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- .3 Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- .4 When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Departmental Representative.

- .5 Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.
- .6 Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
 - .1 Comply with requirements specified in Division 01 Section *Photographic Documentation*.
 - .2 Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.
- .7 Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- .1 Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
 - .1 Comply with requirements for existing services/systems interruptions specified in Division 01 Section *Summary*.
- .2 Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - .1 Arrange to shut off indicated utilities with utility companies.
 - .2 If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - .3 Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
 - .1 Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

3.3 PREPARATION

- .1 Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - .1 Comply with requirements for access and protection specified in Division 01 Section *Temporary Facilities and Controls*.
- .2 Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - .1 Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

- .2 Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
- .3 Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
- .4 Cover and protect furniture, furnishings, and equipment that have not been removed.
- .5 Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section *Temporary Facilities and Controls*.
- .3 Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 - .1 Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

- .1 To limit risk of exposure, the demolition must be phased and limited in area to suit that which can be resealed within a reasonable amount of time. Contractor to have enough temporary coverings on site to cover exposed areas of work.
- .2 General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - .1 Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 - .2 Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 - .3 Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - .4 Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
 - .5 Maintain adequate ventilation when using cutting torches.
 - .6 Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 - .7 Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 - .8 Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

- .9 Dispose of demolished items and materials promptly. Comply with requirements in Division 01 Section *Construction Waste Management and Disposal*.
- .3 There is a high probability of water infiltration/leaks during this project. Particular during the demo/stripping of the existing roofing material. Contractor to have all necessary materials on site to quickly respond when leaks are encountered.
- .4 Contractor is responsible for addressing all new leaks caused during this roofing project. This includes quickly responding to leaks (24/7) by protecting bldg. components from leaks, clean-up/replacement of water damaged items.
- .5 Contractor is responsible for all repairs to lawns, grounds or portions of the building damaged by equipment during the execution of the Work.
- .6 Contractor to advise Departmental Representative immediately if demolition reveals any existing conditions that need to be addressed before proceeding with new installations.
- .7 Do not demolish building elements beyond what is indicated on Drawings without Departmental Representatives approval.
- .8 Removed and Salvaged Items:
 - .1 Clean salvaged items.
 - .2 Pack or crate items after cleaning. Identify contents of containers.
 - .3 Store items in a secure area until delivery to Departmental Representative.
 - .4 Transport items to storage area designated by Departmental Representative.
 - .5 Protect items from damage during transport and storage.
- .9 Removed and Reinstalled Items:
 - .1 Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
 - .2 Pack or crate items after cleaning and repairing. Identify contents of containers.
 - .3 Protect items from damage during transport and storage.
 - .4 Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- .10 Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Departmental Representative, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- .1 Concrete: Demolish in small sections. Cut concrete to a depth of at least 19 mm at junctures with construction to remain, using power-driven saw. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete indicated for selective demolition. Neatly trim openings to dimensions indicated.

- .2 Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.
- .3 Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
- .4 Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
- .5 Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI-WP and its Addendum.
 - .1 Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.
- .6 Roofing: Remove no more existing roofing than can be covered in one day by new roofing and so that building interior remains watertight and weather tight. Refer to Division 07 for new roofing requirements.
 - .1 Remove existing roof membrane, flashings, copings, and roof accessories.
 - .2 Remove existing roofing system down to substrate.
- .7 Air-Conditioning Equipment: Remove equipment without releasing refrigerants.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- .1 General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Departmental Representative 's property, remove demolished materials from Project site and legally dispose of them in an approved landfill.
 - .1 Do not allow demolished materials to accumulate on-site.
 - .2 Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - .3 Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 - .4 Comply with requirements specified in Division 01 Section *Construction Waste Management and Disposal*.
- .2 Burning: Do not burn demolished materials.
- .3 Disposal: Transport demolished materials off Facility's property and legally dispose of them.

3.7 CLEANING

- .1 Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Wood blocking and nailers.
 - .2 Wood furring.
 - .3 Wood sleepers.
 - .4 Plywood blocking within walls.
- .2 Types of items not described in this Section:
 - .1 Framing with dimension lumber.
 - .2 Framing with engineered wood products.
 - .3 Utility shelving.
 - .4 Lumber treated with fire-retardant.
- .3 Related Requirements
 - .1 Section 01 74 21 - *Construction/Demolition Waste Management and Disposal*.
 - .2 Section 09 91 23 - *Interior Painting* for priming and finish paint of equipment backer boards prior to use.
 - .3 Section 07 92 00 - *Joint Sealants*.
 - .4 Section 09 29 00 - *Gypsum Board*

1.2 REFERENCES

- .1 American National Standards Institute/National Particleboard Association (ANSI/NPA)
 - .1 ANSI/NPA A208.1-2009, Particleboard.
- .2 ASTM International
 - .1 ASTM A123/A123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .2 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
 - .3 ASTM C578-11a, Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
 - .4 ASTM C1289-11, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
 - .5 ASTM C1396/C1396M-11, Standard Specification for Gypsum Board.
 - .6 ASTM D1761-06, Standard Test Methods for Mechanical Fasteners in Wood.
 - .7 ASTM D5456-11, Standard Specification for Evaluation of Structural Composite Lumber Products.
- .3 Canada Green Building Council (CaGBC)

- .1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations (including Addendum 2007).
- .2 LEED Canada-NC-2009, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations 2009.
- .3 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for Commercial Interiors.
- .4 LEED Canada-EB: O M-2009, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for Existing Buildings: Operations and Maintenance 2009.
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-11.3-M87, Hardboard.
 - .2 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
 - .3 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction and amendment.
 - .4 CAN/CGSB-71.26-M88, Adhesive for Field-Gluing Plywood to Lumber Framing for Floor Systems.
- .5 CSA International
 - .1 CAN/CSA-A247-M86(R1996), Insulating Fiberboard.
 - .2 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
 - .3 CSA O112.9-10, Evaluation of Adhesives for Structural Wood Products (Exterior Exposure).
 - .4 CSA O121-08, Douglas Fir Plywood.
 - .5 CAN/CSA O122-06(R2011), Structural Glued-Laminated Timber.
 - .6 CSA O141-05(R2009), Softwood Lumber.
 - .7 CSA O151-09, Canadian Softwood Plywood.
 - .8 CSA O153-M1980(R2008), Poplar Plywood.
 - .9 CSA O325-07, Construction Sheathing.
 - .10 CSA O437 Series-93(R2011), Standards on OSB and Waferboard.
 - .11 CAN/CSA-Z809-08, Sustainable Forest Management.
- .6 Forest Stewardship Council (FSC)
 - .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.
- .7 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2010.
- .8 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1113-A2011, Architectural Coatings.

- .2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.
- .9 Sustainable Forestry Initiative (SFI)
 - .1 SFI-2010-2014 Standard.
- .10 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S706-09, Standard for Wood Fibre Insulating Boards for Buildings.

1.3 DEFINITIONS

- .1 Dimension Lumber: Lumber of 38 mm actual or greater but less than 114 mm actual in least dimension.
- .2 Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - .1 NLGA: National Lumber Grades Authority.

1.4 ACTION SUBMITTALS

- .1 Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - .1 Include data for wood-preserved treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - .2 For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - .3 Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect wood from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.

- .5 Packaging Waste Management: remove for reuse and return of pallets, as specified in Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- .1 Certified Wood: Lumber and plywood shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, *FSC Principles and Criteria for Forest Stewardship*.
- .2 Lumber: In accordance with:
 - .1 CAN/CSA-O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
- .3 Softwood Plywood panels: to CAN/CSA-O325.0.
- .4 Hardwood Veneer Plywood Panels: to HPVA HP-1.
- .5 Provide dressed lumber, S4S, unless otherwise indicated.
- .6 Maximum Moisture Content of Lumber: 19 percent for 38 mm actual thickness or less, no limit for more than 38 mm actual thickness unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- .1 Preservative Treatment by Pressure Process: to CSA O80 Series 2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated with inorganic boron (SBX).
 - .1 Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Acceptable Preservative Treatments are Alkaline Copper Quaternary (ACQ) and/or Copper Azole (CA).
- .2 Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- .3 Mark lumber with treatment quality mark of an inspection agency approved by the Canadian Lumber Standards Accreditation Board.
- .4 Application: Treat items indicated on Drawings, and the following, unless otherwise noted.
 - .1 Wood nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapour barriers, and waterproofing.

- .2 Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.
- .3 Furring attached directly to the interior of below-grade exterior masonry or concrete walls.

2.3 MISCELLANEOUS LUMBER

- .1 General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - .1 Blocking.
 - .2 Nailers.
 - .3 Furring.
- .2 For items of dimension lumber size, provide Construction or No. 2 grade lumber and any of the following species: [and the following species:]
 - .1 Spruce-pine-fir; NLGA.
- .3 For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
 - .1 Spruce-pine-fir, Construction or No. 2 Common grade; NLGA.
- .4 For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- .5 For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- .6 For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.4 PLYWOOD

- .1 Plywood Blocking: DFP or CSP sheathing grade or PP standard sheathing grade, T&G edge.

2.5 FASTENERS

- .1 General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - .1 Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- .2 Nails, Brads, and Staples: CSA B111.
- .3 Power-Driven Fasteners: NES NER-272.

- .4 Wood Screws: ASME B18.6.1.
- .5 Screws for Fastening to Metal Framing: ASTM C 954, length as recommended by screw manufacturer for material being fastened.
- .6 Lag Bolts: ASME B18.2.3.8M.
- .7 Bolts: Steel bolts complying with ASTM F 568M, Property Class 4.6; with ASTM A 563M hex nuts and, where indicated, flat washers.
- .8 Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
 - .1 Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2.6 MISCELLANEOUS MATERIALS

- .1 Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
 - .1 Adhesives shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- .2 Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.6 mm.

Part 3 EXECUTION

3.1 INSTALLATION, GENERAL

- .1 Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- .2 Where wood-preserved-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- .3 Framing Standard: Comply with more stringent of *NBCC 2005 Part 9* and these specifications.
- .4 Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.

- .5 Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- .6 Do not splice structural members between supports unless otherwise indicated.
- .7 Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - .1 Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 406 mm o.c.
- .8 Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- .9 Comply with manufacturer's instructions for applying field treatment to cut surfaces of preservative-treated lumber.
 - .1 Use inorganic boron for items that are continuously protected from liquid water.
 - .2 Use copper naphthenate for items not continuously protected from liquid water.
- .10 Securely attach rough carpentry work to substrate by anchoring and fastening.
- .11 Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD SLEEPER, BLOCKING, AND NAILER INSTALLATION

- .1 Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- .2 Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 WOOD FURRING INSTALLATION

- .1 Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- .2 Furring to Receive Plywood or Hardboard Paneling: Install 19-by-63 mm actual-size furring at 406 mm o.c.

3.4 PROTECTION

- .1 Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply borate treatment. Apply borate solution by spraying.

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Wall sheathing: plywood, gypsum board, and board types.
 - .2 Roof sheathing: plywood and board types.
 - .3 Subflooring: plywood and board types.
 - .4 Underlayment: plywood and board types.
 - .5 Building wrap.
 - .6 Sheathing joint-and-penetration treatment.
 - .7 Flexible flashing at openings in sheathing.
- .2 Types of items you will not find described in this Section:
 - .1 Backing panels for electrical equipment.

1.2 ACTION SUBMITTALS

- .1 Product Data: For building wrap, flexible flashings, and joint-and-penetration treatment. Include manufacturer's installation instructions.

1.3 QUALITY ASSURANCE

- .1 Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance by a testing and inspecting agency acceptable to authorities having jurisdiction.
- .2 Source Limitations: Obtain building wrap and flexible flashing material from single source.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

Part 2 PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- .1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% (S-dry) or less in accordance with following standards:
 - .1 CAN/CSA-O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
 - .3 Provide dressed lumber, S4S, unless otherwise indicated.

2.2 WOOD PANEL PRODUCTS, GENERAL

- .1 Plywood panels: to CAN/CSA-O325.0.
- .2 Douglas fir plywood (DFP): to CSA O121, standard construction.
- .3 Canadian softwood plywood (CSP): to CSA O151, standard construction.
- .4 Poplar plywood (PP): to CSA O153, standard construction.
- .5 Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- .6 Factory mark panels to indicate compliance with applicable standard.

2.3 PRESERVATIVE-TREATED LUMBER AND PLYWOOD

- .1 Preservative Treatment by Pressure Process: to CSA O80 Series.
 - .1 Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Acceptable Preservative Treatments are Alkaline Copper Quaternary (ACQ) and/or Copper Azole (CA).
- .2 Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- .3 Application: Treat items specifically indicated on drawings as pressure treated and lumber and plywood in contact with masonry or concrete.

2.4 WALL SHEATHING

- .1 Plywood Wall Sheathing: DFP or CSP sheathing grade or PP standard sheathing grade, T&G edge.
 - .1 Locations: Over wood framing, unless otherwise noted.
- .2 Board Sheathing: NLGA Number 4 common grade or better, 19 mm thick.
 - .1 Location: Only where specified on drawings.
- .3 Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.
 - .1 Locations: Over steel stud framing and where specifically indicated on drawings.

2.5 ROOF SHEATHING

- .1 Plywood Roof Sheathing: Plywood, DFP or CSP sheathing grade or PP standard sheathing grade, T&G edge.
 - .1 Locations: Typical, unless otherwise indicated.
- .2 Board Sheathing: NLGA Number 3 common grade or better, 19 mm thick.
 - .1 Location: Only where specified on drawings.

2.6 SUBFLOORING AND UNDERLAYMENT

- .1 Plywood Subflooring: Plywood, DFP or CSP sheathing grade or PP standard sheathing grade, T&G edge.
 - .1 Locations: Typical, unless otherwise indicated.
- .2 Board Sub-Floor: NLGA Number 3 common grade or better, 19 mm thick.
 - .1 Location: Only where specified on drawings.
- .3 Underlayment, General: Provide underlayment in nominal thicknesses indicated or, if not indicated, not less than 6.4 mm over smooth subfloors and not less than 9.5 mm over board or uneven subfloors.
- .4 Plywood Underlayment: Plywood, DFP or CSP grade, or PP grade, square edge.
 - .1 Locations: Typical, unless otherwise indicated.
- .5 Board Underlayment: NLGA Number 2 grade or better, 19 mm thick.
 - .1 Location: When specified on drawings.

2.7 FASTENERS

- .1 General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - .1 For roof and wall sheathing and wood treated with preservative, provide fasteners with hot-dip zinc coating complying with A CAN/CSA-G164 or Type 304 stainless steel.
- .2 Nails, Brads, and Staples: to CSA B111.
- .3 Power-Driven Fasteners: NES NER-272.
- .4 Wood Screws: ASME B18.6.1.
- .5 Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
 - .1 For wall and roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
- .6 Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
 - .1 For steel framing from 0.84 to 2.84 mm thick, attach sheathing to comply with ASTM C 954.

2.8 WEATHER-RESISTANT SHEATHING PAPER

- .1 Building Wrap: spunbonded olefin type to CAN/CGSB-51.32.

- .1 Air leakage rate at 75 Pa air pressure not greater than 0.02 L/s/m².
 - .2 Water vapour transmission of greater than 1100 Ng/Pa.s.m².
 - .3 Water penetration resistance of 200 cm minimum in accordance with AATCC-127.
 - .4 Allowable UV Exposure Time: Not less than three months.
- .2 Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.9 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- .1 Sealant for Glass-Mat Gypsum Sheathing Board: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing, and recommended by tape and sheathing manufacturers for use with glass-fibre sheathing tape and for covering exposed fasteners.
- .2 Sheathing Tape for Glass-Mat Gypsum Sheathing Board: Self-adhering glass-fibre tape, minimum 50 mm wide, 390 by 390 or 390 by 780 threads/m, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing board and with a history of successful in-service use.

2.10 MISCELLANEOUS MATERIALS

- .1 Adhesives for Field Gluing Panels to Framing: Formulation complying with CGSB-71.26, cartridge-loaded, that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.
 - .1 Use adhesives that have a VOC content of 70g/L or less.
- .2 Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.6 mm.
- .3 Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.
- .4 Floor Underlayment Paper: purpose made heavy-weight underlayment flooring paper made from 100% recycled paper products.

Part 3 EXECUTION

3.1 INSTALLATION, GENERAL

- .1 Comply with requirements of NBC 1995 Part 9 supplemented by following paragraphs.
- .2 Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- .3 Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.

- .4 Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- .5 Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- .6 Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- .7 Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.
- .8 Install underlayment floor paper over top of subfloor when either or both the subfloor and the underlayment consist of board lumber.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- .1 Fastening Methods: Fasten panels as indicated below:
 - .1 Subflooring:
 - .1 Glue and nail to wood framing.
 - .2 Screw to cold-formed metal framing.
 - .3 Space panels 3 mm apart at edges and ends.
 - .4 Install board type sub-flooring at 45 degrees to floor framing.
 - .2 Wall and Roof Sheathing:
 - .1 Nail to wood framing.
 - .2 Screw to cold-formed metal framing.
 - .3 Space panels 3 mm apart at edges and ends.
 - .3 Underlayment:
 - .1 Nail to subflooring.
 - .2 Space panels 0.8 mm apart at edges and ends.
 - .3 Install board-type underlayment perpendicular to the subfloor.
 - .4 Fill and sand edge joints of underlayment receiving resilient flooring right before installing flooring.

3.3 GYPSUM SHEATHING INSTALLATION

- .1 Comply with GA-253 and with manufacturer's written instructions.
 - .1 Fasten gypsum sheathing to wood framing with screws.
 - .2 Fasten gypsum sheathing to cold-formed metal framing with screws.
 - .3 Install boards with a 9.5 mm gap where non-load-bearing construction abuts structural elements.
 - .4 Install boards with a 6.4 mm gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

- .2 Apply fasteners so heads bear tightly against face of sheathing boards but do not cut into facing.
- .3 Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.
 - .1 Space fasteners approximately 200 mm o.c. and set back a minimum of 9.5 mm from edges and ends of boards.
 - .2 For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.
- .4 Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.
 - .1 Space fasteners approximately 200 mm o.c. and set back a minimum of 9.5 mm from edges and ends of boards.
 - .2 For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

3.4 WEATHER-RESISTANT SHEATHING-PAPER INSTALLATION

- .1 General: Cover sheathing with weather-resistant sheathing paper as follows:
 - .1 Apply barrier to cover vertical flashing with a minimum 100 mm overlap, unless otherwise indicated.
- .2 Building Wrap: Comply with manufacturer's written instructions.
 - .1 Seal seams, edges, fasteners, and penetrations with tape.
 - .2 Extend into jambs of openings and seal corners with tape.

3.5 SHEATHING JOINT-AND-PENETRATION TREATMENT

- .1 Seal gypsum board sheathing joints according to sheathing manufacturer's written instructions, except when adhered membrane is scheduled for application directly over top of panel.
 - .1 Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient quantity of sealant to completely cover joints and fasteners after towelling. Seal other penetrations and openings.

3.6 FLEXIBLE FLASHING INSTALLATION

- .1 Apply flexible flashing at all framed openings and where indicated to comply with manufacturers written instructions.
 - .1 Prime substrates as recommended by flashing manufacturer.
 - .2 Lap seams and junctures with other materials at least 100 mm, except that at flashing flanges of other construction, laps need not exceed flange width.

- .3 Lap flashing over weather-resistant building paper at bottom and sides of openings.
- .4 Lap weather-resistant building paper over flashing at heads of openings.
- .5 After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

END OF SECTION

Part 1 GENERAL

1.1 RELATED DOCUMENTS

- .1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- .1 Types of items described in this Section:
- .1 Interior standing and running trim.
 - .2 Clothes closet shelving and clothes rods.
 - .3 Interior wood frames and jambs.
 - .4 Interior wood stairs intended to be covered with tread and riser covers.
 - .5 Interior wood hand railings.
 - .6 Flush wood panelling and wainscoting.
- .2 Types of items you will not find described in this Section:
- .1 Shop-fabricated interior woodwork.
 - .2 Wood Panelling as follows
 - .1 Pre-manufactured / proprietary wood panelling system.
 - .2 Board paneling.
 - .3 Plastic-laminate-clad flush paneling.
 - .4 Stile and rail wood paneling.
 - .3 Foam-plastic mouldings.
 - .4 Stair and Landing guards, newel posts, balustrades, and integrated railings.
 - .5 Interior ornamental wood columns.
 - .6 Furring, blocking, and other carpentry work not exposed to view and for structural wood decking and framing exposed to view.
 - .7 Platform framing, headers, partition framing, and other rough framing associated with stairwork
 - .8 Priming, backpriming, and finishing of interior finish carpentry.
 - .9 Stair tread and riser covers.

1.3 DEFINITIONS

- .1 Lumber grading agencies, and the abbreviations used to reference them, include the following:
- .1 NHLA: National Hardwood Lumber Association.
 - .2 NLGA: National Lumber Grades Authority.

1.4 SUBMITTALS

- .1 Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colours and include construction and application details.

- .1 Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical treatment manufacturer's written instructions for finishing treated material.
- .2 Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- .3 For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
- .4 Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- .2 Samples for Verification
 - .1 For each species and cut of lumber and panel products with non-factory-applied finish, with 1/2 of exposed surface finished, 300 sq. cm for lumber and 200 by 250 mm for panels.
- .3 Sustainability Submittals:
 - .1 Product Data for adhesives and glues used at Project site, including printed statement of VOC content.
 - .2 Product Data for composite-wood products, documentation indicating that product contains no urea formaldehyde.
 - .3 Chain-of-custody certificates certifying that products specified to be made from certified wood comply with forest certification requirements. Include evidence that mill is certified for chain of custody by an FSC-accredited certification body.
 - .1 Include statement indicating costs for each certified wood product.
- .4 Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

- .1 Quality Standard
 - .1 Unless otherwise indicated, comply with AWMAC's "*Architectural Woodwork Quality Standards*" for grades of interior finish carpentry indicated for construction, installation, and other requirements.
- .2 Forest Certification
 - .1 Provide interior finish carpentry produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "*FSC Principles and Criteria for Forest Stewardship*."
- .3 Mock-ups
 - .1 Build mock-ups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - .2 Reviewed mock-ups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Protect materials against weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation within and around stacks and under temporary coverings.
- .2 Deliver interior finish carpentry materials only when environmental conditions meet requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

1.7 PROJECT CONDITIONS

- .1 Environmental Limitations
 - .1 Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
 - .2 Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
 - .1 Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - .2 Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

Part 2 PRODUCTS

2.1 MATERIALS

- .1 General
 - .1 Provide materials that comply with requirements of AWMAC's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
 - .2 Hardwood Lumber Trim for Transparent Finish (Stain or Clear Finish)
 - .1 Species
 - .1 Refer to drawings.
 - .2 If drawings do not indicate species, provide maple.
 - .2 Forestry Stewardship Council (FSC) certified.
 - .3 Maximum Moisture Content: 13 percent.
 - .4 Finger Jointing: Not allowed.
 - .5 Gluing for Width: Allowed.
 - .6 Veneered Material: Allowed.
 - .7 Face Surface: Surfaced (smooth).
 - .8 Matching: Selected for compatible grain and colour.
- .3 Lumber Trim for Opaque Finish (Painted)

- .1 Species
 - .1 Refer to drawings.
 - .2 If drawings do not indicate species, provide any closed grain hardwood.
- .2 Forestry Stewardship Council (FSC) certified.
- .3 Maximum Moisture Content: 13 percent.
- .4 Finger Jointing: Allowed.
- .5 Face Surface: Surfaced (smooth).
- .6 Optional Material: Primed MDF of same actual dimensions as lumber indicated may be used in lieu of lumber.
- .4 Lumber for Concealed Locations
 - .1 Forest Stewardship Council (FSC) certified.
 - .2 Softwood lumber: to CAN/CSA-O141. Kiln dried to 15 percent maximum moisture content.
 - .1 Wood species: Pine.
 - .3 Hardwood lumber: to National Hardwood Lumber Association (NHLA)
- .5 Veneer-Faced Panel Products (Hardwood Plywood)
 - .1 To HPVA HP-1.
 - .2 Made with adhesive containing no urea formaldehyde.
 - .3 Forestry Stewardship Council (FSC) certified.
 - .4 Wood Species
 - .1 Refer to drawings.
 - .2 If drawings do not indicate wood species, provide maple.
 - .5 Grade: Grade B or better veneer for, unless otherwise noted.
- .6 Medium-Density Fiberboard
 - .1 To ANSI A208.2, Grade MD.
 - .2 Made with binder containing no urea formaldehyde.
 - .3 Provide products made from not less than 80% recycled wood fibre.
- .7 Softwood Plywood
 - .1 Canadian softwood plywood (CSP) to CSA O151, standard construction or better.
 - .2 Made with adhesive containing no urea formaldehyde.
 - .3 Forestry Stewardship Council (FSC) certified.
- .8 Structural Composite Lumber
 - .1 Made from wood veneers with grain primarily parallel to member lengths, to Structural Glued-Laminated Timber CAN/CSA-O122 and manufactured with an exterior-type adhesive containing no urea formaldehyde.
- .9 Furring, Blocking, Shims, and Hanging Strips
 - .1 Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- .10 Anchors

- .1 Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
- .11 Adhesives, General
 - .1 Do not use adhesives that contain urea formaldehyde.
 - .2 VOC Limits for Installation Adhesives and Glues
 - .1 Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - .1 Wood Glues: 30 g/L.
 - .2 Contact Adhesive: 250 g/L.
- 2.2 FABRICATION, GENERAL**
 - .1 Interior Finish Carpentry Grade: Unless otherwise indicated, provide AWMAC Custom-grade.
 - .2 Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
 - .3 Back out or kerf backs of the following members except those with ends exposed in finished work:
 - .1 Interior standing and running trim except shoe and crown mouldings.
 - .2 Interior wood door frames.
- 2.3 STANDING AND RUNNING TRIM**
 - .1 Wood Species
 - .1 Refer to drawings for wood species.
 - .2 If drawings do not indicate wood species, provide maple for transparent finish.
 - .2 Sizes and Profiles
 - .1 Refer to drawings.
- 2.4 CLOTHES CLOSET SHELVING AND CLOTHES RODS**
 - .1 Wood Species
 - .1 Refer to drawings for wood species.
 - .2 If drawings do not indicate wood species, provide maple for transparent finish.
 - .2 Closet Shelving
 - .1 Refer to drawings.
 - .2 If drawings do not indicate requirements, provide 19 mm hardwood plywood with 19x64 mm hardwood nosing.
 - .3 Closet Shelf Bulkheads/Gable Ends

- .1 Refer to drawings.
- .2 If drawings do not indicate requirements, provide 19 mm hardwood plywood with hardwood edging.
- .4 Shelf Cleats
 - .1 Refer to drawings.
 - .2 If drawings do not indicate requirements, provide 19-by-114 mm boards, hardwood lumber trim for transparent finish.
- .5 Clothes Rods
 - .1 33 mm diameter, chrome-plated steel tubes.
- .6 Rod Flanges
 - .1 Chrome-plated steel or stainless steel.

2.5 INTERIOR WOOD FRAMES AND JAMBS

- .1 Wood Species
 - .1 Refer to drawings for wood species.
 - .2 If drawings do not indicate wood species, provide maple for transparent finish.
- .2 For frames or jambs wider than available lumber, use veneered construction. Do not glue for width.
- .3 Profiles
 - .1 Refer to drawings.
 - .2 If drawings do not describe interior frames and jambs, provide 19 mm thick frames and jambs, 38 mm wide mullions, and 9.5 x 38 mm applied wood stops and glazing beads.

2.6 INTERIOR WOOD STAIRS

- .1 Rough Carriages for Stairs
 - .1 Cut rough carriages from one of the following.
 - .1 Softwood Lumber, No. 1 grade or better.
 - .2 Structural composite lumber, Grade 1700Fb-1.3E; or better.
- .2 Treads
 - .1 Refer to drawings.
 - .2 If drawings do not indicate material, fabricate treads from 38 mm softwood lumber.
 - .3 Groove underside of risers to accept risers.
- .3 Risers
 - .1 Refer to drawings.
 - .2 If drawings do not indicate material, fabricate from 19 mm thick softwood plywood.
- .4 False Stringers

- .1 Refer to drawings.
- .2 If drawings do not indicate material, fabricate from 19 mm hardwood plywood. Finish exposed edges with hardwood lumber.

2.7 WOOD HAND RAILS

- .1 Wood Species
 - .1 Refer to drawings for wood species.
 - .2 If drawings do not indicate wood species, provide maple for transparent finish.
- .2 Interior Railings
 - .1 Solid or laminated lumber.
 - .2 Profile and Sizes
 - .1 Refer to drawings.
 - .2 If drawings do not describe interior railings, then provide 40 mm round hardwood railing.
 - .3 Joinery
 - .1 Refer to drawings.
 - .2 If drawings do not describe joinery, then join railings at changes in direction or elevation using mitred cuts and concealed draw bolts.

2.8 FLUSH WOOD PANELING AND WAINSCOTS

- .1 Wood Species and Cut::
 - .1 Refer to drawings.
 - .2 If drawings do not indicate, provide maple.
- .2 Panel-Matching Method: No matching between panels is required. Select and arrange panels for similarity of grain pattern and colour between adjacent panels.
- .3 Use largest practical sheets.

2.9 MISCELLANEOUS MATERIALS

- .1 Fasteners for Interior Finish Carpentry
 - .1 Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
- .2 Glue
 - .1 Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.
 - .2 Use wood glue that has a VOC content of 30 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- .3 Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is recommended for indicated use by adhesive manufacturer.
 - .1 Use adhesive that has a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

Part 3 EXECUTION

3.1 EXAMINATION

- .1 Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- .2 Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- .3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- .1 Clean substrates of projections and substances detrimental to application.
- .2 Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours.

3.3 INSTALLATION, GENERAL

- .1 Grade
 - .1 Install interior finish carpentry to comply with requirements for AWMAC Custom grade.
 - .2 Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
 - .3 Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - .1 Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - .2 Countersink fasteners, fill surface flush, and sand where face fastening is unavoidable.
 - .3 Install to tolerance of 3 mm in 2438 mm for level and plumb. Install adjoining interior finish carpentry with 0.8-mm maximum offset for flush installation and 1.5-mm maximum offset for reveal installation.
 - .4 Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.
 - .4 Preparation for Finishing
 - .1 Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for interior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

- .1 Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 610 mm long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout

length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.

- .1 Match colour and grain pattern of trim for transparent finish (stain or clear finish) across joints.
- .2 Install trim after gypsum board joint finishing operations are completed.
- .3 Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 CLOTHES CLOSET SHELVING AND CLOTHES ROD INSTALLATION

.1 Cleats

- .1 Cut shelf cleats at ends of shelves about 13 mm less than width of shelves and sand exposed ends smooth.
- .2 Install shelf cleats by fastening to framing or backing with finish nails or trim screws, set below face and filled. Space fasteners not more than 400 mm o.c. Use 2 fasteners at each framing member or fastener location for cleats 89 mm actual in width and wider.
 - .1 Apply a bead of multipurpose construction adhesive to back of shelf cleats right before installing. Remove adhesive that is squeezed out immediately after fastening shelf cleats in place.

.2 Shelves

- .1 Cut shelves to neatly fit openings with only enough gap to allow shelves to be removed and reinstalled. Install shelves, fully seated on cleats, brackets, and supports.
- .2 Fasten shelves to cleats with finish nails or trim screws, set flush.

.3 Bulkheads / Gable Ends

- .1 Refer to drawings.
- .2 If drawings do not show end supports for shelves or do not show intermediate supports for shelves longer than 1200 mm in length, then provide unsupported ends of shelves with gable ends and support shelves at 1200 mm o.c. with bulkheads that extend from the floor to the underside of the shelf, fabricated the same width as shelf and secured to the floor with continuous 19 x 19 hardwood cleats all sides.

.4 Rods

- .1 Install rod flanges for rods. Fasten to shelf cleats, framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors. Install rods in rod flanges.

3.6 INTERIOR WOOD FRAMES AND JAMBS

- .1 Install wood frames and jambs in accordance with the referenced quality standard.

3.7 INTERIOR WOOD STAIRS

- .1 False Stringers

- .1 Maintain 75 mm clearance from top edge of false stringer an imagery line running through the leading edge of stair nosings, unless otherwise noted.
 - .2 Secure false stringers flat against adjacent stairwell walls using counter sunk finishing nails in exposed locations.
 - .3 Use longest practical lengths for false stringers, with seams placed symmetrical along the full length of the flight of stairs.
 - .4 Extend false strings out at top and bottom of stairs level with floor a distance of 75 mm from the last nosing, unless otherwise noted.
- .2 Rough Carriages
 - .1 Securely anchor carriages through false stringers and into supporting substrates.
 - .2 Install intermediate rough carriages spaced at no greater than 900 mm o.c.
 - .3 General
 - .1 Glue and screw-fasten treads, risers, and carriage boards securely together to form strong and rigid assembly.
 - .2 Ensure riser and tread dimensions do not vary greater than 3 mm from adjacent treads and risers and not more than 6 mm between any treads and risers in any one flight of stairs.

3.8 WOOD HAND RAIL INSTALLATION

- .1 Railings
 - .1 Secure wall rails with metal brackets. Fasten freestanding railings to handrail brackets and to trim at walls with countersunk-head wood screws or rail bolts, and glue. Assemble railings at goosenecks, easements, and splices with rail bolts and glue.
 - .2 Space metal brackets within 300 mm of the end of handrails and of changes in direction, and intermediate brackets symmetrical spaced at no greater than 1200 mm.
 - .3 At turns in the handrail, ensure every segment of handrail is supported by a metal bracket.

3.9 FLUSH WOOD PANELLING AND WAINSCOTING

- .1 Anchor paneling to supporting substrate with concealed face fasteners laid out in a symmetrical pattern; unless otherwise indicated.
- .2 Install flush paneling with no more than 1.5 mm in 2400 mm vertical cup or bow and 3 mm in 2400 mm horizontal variation from a true plane.
- .3 Provide hardwood battens at all seams and hardwood cap moulding at all exposed edges; unless otherwise indicated.
- .4 Orient wood grain vertically and plumb.

3.10 ADJUSTING

- .1 Replace interior finish carpentry that is damaged or does not comply with requirements. Interior finish carpentry may be repaired or refinished if work complies with require-

ments and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.11 CLEANING

- .1 Clean interior finish carpentry on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.12 PROTECTION

- .1 Protect installed products from damage from weather and other causes during remainder of the construction period.
- .2 Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
 - .1 Indications that materials are wet or moisture damaged include, but are not limited to, discolouration, sagging, or irregular shape.
 - .2 Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discolouration.

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Glass-fibre blanket insulation.
- .2 Types of items you will not find described in this Section:
 - .1 Foam-plastic board insulation.
 - .2 Glass-fibre board insulation.
 - .3 Mineral-wool board insulation
 - .4 Mineral-wool blanket insulation. (Also known as “*Rockwool*”).
 - .5 Loose-fill insulation.
 - .6 Spray polyurethane foam insulation.
 - .7 Insulation installed in cavity walls and masonry cells.
 - .8 Air/Vapour barriers.
 - .9 Spray-foam sealant at window and door rough openings.
 - .10 Spray-applied cellulosic insulation.
 - .11 Cellular-glass insulation.
 - .12 “*Bag Insulation*” installed as part of Metal Building System.
 - .13 Insulation sandwich panels.
 - .14 Insulated drainage panels installed with waterproofing.
 - .15 Insulation specified as part of an exterior insulation finishing system.
 - .16 Insulation specified as part of roofing construction.
 - .17 Insulation installed as part of a perimeter fire-resistive joint system.
 - .18 Radiant barriers.
 - .19 Insulation for mechanical systems.

1.2 SUBMITTALS

- .1 Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

- .1 Surface-Burning Characteristics
 - .1 As determined by testing identical products according to CAN/ULC S102 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

Part 2 PRODUCTS

2.1 GLASS-FIBRE BLANKET INSULATION

- .1 Unfaced, Glass-Fibre Blanket Insulation
 - .1 To CAN/ULC-S702, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per CAN/ULC S102; passing CAN4 S114 for combustion characteristics.
- .2 Poly-encapsulated Un-faced, Glass-Fibre Blanket Insulation
 - .1 Same as unfaced, glass-fibre blanket insulation but wrapped air-tight in polyethylene plastic sheet.
- .3 Eave Ventilation Troughs
 - .1 Preformed, rigid fibreboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.
- .4 Environmental Requirements
 - .1 Provide insulation manufactured with 100 percent acrylic binders and no formaldehyde.
 - .2 Provide insulating materials with post-consumer recycled content constituting a minimum of 20% post-consumer recycled content plus 5% pre-consumer recycled content, consisting of a minimum of 25%.

Part 3 EXECUTION

3.1 PREPARATION

- .1 Clean substrates of substances that are harmful to insulation or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

- .1 Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- .2 Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- .3 Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- .4 Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

- .5 Keep insulation that is not rated as non-combustible construction a minimum of 75 mm from heat emitting devices and recessed light fixtures, and minimum 50 mm from side-walls of CAN/ULC-S604 chimneys and CSA-B149.1 and CSA-B149.2 type B and L vents.

3.3 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- .1 Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- .2 Glass-Fibre Blanket Insulation
 - .1 Install in cavities formed by framing members according to the following requirements:
 - .1 Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - .2 Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - .3 Fill cavities full of insulation, unless otherwise noted.
 - .4 Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
 - .5 For metal-framed wall cavities where cavity heights exceed 2438 mm, support unfaced blankets mechanically.
 - .6 For wood-framed construction, install blankets according to ASTM C 1320.

3.4 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

- .1 Where glass-fibre blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thicknesses indicated. Extend insulation 1219 mm up either side of partitions.

3.5 PROTECTION

- .1 Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Building wrap.
 - .2 Flexible flashing.
- .2 Types of items you will not find described in this Section:
 - .1 Asphalt-type Building paper.
 - .2 Sheathing joint and penetration treatment.
 - .3 Modified bituminous sheet air barriers.

1.2 ACTION SUBMITTALS

- .1 Product Data: For each type of product.
 - .1 For building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.

Part 2 PRODUCTS

2.1 WATER-RESISTIVE BARRIER

- .1 Building Wrap: ASTM E 1677, Type I air barrier; UV stabilized; and acceptable to authorities having jurisdiction.
 - .1 Water-Vapour Permeance: Not less than 150 g through 1 sq. m of surface in 24 hours per ASTM E 96/E 96M, Desiccant Method (Procedure A).
 - .2 Air Permeance: Not more than 0.02 L/s x sq. m at 75 Pa when tested according to ASTM E 2178.
 - .3 Allowable UV Exposure Time: Not less than three months.
- .2 Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.2 MISCELLANEOUS MATERIALS

- .1 Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 1.0 mm.
- .2 Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.
- .3 Nails and Staples: ASTM F 1667.

Part 3 EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

- .1 Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed.
- .2 Cover sheathing with water-resistive barrier as follows:
 - .1 Cut back barrier 13 mm on each side of the break in supporting members at expansion- or control-joint locations.
 - .2 Apply barrier to cover vertical flashing with a minimum 100-mm overlap unless otherwise indicated.
- .3 Building Wrap: Comply with manufacturer's written instructions.
 - .1 Seal seams, edges, fasteners, and penetrations with tape.
 - .2 Extend into jambs of openings and seal corners with tape.

3.2 FLEXIBLE FLASHING INSTALLATION

- .1 Apply flexible flashing where indicated to comply with manufacturer's written instructions.
 - .1 Prime substrates as recommended by flashing manufacturer.
 - .2 Lap seams and junctures with other materials at least 100 mm except that at flashing flanges of other construction, laps need not exceed flange width.
 - .3 Lap flashing over water-resistive barrier at bottom and sides of openings.
 - .4 Lap water-resistive barrier over flashing at heads of openings.
 - .5 After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Vapour-retarding, modified bituminous air barriers of the following types:
 - .1 Self-adhering.
 - .2 Thermofusible (torch grade)
 - .2 Spray-foam sealant.
- .2 Types of items not described in this Section:
 - .1 Embedded flashings in masonry.
 - .2 Weather barriers and building wraps.
 - .3 Roof air barriers.
 - .4 Fluid-applied membrane air barriers.
 - .5 Sheet metal flashings.
 - .6 Joint-sealant materials and installation.
- .3 Related Requirements
 - .1 Section 01 45 00 - *Quality Control*.
 - .2 Section 01 51 00 - *Temporary Utilities*.
 - .3 Section 01 61 00 - *Common Product Requirements*.
 - .4 Section 07 92 00 - *Joint Sealants*.

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.33-M89, Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction.

1.3 DEFINITIONS

- .1 Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 PERFORMANCE REQUIREMENTS

- .1 General: Air barrier shall be capable of performing as a continuous vapour-retarding air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

- .2 Air Barrier Assembly Air Leakage: Not to exceed 0.1 L/s x sq. m of surface area at 75 Pa; when tested to CAN/CGSB 149.15.

1.5 PRECONSTRUCTION TESTING

- .1 Mock-up Testing: Air barrier assemblies shall comply with performance requirements indicated, as evidenced by reports based on mock-up testing by a qualified testing agency.
 - .1 Contractor will engage a qualified testing agency.
 - .2 Quantitative Air Leakage Testing: Testing of the mock-up for air leakage will be conducted not to exceed the test pressure differential, positive and negative, indicated in Performance Requirements Article for air barrier assembly air leakage when tested according to CAN/CGSB 149.15.
 - .3 Notify Departmental Representative seven days in advance of the dates and times when mock-up testing will take place.

1.6 ACTION SUBMITTALS

- .1 Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of air barrier.
- .2 Inspection and Testing Procedures: Submit schedule and protocols for inspection and testing procedures, as prepared by the testing Agency, including frequency of tests and inspections and protocols for enhanced and more frequent tests and inspections if poor performance is detected.

1.7 INFORMATIONAL SUBMITTALS

- .1 Qualification Data: For testing agency.
- .2 Field quality-control reports.

1.8 QUALITY ASSURANCE

- .1 Testing Agency Qualifications: Agency independent of the Contractor, installer, and manufacturer who has a proven track record over a minimum of ten years and over 10 more projects at least 50% of this Project size, in performing inspections and testing of air barrier systems.
- .2 Product Compatibility: Use only products with known compatibility with adjacent products proposed, and in particular any torch or heat applied membranes applied or to be applied as part of the work of this Project.
- .3 Applicator Qualifications: A firm experienced in applying air barrier materials similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

- .4 Mock-ups: Before beginning installation of air barrier, build mock-ups of exterior wall assembly, 14 sq. m, incorporating backup wall construction, external cladding, window, door frame, and sill, insulation, and flashing to demonstrate surface preparation, crack and joint treatment, and sealing of gaps, terminations, and penetrations of air barrier membrane.
 - .1 Coordinate construction of mock-up to permit inspection by testing agency of air barrier before external insulation and cladding is installed.
 - .2 Include junction with roofing membrane, building corner condition, and foundation wall intersection.
 - .3 If Departmental Representative determines mock-ups do not comply with requirements, reconstruct mock-ups and apply air barrier until mock-ups are approved.
 - .4 Approved mock-ups may become part of the completed Work if undisturbed at time of Substantial Completion.
- .5 Preinstallation Conference: Conduct conference at Project site.
 - .1 Include installers of other construction connecting to air barrier, such as roofing, waterproofing, Architectural precast concrete, masonry, joint sealants, windows, glazed curtain walls, and door frames.
 - .2 Review air barrier requirements including surface preparation, substrate condition and pre-treatment, minimum substrate curing period, forecasted weather conditions, special details and sheet flashings, mock-ups, installation procedures, sequence of installation, testing and inspecting procedures, and protection and repairs.

1.9 DELIVERY, STORAGE, AND HANDLING

- .1 Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air barrier manufacturer.
- .2 Remove and replace liquid materials that cannot be applied within their stated shelf life.
- .3 Store rolls according to manufacturer's written instructions.
- .4 Protect stored materials from direct sunlight.
- .5 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .6 Develop Construction Waste Management Plan related to Work of this Section and Section 01 74 21 - Construction/Demolition Waste Management and Disposal

1.10 PROJECT CONDITIONS

- .1 Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air barrier manufacturer. Protect substrates from environ-

mental conditions that affect performance of air barrier. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

Part 2 PRODUCTS

2.1 SELF-ADHERING SHEET AIR BARRIER

- .1 Modified Bituminous Sheet: 1.0 mm thick, self-adhering sheet consisting of 0.9 mm of rubberized asphalt laminated to a 0.1 mm thick, polyethylene film with release liner on adhesive side.
 - .1 Physical and Performance Properties:
 - .1 Membrane Air Permeance: Not to exceed 0.02 L/s x sq. m of surface area at 75-Pa pressure difference; ASTM E 2178.
 - .2 Tensile Strength: 1.7 MPa minimum; ASTM D 412, Die C, modified.
 - .3 Ultimate Elongation: 200 percent minimum; ASTM D 412, Die C, modified.
 - .4 Low-Temperature Flexibility: Pass at minus 29 deg C; ASTM D 1970.
 - .5 Crack Cycling: Unaffected after 100cycles of 3 mm movement; ASTM C 836.
 - .6 Puncture Resistance: 180 N minimum; ASTM E 154.
 - .7 Water Absorption: 0.15 percent weight-gain maximum after 48-hour immersion at 21 deg C; ASTM D 570.
 - .8 Vapour Permeance: Maximum of 2.9 ng/Pa x s x sq. m; ASTM E 96, Water Method.

2.2 THERMOFUSIBLE SHEET AIR-BARRIER

- .1 Modified Bituminous Sheet: 2.5 mm thick, reinforced non-woven polyester reinforcement SBS modified bitumen membrane with thermofusible plastic film on both faces, having the following physical properties:
 - .1 Membrane Air Permeance: Not to exceed 0.02 L/s x sq. m of surface area at 75-Pa pressure difference; ASTM E 2178.
 - .2 Vapour permeance: Maximum of 0.2 ng/Pa.m².s, (0.003 perms),
 - .3 Low temperature flexibility: -15 deg. C to CGSB 37-GP-56M,
 - .4 Elongation: 40% md, 40% xd.

2.3 AUXILIARY MATERIALS

- .1 General: Auxiliary materials recommended by air barrier manufacturer for intended use and compatible with air barrier. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
- .2 Primer: Liquid primer recommended for substrate by manufacturer of air barrier material.

- .3 Counter-flashing Strip: modified bituminous sheet air barrier of type in accordance with the Schedule outlined below.
- .4 Termination Mastic: Cold fluid-applied elastomeric liquid; trowel grade.
- .5 Substrate Patching Membrane: Manufacturer's standard trowel-grade substrate filler.
- .6 Adhesive and Tape: Air barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.
- .7 Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.64 mm thick, and Series 300 stainless-steel fasteners.
- .8 Sprayed Polyurethane Foam Sealant: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 24 to 32 kg/cu. m density; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.
- .9 Modified Bituminous Transition Strip: Vapour-retarding, 1.0 mm thick, smooth-surfaced, self-adhering; consisting of 0.9 mm of rubberized asphalt laminated to a 0.1 mm thick polyethylene film with release liner backing.
- .10 Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low-modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Division 07 Section Joint Sealants.

Part 3 EXECUTION

3.1 EXAMINATION

- .1 Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.
 - .1 Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
 - .2 Verify that concrete has cured and aged for minimum time period recommended by air barrier manufacturer.
 - .3 Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
 - .4 Verify that masonry joints are flush and completely filled with mortar.
 - .5 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FIRE PRECAUTIONS – THERMOFUSIBLE SHEET

- .1 Prior to the start of work, conduct a site inspection to establish safe working practices and make sure all procedures and proposed changes are approved to minimize the risk of fires.

- .2 Fire Watch: At the end of each workday, use a heat detector gun to spot any smouldering or concealed fire. A minimum of one worker shall remain on site for a minimum of one hour after stop of thermofusible sheet application.
- .3 Never apply the torch directly to old and wood surfaces.
- .4 Throughout membrane installation, maintain a clean site and have one approved ABC fire extinguisher within 6 metres of each propane torch. Respect all safety measures described in technical data sheets. Torches must never be placed near combustible or flammable products. Torches should never be used where the flame is not visible or cannot be easily controlled.

3.3 SURFACE PREPARATION

- .1 Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.
- .2 Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- .3 Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- .4 Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.
- .5 Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- .6 Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.
 - .1 Install modified bituminous strips and center over treated construction and contraction joints and cracks exceeding a width of 1.6 mm.
- .7 Bridge and cover isolation joints, expansion joints and discontinuous deck-to-wall and deck-to-deck joints with overlapping modified bituminous strips.
- .8 At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
- .9 Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.4 INSTALLATION

- .1 Install modified bituminous sheets according to air barrier manufacturer's written instructions and according to recommendations in ASTM D 6135.

- .1 When ambient and substrate temperatures range between minus 4 and plus 5 deg C, install self-adhering, modified bituminous air barrier sheets produced for low-temperature application. Do not use low-temperature sheet if ambient or substrate temperature is higher than 16 deg C.
- .2 Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.
 - .1 Install modified bituminous strips centered over vertical inside corners. Install 19 mm fillets of termination mastic on horizontal inside corners.
- .3 Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations with termination mastic and according to ASTM D 6135.
- .4 Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Reprime areas exposed for more than 24 hours.
 - .1 Prime glass-fibre-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.
- .5 Apply and firmly adhere modified bituminous sheets horizontally over area to receive air barrier sheets. Accurately align sheets and maintain a uniform 64 mm minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure airtight installation.
 - .1 Apply sheets in a shingled manner to shed water without interception by any exposed sheet edges.
 - .2 Roll sheets firmly to enhance adhesion to substrate.
- .6 Apply continuous modified bituminous sheets over modified bituminous strips bridging substrate cracks, construction, and contraction joints.
- .7 CMU: Install air barrier sheet horizontally against the CMU beginning at base of wall. Align top edge of air barrier sheet immediately below protruding masonry ties or joint reinforcement or ties and firmly adhere in place.
 - .1 Overlap horizontally adjacent sheets a minimum of 50 mm and roll seams.
 - .2 Apply overlapping sheets with bottom edge slit to fit around masonry reinforcing or ties. Roll firmly into place.
 - .3 Seal around masonry reinforcing or ties and penetrations with termination mastic.
 - .4 Continue the membrane into all openings in the wall, such as doors, windows, and terminate at points to maintain an airtight barrier that will not be visible from interior.
- .8 Seal top of through-wall flashings to air barrier sheet with an additional 150 mm wide, modified bituminous strip.
- .9 Seal exposed edges of sheets at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

- .10 Install air barrier sheets and auxiliary materials to form a seal with adjacent construction and to maintain a continuous air barrier.
 - .1 Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
 - .2 Install modified bituminous strip on roofing membrane or base flashing so that a minimum of 75 mm of coverage is achieved over both substrates.
- .11 Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, concrete below-grade structures, floor-to floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings using accessory materials and according to manufacturer's tested assembly.
- .12 Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply modified bituminous transition strip so that a minimum of 75 mm of coverage is achieved over both substrates. Maintain 75 mm of full contact over firm bearing to perimeter frames with not less than 25 mm of full contact.
 - .1 Modified Bituminous Transition Strip: Roll firmly to enhance adhesion.
- .13 Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous penetrations of air barrier membrane with foam sealant.
- .14 At end or each working day, seal top edge of membrane to substrate with termination mastic.
- .15 Apply joint sealants forming part of air barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- .16 Repair punctures, voids, and deficient lapped seams in air barrier. Slit and flatten fishmouths and blisters. Patch with air barrier sheet extending 150 mm beyond repaired areas in all directions.
- .17 Do not cover air barrier until it has been tested and inspected by the testing agency.
- .18 Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.5 FIELD QUALITY CONTROL

- .1 Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.
- .2 Inspections: Inspect air barrier system for compliance with requirements. Confirm the following:
 - .1 The continuity of air barrier system has been achieved throughout the building envelope with no gaps or holes.

- .2 There is continuous structural support of air barrier system has been provided.
 - .3 Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
 - .4 Site conditions for application temperature and dryness of substrates have been maintained.
 - .5 Maximum exposure time of materials to UV deterioration has not been exceeded.
 - .6 Substrates have been properly primed.
 - .7 Laps in sheet materials have complied with the minimum requirements and have been shingled in the correct direction (or mastic applied on exposed edges), with no fishmouths.
 - .8 Termination mastic has been applied on cut edges.
 - .9 Air barrier has been firmly adhered to substrate.
 - .10 Compatible materials have been used.
 - .11 Transitions at changes in direction and structural support at gaps have been provided.
 - .12 Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation, and priming of surfaces, structural support, integrity, and continuity of seal.
 - .13 All penetrations have been sealed.
- .3 Tests: Perform tests, including:
- .1 Quantitative Air Leakage Testing: Testing not to exceed the test pressure differential, positive, and negative, indicated in Performance Requirements Article for air barrier assembly air leakage according to CAN/CGSB 149.15; or an approved alternate.
- .4 Remove and replace deficient air barrier components and retest as specified above.

3.6 CLEANING AND PROTECTION

- .1 Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
 - .1 Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace air barrier exposed to these conditions for more than 30 days.
 - .2 Protect air barrier from contact with creosote, uncured coal-tar products, TPO, EPDM, flexible PVC membranes, and sealants not approved by air barrier manufacturer.
- .2 Clean spills, stains, and soiling from adjacent construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

3.7 SCHEDULE

- .1 Install any one of the following sheet air barriers overtop of cast-in-place concrete and concrete masonry unit substrates:
 - .1 Thermofusible.
 - .2 Self-adhering.
- .2 Install self-adhering sheet air barriers over all other substrates.

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Polyethylene sheet vapour barriers and associated interfaces
 - .1 For application behind interior finish substrates of exterior walls and ceilings, and attached to wood, steel stud, and other similar framing..
 - .2 Spray-foam sealant at door and window rough openings.
- .2 Types of items you will not find described in this Section:
 - .1 Self-adhering, vapour-retarding, modified bituminous sheet air barriers.
 - .2 Torch-applied, vapour-retarding, modified bituminous sheet air barriers.
 - .3 Ground Cover.
 - .4 Performance criteria for air-tightness of building envelope.
 - .5 Vapour barriers incorporated into roofing systems.
 - .6 Weather barriers and building wraps.
- .3 Related Requirements
 - .1 Section 01 33 00 - *Submittal Procedures*.
 - .2 Section 01 74 21 - *Construction/Demolition Waste Management and Disposal*.
 - .3 Section 06 10 53 – *Miscellaneous Rough Carpentry*.

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.33-M89, Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction.
 - .2 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.

1.3 DEFINITIONS

- .1 Vapour Barrier: for the purposes of this specification Section the term Vapour Barrier is synonymous with Air Vapour Barrier and Air Barrier, and is intended to with an air tight barrier for the purposes of retarding vapour.

1.4 SUBMITTALS

- .1 Shop Drawings: Show locations and extent of vapour barrier. Include details for penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.

- .1 Submit applicable details taken from the Canadian Home Builders Association Builder's manual, latest edition. Augment with custom details to suit particular site conditions.
- .2 Include details of interfaces with other materials that form part of vapour barrier.
- .2 Submit Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS).

1.5 QUALITY ASSURANCE

- .1 Applicator Qualifications: A firm experienced in applying vapour barrier materials similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- .2 Mock-ups: Before beginning installation of vapour barrier, build mock-ups of exterior wall assembly, 14 sq. m incorporating backup wall construction, external cladding, window, door frame and sill, insulation, and flashing to demonstrate surface preparation, crack and joint treatment, and sealing of gaps, terminations, and penetrations of air barrier membrane.
 - .1 Coordinate construction of mock up to permit review by Departmental Representative.
 - .2 Include junction with roofing membrane, building corner condition, and foundation wall intersection.
 - .3 If Departmental Representative determines mock-ups do not comply with requirements, reconstruct mock-ups and apply vapour barrier until mock-ups are approved.
 - .4 Approved mock-ups may become part of the completed Work if undisturbed at time of Substantial Completion.
- .3 Preinstallation Conference: Conduct conference at Project site.
 - .1 Include installers of other construction connecting to vapour barrier, such as roofing, waterproofing, Architectural precast concrete, masonry, joint sealants, windows, glazed curtain walls, and door frames.
 - .2 Review vapour barrier requirements including surface preparation, substrate condition and pre-treatment, minimum substrate curing period, forecasted weather conditions, special details and sheet flashings, mock-ups, installation procedures, sequence of installation, testing and inspecting procedures, and protection and repairs.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Store rolls according to manufacturer's written instructions.
- .2 Protect stored materials from direct sunlight.
- .3 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 PRODUCTS

2.1 SHEET VAPOUR BARRIER

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

2.2 ACCESSORIES

- .1 Joint sealing tape: air resistant pressure sensitive adhesive tape, type recommended by vapour barrier manufacturer, 50 mm wide
- .2 Sealant: Acoustical sealant to CAN/CGSB-19-21.
- .3 Sprayed Polyurethane Foam Sealant: 1- or 2-component, foamed-in-place, polyurethane foam sealant, and 24 to 32 kg /cu. m density.
- .4 Staples: minimum 6 mm leg.
- .5 Moulded box vapour barrier: factory moulded polyethylene box for use with recessed electric switch and outlet device boxes.

Part 3 EXECUTION

3.1 EXAMINATION

- .1 Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.
 - .1 Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
 - .2 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- .1 Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.

3.3 INSTALLATION

- .1 Install vapour barrier and auxiliary materials to form a seal with adjacent construction and to maintain a continuous vapour barrier.
- .2 Install vapour barrier on warm side of exterior wall ceiling and floor assemblies prior to installation of to form continuous vapour barrier.
- .3 Use sheets of largest practical size to minimize joints.
- .4 Coordinate the installation of vapour barrier with installation of roofing membrane and base flashing to ensure continuity of vapour barrier with roofing membrane.

- .5 Connect and seal exterior wall vapour barrier membrane continuously to roofing membrane vapour barrier, concrete below-grade structures, floor-to floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings using accessory materials.
- .6 Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed.
- .7 Do not cover air barrier until notice has been given to Departmental Representative that the plastic sheet has been installed and 48 hours has elapsed.
- .8 Correct deficiencies in or remove vapour barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.4 WALL OPENINGS

- .1 Cut vapour barrier to suit rough stud openings for wall openings. Secure vapour barrier air tight to rough stud opening. Fill gaps in perimeter frame surfaces of windows, storefronts, doors, and miscellaneous penetrations of vapour barrier with foam sealant and acoustical sealant.

3.5 PERIMETER SEALS

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

3.6 LAP JOINT SEALS

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

3.7 ELECTRICAL BOXES

- .1 Seal electrical switch and outlet device boxes that penetrate vapour barrier as follows:
 - .1 Install moulded box vapour barrier.
 - .2 Apply sealant to seal edges of flange to main vapour barrier and seal wiring penetrations through box cover.

3.8 PENETRATIONS

- .1 Seal all other penetrations through vapour barrier in accordance with applicable details contained in the Canadian Home Builders Association Builder's Manual.

3.9 FIELD QUALITY CONTROL

- .1 Test sheet vapour barrier in accordance with Division 07 Section Air Barrier Testing and Verification.
- .2 Remove and replace deficient air barrier components and retest.

3.10 CLEANING AND PROTECTION

- .1 Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
 - .1 Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace vapour barrier exposed to these conditions for more than 30 days.
 - .2 Protect vapour barrier from contact with creosote, uncured coal-tar products, TPO, EPDM, and sealants not approved by air barrier manufacturer.
- .2 Clean spills, stains, and soiling from adjacent construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Asphalt shingles.
 - .2 Eave Protection / Self-adhering sheet underlayment.
 - .3 Ridge vents.
- .2 Types of items not described in this Section:
 - .1 Roof deck wood structural panels.
 - .2 Metal roof penetration flashings and counter flashings not part of this Section.

1.2 DEFINITIONS

- .1 Roofing Terminology: Refer to ASTM D 1079 and glossary of CRCA's CRCA Specification Manual for definitions of terms related to roofing work in this Section.

1.3 ACTION SUBMITTALS

- .1 Product Data: For each type of product indicated.
- .2 Samples for Initial Selection: For each type of asphalt shingle, ridge vent indicated.
- .3 Samples for Verification: For the following products, of sizes indicated, to verify colour selected.
 - .1 Asphalt Shingle: Full-size asphalt shingle strip.
 - .2 Ridge Vent: 300mm long Sample.

1.4 INFORMATIONAL SUBMITTALS

- .1 Warranties: Special warranties specified in this Section.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Store roofing materials in a dry, well-ventilated, weather tight location according to asphalt shingle manufacturer's written instructions. Store underlayment rolls on end on pallets or other raised surfaces. Do not double-stack rolls.
 - .1 Handle, store, and place roofing materials in a manner to avoid significant or permanent damage to roof deck or structural supporting members.
- .2 Protect unused underlayment from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.

1.6 PROJECT CONDITIONS

- .1 Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit asphalt shingle roofing to be performed according to manufacturer's written instructions and warranty requirements.
 - .1 Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended by manufacturer.

1.7 WARRANTY

- .1 Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace asphalt shingles that fail in materials or workmanship within specified warranty period. Materials failures include manufacturing defects and failure of asphalt shingles to self-seal after a reasonable time.
 - .1 Material Warranty Period: 25 years from date of Substantial Completion, prorated.
 - .2 Special Project Warranty: Roofing Installer's warranty, on warranty form at end of this Section, signed by roofing Installer, covering Work of this Section, in which roofing Installer agrees to repair or replace components of asphalt shingle roofing that fail in materials or workmanship within the following warranty period:
 - .1 Warranty Period: Two years from date of Substantial Completion.

1.8 EXTRA MATERIALS

- .1 Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - .1 Asphalt Shingles: 9.3 sq. m of each type, in unbroken bundles.

Part 2 PRODUCTS

2.1 GLASS-FIBRE-REINFORCED ASPHALT SHINGLES

- .1 Laminated-Strip Asphalt Shingles: CSA A123.5, laminated, multi-ply overlay construction, glass-fibre reinforced, mineral-granule surfaced, and self-sealing.
 - .1 Type: Three tab, regularly spaced, manufacturer's standard size; unless otherwise noted.
 - .2 Colour and Blends: Chosen from manufacturer's full range, unless otherwise noted.
- .2 Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.

2.2 EAVE PROTECTION / UNDERLAYMENT MATERIALS

- .1 Eave Protection / Underlayment: Self-adhering sheet underlayment (as known as Ice and Water Shield): ASTM D 1970, minimum of 1.4mm thick sheet; glass-fibre-mat-reinforced, SBS-modified asphalt; mineral-granule surfaced; with release paper backing; cold applied. Provide primer for adjoining concrete or masonry surfaces to receive underlayment.

2.3 RIDGE VENTS

- .1 Ridge Vent: Manufacturer's standard rigid section high-density polypropylene or other UV-stabilized plastic ridge vent with nonwoven geotextile filter strips and with external deflector baffles; for use under ridge shingles.
 - .1 No water infiltration when tested with 225 mm of rain at 110 mph; and no snow infiltration at 70 mph

2.4 ACCESSORIES

- .1 Asphalt Roofing Cement:
 - .1 Plastic cement: to CAN/CGSB-37.5-M89 Cutback Asphalt Plastic Cement.
 - .2 Lap cement: to CAN/CGSB-37.4-M89 Fibrated, Cutback Asphalt, Lap Cement for Asphalt Roofing.
- .2 Roofing Nails: CSA B111; aluminum, stainless-steel, copper, or hot-dip galvanized steel wire shingle nails, minimum 3mm diameter, barbed or smooth shank, sharp-pointed, with a minimum 9.5mm diameter flat head and of sufficient length to penetrate 19 mm into solid wood decking or extend at least 3 mm through OSB or plywood sheathing.
 - .1 Where nails are in contact with metal flashing, use nails made from same metal as flashing.

2.5 METAL FLASHING AND TRIM

- .1 Sheet Metal Flashing and Trim: Comply with requirements in Division 07 Section Sheet Metal Flashing and Trim.
 - .1 Sheet Metal: Prepainted, metallic-coated steel.
 - .1 Colour: Chosen from manufacturer's full range, unless otherwise noted.
 - .2 Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's Architectural Sheet Metal Manual that apply to design, dimensions, metal, and other characteristics of item.
 - .1 Step Flashings: Fabricate with a headlap of 50 mm and a minimum extension of 125 mm over the underlying asphalt shingle and up the vertical surface.
 - .2 Cricket Flashings: Fabricate with concealed flange extending a minimum of 600 mm beneath upslope asphalt shingles and 150 mm beyond each side of chimneys and skylights and 150 mm above the roof plane.
 - .3 Open Valley Flashings: Fabricate in lengths not exceeding 3 m with 25mm high inverted-V profile at center of valley and equal flange widths of 300 mm.
 - .4 Drip Edges: Fabricate in lengths not exceeding 3 m with 50 mm roof deck flange and 38 mm fascia flange with 9.6- mm drip at lower edge.
- .3 Vent Stack Flashing: Metal flashing sleeve, with integral deck flange, uninsulated, and as follows:
 - .1 Metal: Aluminum sheet, 1.6 mm thick, mill finished.
 - .2 Height: 330 mm.
 - .3 Diameter: to suit vent pipe.

Part 3 EXECUTION

3.1 EXAMINATION

- .1 Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
 - .1 Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
 - .2 Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provision has been made for flashings and penetrations through asphalt shingles.
 - .3 For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
- .2 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- .1 Single-Layer Felt Underlayment: Install single layer of felt underlayment on roof deck perpendicular to roof slope in parallel courses. Lap sides a minimum of 50 mm over underlying course. Lap ends a minimum of 100 mm. Stagger end laps between succeeding courses at least 1830 mm. Fasten with felt underlayment nails.
 - .1 Install felt underlayment on roof deck not covered by self-adhering sheet underlayment. Lap sides of felt over self-adhering sheet underlayment not less than 75 mm in direction to shed water. Lap ends of felt not less than 150 mm over self-adhering sheet underlayment.
- .2 Self-Adhering Sheet Underlayment: Install in accordance with CAN3-A123.51-M85 (R1992) Asphalt Shingle Application on Roof Slopes 1:3 and Steeper except where specified otherwise. Install self-adhering sheet underlayment, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install at locations indicated below and in locations shown on Drawings, lapped in direction to shed water. Lap sides not less than 89 mm. Lap ends not less than 150 mm staggered 600 mm between courses. Roll laps with roller. Cover underlayment within seven days. Prime concrete and masonry surfaces to receive self-adhering sheet underlayment.
 - .1 Eaves: Extend from edges of eaves 914 mm beyond interior face of exterior wall.
 - .2 Rakes: Extend from edges of rake 914 mm beyond interior face of exterior wall.
 - .3 Valleys: Extend from lowest to highest point 450 mm on each side.
 - .4 Hips: Extend 450 mm on each side.
 - .5 Ridges: Extend 914 mm on each side without obstructing continuous ridge vent slot.
 - .6 Sidewalls: Extend beyond sidewall 450 mm and return vertically against sidewall not less than 450 mm.
 - .7 Dormers, Chimneys, Skylights, and other Roof-Penetrating Elements: Extend beyond penetrating element 450 mm and return vertically against penetrating element not less than 450 mm.

- .8 Roof Slope Transitions: Extend 450 mm on each roof slope.
- .9 On roof with slope of 6:12 or lower: over entire roof.
- .3 Metal-Flashed Open Valley Underlayment: Install two layers of 914mm wide felt underlayment centered in valley. Stagger end laps between layers at least 1830 mm. Lap ends of each layer at least 300 mm in direction to shed water, and seal with asphalt roofing cement. Fasten each layer to roof deck with felt underlayment nails.
 - .1 Lap roof deck felt underlayment over first layer of valley felt underlayment at least 150 mm.

3.3 METAL FLASHING INSTALLATION

- .1 General: Install metal flashings and other sheet metal to comply with requirements in Division 07 Section Sheet Metal Flashing and Trim.
 - .1 Install metal flashings according to recommendations in CRCA's CRCA Specification Manual.
- .2 Step Flashings: Install with a headlap of 50 mm and extend over the underlying asphalt shingle and up the vertical surface. Fasten to roof deck only.
- .3 Cricket Flashings: Install against the roof-penetrating element extending concealed flange beneath upslope asphalt shingles and beyond each side.
- .4 Open Valley Flashings: Install centrally in valleys, lapping ends at least 200 mm in direction to shed water. Fasten upper end of each length to roof deck beneath overlap.
 - .1 Secure hemmed flange edges into metal cleats spaced 300 mm apart and fastened to roof deck.
 - .2 Adhere 225 mm wide strip of self-adhering sheet to metal flanges and to self-adhering sheet underlayment.
- .5 Rake Drip Edges: Install rake drip edge flashings over underlayment and fasten to roof deck.
- .6 Eave Drip Edges: Install eave drip edge flashings below underlayment and fasten to roof sheathing.
- .7 Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

3.4 ASPHALT SHINGLE INSTALLATION

- .1 Install asphalt shingles according to manufacturer's written instructions, CAN3-A123.51, and asphalt shingle recommendations in CRCA's CRCA Specification Manual.
- .2 Install asphalt shingles on roof slopes 1:3 and steeper in accordance with CAN3-A123.51 supplemented as follows:
 - .1 Install shingles using nails.
 - .2 Seal down shingles with a 25 mm spot of asphalt cement under the centre of each tab.

- .3 Use inverted shingles as starter strip material.
- .4 Closed-Cut Valleys: Extend asphalt shingle strips from one side of valley 457 mm beyond center of valley. Use one-piece shingle strips without joints in the valley. Fasten with extra nail in upper end of shingle. Install asphalt shingle courses from other side of valley and cut back to a straight line 50 mm short of valley centerline. Trim upper concealed corners of cut-back shingle strips.
 - .1 Do not nail asphalt shingles within 150 mm of valley center.
 - .2 Set trimmed, concealed-corner asphalt shingles in a 75 mm wide bed of asphalt roofing cement.
- .5 Ridge and Hip Cap Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.
- .3 Install starter strip along lowest roof edge, consisting of an asphalt shingle strip 175 mm wide with self-sealing strip face up at roof edge.
 - .1 Extend asphalt shingles 13 mm over fascia at eaves and rakes.
 - .2 Install starter strip along rake edge.
- .4 Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
- .5 Fasten asphalt shingle strips with a minimum of six roofing nails located according to manufacturer's written instructions.
 - .1 Seal asphalt shingles with asphalt roofing cement spots.
- .6 Closed-Cut Valleys: Extend asphalt shingle strips from one side of valley 300 mm beyond center of valley. Use one-piece shingle strips without joints in the valley. Fasten with extra nail in upper end of shingle. Install asphalt shingle courses from other side of valley and cut back to a straight line 50 mm short of valley centerline. Trim upper concealed corners of cut-back shingle strips.
 - .1 Do not nail asphalt shingles within 150 mm of valley center.
 - .2 Set trimmed, concealed-corner asphalt shingles in a 75 mm wide bed of asphalt roofing cement.
- .7 Ridge Vents: Install continuous ridge vents over asphalt shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.
- .8 Ridge and Hip Cap Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.
 - .1 Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

3.5 ROOFING INSTALLER'S WARRANTY SAMPLE

- .1 WHEREAS <Insert name> of <Insert address>, herein called the Roofing Installer, has performed roofing and associated work (work) on the following project:

- .1 Owner: <Insert name of Owner.>
 - .2 Address: <Insert address.>
 - .3 Building Name/Type: <Insert information.>
 - .4 Address: <Insert address.>
 - .5 Area of Work: <Insert information.>
 - .6 Acceptance Date: <Insert date.>
 - .7 Warranty Period: <Insert time.>
 - .8 Expiration Date: <Insert date.>
- .2 AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- .3 NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.
- .4 This Warranty is made subject to the following terms and conditions:
- .1 Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
 - .1 lightning;
 - .2 fire;
 - .3 failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - .4 faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - .5 vapor condensation on bottom of roofing; and
 - .6 activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
 - .2 When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
 - .3 Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
 - .4 During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become

null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.

- .5 During Warranty Period, if original use of roof is changed, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
- .6 Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
- .7 This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

.5 IN WITNESS THEREOF, this instrument has been duly executed this <Insert day> day of <Insert month>, <Insert year>.

- .1 Authorized Signature: <Insert signature.>
- .2 Name: <Insert name.>
- .3 Title: <Insert title.>

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Formed Products:
 - .1 Formed roof drainage sheet metal fabrications.
 - .2 Formed low-slope roof sheet metal fabrications.
 - .3 Formed steep-slope roof sheet metal fabrications.
 - .4 Formed wall sheet metal fabrications.
 - .5 Formed equipment support flashing.
 - .6 Formed overhead-piping safety pans.
 - .7 Gutters with girths not greater than 380 mm; and Schedule 80 downspouts.
 - .2 Types of items you will not find described in this Section:
 - .1 Manufactured Products:
 - .1 Manufactured through-wall flashing and counterflashing.
 - .2 Manufactured reglets and counterflashing.
 - .2 Gutters with girth greater than 380 mm.
 - .3 Downspouts fabricated from sheet metal.
 - .4 Downspout tie-in to weeping tile system.
 - .5 Built-in gutters.
 - .6 Wood nailers, curbs, and blocking.
 - .7 Installing sheet metal flashing and trim integral with roofing.
 - .8 Sheet metal flashing and trim integral with metal wall panels.
 - .9 Manufactured roof specialties not part of sheet metal flashing and trim.
 - .10 Set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
 - .11 Manufactured sheet metal expansion-joint covers.
 - .3 Related Requirements:
 - .1 Section 06 10 53 - Miscellaneous Rough Carpentry for wood nailers, curbs, and blocking.
 - .2 Section 07 72 00 - Roof Accessories for set-on-type curbs, equipment supports, vents, and other manufactured roof accessory units.

1.2 REFERENCES

- .1 The Aluminum Association Inc. (AAI)
 - .1 AAI-Aluminum Sheet Metal Work in Building Construction-2002.

- .2 AAI DAF45-03, Designation System for Aluminum Finishes.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A167-99(2004), Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - .2 ASTM A240/A240M-07e1, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - .3 ASTM A606-04, Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance.
 - .4 ASTM A653/A653M-07, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .5 ASTM A792/A792M-06a, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - .6 ASTM B32-04, Standard Specification for Solder Metal.
 - .7 ASTM B370-03, Standard Specification for Copper Sheet and Strip for Building Construction.
 - .8 ASTM D523-89(1999), Standard Test Method for Specular Gloss.
 - .9 ASTM D822-01(2006), Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
- .3 Canadian Roofing Contractors Association (CRCA)
 - .1 Roofing Specifications Manual 1997.
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
 - .2 CAN/CGSB-93.1-M85, Sheet Aluminum Alloy, Prefinished, Residential.
- .5 Canadian Standards Association (CSA International)
 - .1 CSA A123.3-05, Asphalt Saturated Organic Roofing Felt.
 - .2 AAMA/WDMA/CSA 101/I.S.2/A440-2008, Standard/Specification for Windows, Doors, and Unit Skylights.
 - .3 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
- .6 Green Seal Environmental Standards
 - .1 Standard GS-03-93, Anti-Corrosive Paints.
 - .2 Standard GS-11-97, Architectural Paints.
 - .3 Standard GS-36-00, Commercial Adhesives.
- .7 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .8 South Coast Air Quality Management District (SCAQMD), California State

- .1 SCAQMD Rule #1113-04, Architectural Coatings.
- .2 SCAQMD Rule #1168-05, Adhesives and Sealants.

1.3 PERFORMANCE REQUIREMENTS

- .1 General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- .2 Fabricate and install roof edge flashing and copings capable of resisting forces according to recommendations in FMG Loss Prevention Data Sheet 1-49.
- .3 Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.
 - .1 Temperature Change (Range): 67 deg C, ambient; 100 deg C, material surfaces.

1.4 ACTION SUBMITTALS

- .1 Samples for Initial Selection: For each type of sheet metal flashing, trim, and accessory indicated with factory-applied colour finishes involving colour selection.

1.5 QUALITY ASSURANCE

- .1 Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
- .2 Sheet Metal Flashing and Trim Standard: Comply with SMACNA's Architectural Sheet Metal Manual unless more stringent requirements are specified or shown on Drawings.
- .3 Mock-ups: Build mock-ups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - .1 Build mock-up of typical roof eave, including any built-in gutter, fascia, fascia trim, apron flashing, and other trims specified or required approximately 3.0 m long, including supporting construction cleats, seams, attachments, underlayment, and accessories.
 - .2 Approval of mock-ups does not constitute approval of deviations from the Contract Documents contained in mockups unless Departmental Representative specifically approves such deviations in writing.
 - .3 Approved mock-ups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .2 Materials and Resources Credit and MRC2.2 Construction Waste Management: Divert 75% From Landfill: prepare Construction Waste Management plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 PRODUCTS

2.1 SHEET METALS

- .1 General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
- .2 Aluminum Sheet: (ASTM B 209M), alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.
 - .1 Surface: Smooth, flat.
 - .2 Exposed Coil-Coated Finishes, unless otherwise noted:
 - .1 Three-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both colour coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - .2 Colours: If not otherwise indicated then selected by Departmental Representative from full range of industry colours.
 - .3 Concealed Finish: Pretreat with manufacturer's standard white or light-coloured acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.013 mm.
- .3 Metallic-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - .1 Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, Z275 coating designation; structural quality.
 - .2 Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZM150 coating designation, Grade 275; structural quality.
 - .3 Surface: Smooth, flat.
 - .4 Exposed Coil-Coated Finish, unless otherwise noted:

- .1 Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both colour coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
- .2 Colours: If not otherwise indicated then selected by Departmental Representative from full range of industry colours.
- .5 Concealed Finish: Pretreat with manufacturer's standard white or light-coloured acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.013 mm.
- .4 Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed.
 - .1 Finish: 2D (dull, cold rolled).
 - .2 Surface: Smooth, flat.
 - .3 Locations: use only in locations where not exposed to view; or in locations where no other material option is permitted.

2.2 UNDERLAYMENT MATERIALS

- .1 Self-Adhering, High-Temperature Sheet: Minimum 0.76 to 1.0 mm thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 - .1 Thermal Stability: ASTM D 1970; stable after testing at 116 deg C.
 - .2 Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 29 deg C.
- .2 Slip Sheet: Building paper, 0.16-kg/sq. m minimum, rosin sized.

2.3 MISCELLANEOUS MATERIALS

- .1 General: Provide materials and types of fasteners, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal unless otherwise indicated.
- .2 Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.
 - .1 General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - .1 Exposed Fasteners: Heads matching colour of sheet metal using plastic caps or factory-applied coating.
 - .2 Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

- .3 Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
- .2 Fasteners for Zinc-Coated (Galvanized) and aluminum-Zinc Alloy-Coated Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.
- .3 Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 13 mm wide and 3 mm thick.
- .4 Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- .5 Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- .6 Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 FABRICATION, GENERAL

- .1 General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's *Architectural Sheet Metal Manual* that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
 - .1 Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 - .2 Obtain field measurements for accurate fit before shop fabrication.
 - .3 Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
 - .4 Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.
- .2 Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 6 mm in 6 m on slope and location lines as indicated and within 3 mm offset of adjoining faces and of alignment of matching profiles.
- .3 Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.
- .4 Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 25 mm deep, filled with butyl sealant concealed within joints.

- .5 Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- .6 Fabricate cleats and attachment devices of sizes as recommended by SMACNA's Architectural Sheet Metal Manual and by FMG Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.
- .7 Seams: Fabricate non-moving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
- .8 Do not use graphite pencils to mark metal surfaces.

2.5 ROOF DRAINAGE SHEET METAL FABRICATIONS

- .1 Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 2400 mm long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters.
 - .1 Gutter Style: profile as selected by Departmental Representative from manufacturer's full range.
 - .2 Expansion Joints: Butt type with cover plate.
 - .3 Accessories:
 - .1 Continuous removable leaf screen with sheet metal frame and hardware cloth screen.
 - .2 Wire ball downspout strainer.
 - .3 Valley baffles.
 - .4 Gutters with Girth up to 380 mm: Fabricate from any one of following materials, unless otherwise indicated:
 - .1 Galvanized Steel: 1.32 mm thick.
 - .2 Aluminum-Zinc Alloy-Coated Steel: 1.32 mm
- .2 Downspouts: Schedule 80 galvanized steel pipe, 100 mm diameter unless noted otherwise. Furnish with galvanized metal bolt anchors.
- .3 Parapet Scuppers: Fabricate scuppers of dimensions required with closure flange trim to exterior, 100 mm wide wall flanges to interior, and base extending 100 mm beyond cant or tapered strip into field of roof. Fabricate from one of the following materials unless otherwise noted:
 - .1 Galvanized Steel: 0.028 inch 1.32 mm thick.
 - .2 Aluminum-Zinc Alloy-Coated Steel: 0.028 inch 1.32 mm thick.

- .4 Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape indicated complete with outlet tubes, exterior flange trim,. Fabricate from one of the following materials unless otherwise noted:
 - .1 Galvanized Steel: 0.028 inch 1.32 mm thick.
 - .2 Aluminum-Zinc Alloy-Coated Steel: 0.028 inch 1.32 mm thick.
- .5 Splash Pans: Fabricate from the following materials:
 - .1 Aluminum: 1.02 mm thick.
 - .2 Stainless Steel: 0.48 mm thick.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- .1 Roof-Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 2400 mm long, but not exceeding 3 m long, sections. Furnish with 150 mm wide, joint cover plates.
 - .1 Joint Style: Butt, with 300 mm wide, concealed backup plate Butt, with 300 mm wide, concealed backup plate and 150 mm wide, exposed cover plates.
 - .2 Fabricate from any one of the following materials, unless otherwise noted:
 - .1 Aluminum: 1.27 mm thick.
 - .2 Galvanized Steel: 0.71 mm thick.
 - .3 Aluminum-Zinc Alloy-Coated Steel: 0.71 mm thick.
- .2 Copings: Fabricate in minimum 2400 mm long, but not exceeding 3 m long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Mitre corners, seal, and solder or weld watertight.
 - .1 Coping Profile: as indicated.
 - .2 Joint Style: Butt, with 300 mm wide, concealed backup plate.
 - .3 Fabricate from one of the following materials unless otherwise noted:
 - .1 Aluminum: 1.27 mm thick.
 - .2 Galvanized Steel: 1.02 mm thick.
 - .3 Aluminum-Zinc Alloy-Coated Steel: 1.02 mm thick.
- .3 Roof, Roof to Wall Transition, Roof to Roof Edge Flashing (Gravel Stop) Transition, Roof to Roof Edge Flashing (Gravel Stop) and Fascia Cap Transition, and Expansion-Joint Cover: Fabricate from any one of following materials unless otherwise noted:
 - .1 Aluminum: 1.27 mm thick.
 - .2 Galvanized Steel: 0.86 mm thick.
 - .3 Aluminum-Zinc Alloy-Coated Steel: 0.86 mm thick.
- .4 Base Flashing: Fabricate from any one of following materials unless otherwise noted:
 - .1 Aluminum: 1.02 mm thick.
 - .2 Galvanized Steel: 0.71 mm thick.
 - .3 Aluminum-Zinc Alloy-Coated Steel: 0.71 mm thick.

- .5 Counterflashing: Fabricate from any one of following materials unless otherwise noted:
 - .1 Aluminum: 0.81 mm thick.
 - .2 Galvanized Steel: 0.56 mm thick.
 - .3 Aluminum-Zinc Alloy-Coated Steel: 0.56 mm thick.
- .6 Flashing Receivers: Fabricate from any one of following materials unless otherwise noted:
 - .1 Aluminum: 0.81 mm thick.
 - .2 Galvanized Steel: 0.56 mm thick.
 - .3 Aluminum-Zinc Alloy-Coated Steel: 0.56 mm thick.
- .7 Roof-Penetration Flashing: Fabricate from any one of following materials unless otherwise noted:
 - .1 Galvanized Steel: 0.71 mm thick.
 - .2 Aluminum-Zinc Alloy-Coated Steel: 0.71 mm thick.
- .8 Roof-Drain Flashing: Fabricate from any one of following materials unless otherwise noted:
 - .1 Stainless Steel: 0.40 mm thick.

2.7 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

- .1 Apron, Step, Cricket, and Backer Flashing: Fabricate from any one of following materials unless otherwise noted:
 - .1 Aluminum: 0.81 mm thick.
 - .2 Galvanized Steel: 0.56 mm thick.
 - .3 Aluminum-Zinc Alloy-Coated Steel: 0.56 mm thick.
- .2 Valley Flashing: Fabricate from any one of following materials unless otherwise noted:
 - .1 Galvanized Steel: 0.71 mm thick.
 - .2 Aluminum-Zinc Alloy-Coated Steel: 0.71 mm thick.
- .3 Drip Edges: Fabricate from any one of following materials unless otherwise noted:
 - .1 Aluminum: 0.81 mm thick.
 - .2 Stainless Steel: 0.40 mm thick.
 - .3 Galvanized Steel: 0.56 mm thick.
 - .4 Aluminum-Zinc Alloy-Coated Steel: 0.56 mm thick.
- .4 Eave, Rake, Ridge, and Hip Flashing: Fabricate from any one of following materials unless otherwise noted:
 - .1 Aluminum: 0.81 mm thick.
 - .2 Galvanized Steel: 0.56 mm thick.
 - .3 Aluminum-Zinc Alloy-Coated Steel: 0.56 mm thick.

- .5 Counterflashing: Fabricate from any one of following materials unless otherwise noted:
 - .1 Aluminum: 0.81 mm thick.
 - .2 Galvanized Steel: 0.56 mm thick.
 - .3 Aluminum-Zinc Alloy-Coated Steel: 0.56 mm thick.
- .6 Flashing Receivers: Fabricate from any one of following materials unless otherwise noted:
 - .1 Aluminum: 0.81 mm thick.
 - .2 Galvanized Steel: 0.56 mm thick.
 - .3 Aluminum-Zinc Alloy-Coated Steel: 0.56 mm thick.
- .7 Roof-Penetration Flashing: Fabricate from any one of following materials unless otherwise noted:
 - .1 Stainless Steel: 0.48 mm thick.
 - .2 Galvanized Steel: 0.71 mm thick.
 - .3 Aluminum-Zinc Alloy-Coated Steel: 0.71 mm thick.

2.8 WALL SHEET METAL FABRICATIONS

- .1 Through-Wall Flashing: Fabricate continuous flashings in minimum 2400 mm long, but not exceeding 3.6 m long, sections, under copings, at shelf angles, and where indicated. Fabricate discontinuous lintel, sill, and similar flashings to extend 150 mm beyond each side of wall openings. Form with 50 mm high, end dams where flashing is discontinuous. Fabricate from any one of the following materials, unless otherwise noted:
 - .1 Stainless Steel: 0.40 mm thick.
- .2 Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 100 mm beyond wall openings, unless otherwise noted. Form head and sill flashing with 50 mm high, end dams. Fabricate from any one of the following materials, unless otherwise noted:
 - .1 Aluminum: 0.81 mm thick.
 - .2 Stainless Steel: 0.40 mm thick.
 - .3 Galvanized Steel: 0.56 mm thick.
 - .4 Aluminum-Zinc Alloy-Coated Steel: 0.56 mm thick.
- .3 Wall Expansion-Joint Cover: Fabricate from any one following materials, unless otherwise noted:
 - .1 Aluminum: 1.02 mm thick.
 - .2 Stainless Steel: 0.48 mm thick.
 - .3 Galvanized Steel: 0.71 mm thick.
 - .4 Aluminum-Zinc Alloy-Coated Steel: 0.71 mm thick.

2.9 MISCELLANEOUS SHEET METAL FABRICATIONS

- .1 Equipment Support Flashing: Fabricate from any one of the following materials, unless otherwise noted:
 - .1 Stainless Steel: 0.48 mm thick.
 - .2 Galvanized Steel: 0.71 mm thick.
 - .3 Aluminum-Zinc Alloy-Coated Steel: 0.71 mm thick.
- .2 Overhead-Piping Safety Pans: Fabricate from any one of the following materials, unless otherwise noted:
 - .1 Stainless Steel: 0.64 mm thick.
 - .2 Galvanized Steel: 1.02 mm thick.
 - .3 Aluminum-Zinc Alloy-Coated Steel: 1.02 mm thick.

Part 3 EXECUTION

3.1 EXAMINATION

- .1 Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
 - .1 Verify compliance with requirements for installation tolerances of substrates.
 - .2 Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- .2 For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- .3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- .1 General: Install underlayment as indicated on Drawings.
- .2 Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 150 mm staggered 600 mm between courses. Overlap side edges not less than 90 mm. Roll laps with roller. Cover underlayment within 14 days.

3.3 INSTALLATION, GENERAL

- .1 General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

- .1 Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 - .2 Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 - .3 Space cleats not more than 300 mm apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
 - .4 Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
 - .5 Install sealant tape where indicated and where needed.
 - .6 Torch cutting of sheet metal flashing and trim is not permitted.
 - .7 Do not use graphite pencils to mark metal surfaces.
- .2 Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
- .1 Coat back side of uncoated aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
 - .2 Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet.
- .3 Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 3 m with no joints allowed within 600 mm of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 25 mm deep, filled with sealant concealed within joints.
- .4 Fastener Sizes: Use fasteners of sizes that will penetrate wood sheathing not less than 32 mm for nails and not less than 19 mm for wood screws, metal decking not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- .5 Seal joints as shown and as required for watertight construction.
- .1 Where sealant-filled joints are used, embed hooked flanges of joint members not less than 25 mm into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 4 and 21 deg C, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 4 deg C.
 - .2 Prepare joints and apply sealants to comply with requirements in Division 07 Section *Joint Sealants*.
- .6 Rivets: Rivet joints in uncoated aluminum where indicated and where necessary for strength.

3.4 ROOF DRAINAGE SYSTEM INSTALLATION

- .1 General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.
- .2 Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored gutter brackets spaced not more than 900 mm apart. Provide end closures and seal watertight with sealant. Slope to downspouts.
 - .1 Fasten gutter spacers to front and back of gutter.
 - .2 Loosely lock straps to front gutter bead and anchor to roof deck.
 - .3 Anchor gutter with spikes and ferrules spaced not more than 600 mm apart.
 - .4 Install gutter with expansion joints at locations indicated, but not exceeding, 15.24 m apart. Install expansion-joint caps.
 - .5 Install continuous gutter screens on gutters with noncorrosive fasteners, removable for cleaning gutters.
- .3 Downspouts: Join sections with galvanized pipe fittings.
 - .1 Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 1500 mm o.c. in between.
 - .2 Provide elbows at base of downspout to direct water away from building.
 - .3 Connect downspouts to underground drainage system if and where indicated.
- .4 Splash Pans: Install where downspouts discharge on low-slope roofs. Set in elastomeric sealant compatible with roofing membrane.
- .5 Parapet Scuppers: Install scuppers where indicated through parapet. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
 - .1 Anchor scupper closure trim flange to exterior wall and seal with elastomeric sealant to scupper.
 - .2 Loosely lock front edge of scupper with conductor head.
 - .3 Seal with elastomeric sealant exterior wall scupper flanges into back of conductor head.
- .6 Conductor Heads: Anchor securely to wall with elevation of conductor head rim 25 mm below scupper and gutter discharge.
- .7 Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints a minimum of 100 mm in direction of water flow.

3.5 ROOF FLASHING INSTALLATION

- .1 General: Install sheet metal flashing and trim to comply with performance requirements and SMACNA's *Architectural Sheet Metal Manual*. Provide concealed fasteners where

possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

- .2 Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at 400 mm centers.
- .3 Copings: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for applicable wind zone and as indicated.
 - .1 Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 400 mm centers.
 - .2 Anchor interior leg of coping with screw fasteners and washers at 500 mm centers.
- .4 Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 100 mm over base flashing. Install stainless-steel draw band and tighten.
- .5 Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 100 mm over base flashing. Lap counterflashing joints a minimum of 100 mm and bed with sealant. Secure in a waterproof manner by means of anchor and washer at 900 mm centers.
- .6 Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.6 WALL FLASHING INSTALLATION

- .1 General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- .2 Through-Wall Flashing: Installation of through-wall flashing is specified in Division 04 Section Unit Masonry and Stone Masonry.
- .3 Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 100 mm beyond wall openings unless otherwise indicated.

3.7 MISCELLANEOUS FLASHING INSTALLATION

- .1 Overhead-Piping Safety Pans: Suspend pans independent from structure above as indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.

- .2 Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.8 ERECTION TOLERANCES

- .1 Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 6 mm in 6 m on slope and location lines as indicated and within 3 mm offset of adjoining faces and of alignment of matching profiles.

3.9 CLEANING AND PROTECTION

- .1 Clean off excess sealants.
- .2 Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.
- .3 Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Preformed flashing sleeves.
 - .2 Prefabricated curb & penetration flashing system
 - .3 Pipe supports.
- .2 Related Work:
 - .1 Section 07 31 13 – *Asphalt Shingles* for roofing assemblies.
 - .2 Section 07 62 00 – *Sheet Metal Flashing and Trim* for metal roof flashings and counterflashings.
 - .3 Section 01 33 00 – *Submittal Procedures*.
 - .4 Section 01 74 21 – *Construction/Demolition Waste Management and Disposal*.
 - .5 Mechanical and electrical.
- .3 Types of items not described in this Section:
 - .1 Horizontal lifeline fall protection system and associated flashing units.
 - .1 Guide Wire Roof Anchors
 - .2 Roof curbs.
 - .3 Shop- and field-formed metal flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories
 - .4 Equipment supports.
 - .5 Roof hatches.
 - .6 Heat and smoke vents.
 - .7 Manufactured fasciae, copings, gravel stops, gutters and downspouts, and counter-flashing.
 - .8 Manufactured roof expansion-joint covers.
 - .9 Unit skylights.
 - .10 Ridge vents and snow guards for metal roof panels.
- .4 Related Sections:
 - .1 Section 07 62 00 - *Sheet Metal Flashing and Trim*" for shop- and field-formed metal flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM A506-12, Standard Specification for Alloy and Structural Alloy Steel, Sheet and Strip, Hot-Rolled and Cold-Rolled.

- .2 ASTM B370-11e1, Standard Specification for Copper Sheet and Strip for Building Construction.
- .3 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .4 ASTM D2369-10e1, Standard Test Method for Volatile Content of Coatings.
- .5 ASTM D2832-2011, Standard Guide for Determining Volatile and Nonvolatile Content of Paint and Related Coatings.
- .6 ASTM D5116-10, Standard Guide For Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products.
- .2 CSA International
 - .1 CSA B111-1974(R2005), Wire Nails, Spikes and Staples.
- .3 Green Seal Environmental Standards (GS)
 - .1 GS-11-11, Standard for Paints and Coatings.
 - .2 GS-36-11, Standard for Adhesives for Commercial Use.
- .4 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual - current edition.
 - .1 MPI #76, Primer, Alkyd, Quick Dry, for Metal.

1.3 ACTION SUBMITTALS

- .1 Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

1.4 DELIVERY, STORAGE AND HANDLING

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

Part 2 PRODUCTS

2.1 METAL MATERIALS

- .1 Aluminum Sheet: ASTM B 209M, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.
 - .1 Mill Finish: As manufactured.

2.2 MISCELLANEOUS MATERIALS

- .1 General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- .2 Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
- .3 Underlayment:
 - .1 Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, non-perforated.
 - .2 Polyethylene Sheet: 0.15-mm- thick polyethylene sheet complying with ASTM D 4397.
 - .3 Slip Sheet: Building paper, 0.16-kg/sq. m minimum, rosin sized.
- .4 Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide non-removable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
 - .1 Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
- .5 Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.
- .6 Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.
- .7 Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.
- .8 Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.3 PREFORMED FLASHING SLEEVES

- .1 Vent Stack Flashing: Metal flashing sleeve, uninsulated, with integral deck flange.
 - .1 Metal: Aluminum sheet, 1.60 mm thick.
 - .2 Height: 480 mm.
 - .3 Diameter: as required to fit pipe and conduit penetrations.
 - .4 Finish: Manufacturer's standard.

2.4 PREFABRICATED CURB & PENETRATION FLASHING SYSTEM

- .1 Prefabricated interlocking curb, with a single component elastomeric polyurethane sealant and a fast setting, solvent free mastic that sets within minutes of application.

2.5 PIPE SUPPORTS

- .1 Pipe Supports: Adjustable-height, extruded-aluminum tube, filled with urethane insulation; 50 mm in diameter; with aluminum baseplate, EPDM base seal, manufacturer's recommended hardware for mounting to structure or structural roof deck as indicated, and extruded-aluminum carrier assemblies; suitable for quantity of pipe runs and sizes.
 - .1 Pipe Support Height: If not otherwise indicated, provide 400 mm.
 - .2 Roller Assembly: With stainless-steel roller, sized for supported pipes.
 - .3 Pipe Support Flashing: Manufacturer's standard insulated sleeve flashing with integral base flange; aluminum sheet, 1.60 mm thick.
 - .4 Finish: Manufacturer's standard.
 - .5 Locations: All pipe and conduit runs unless noted otherwise.
- .2 Light-Duty Pipe Supports: Extruded-aluminum base assembly and Type 304 stainless-steel roller assembly for pipe sizes indicated, including manufacturer's recommended load-distributing baseplate.
 - .1 Finish: Manufacturer's standard.
 - .2 Locations: Single pipe and conduit runs for not more than one pipe of conduit run up to 40 mm in diameter.

Part 3 EXECUTION

3.1 EXAMINATION

- .1 Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- .2 Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- .3 Verify dimensions of roof openings for roof accessories.
- .4 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- .1 General: Install roof accessories according to manufacturer's written instructions.
 - .1 Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
 - .2 Anchor roof accessories securely in place so they are capable of resisting indicated loads.

- .3 Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
- .4 Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
- .2 Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 - .1 Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 - .2 Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene sheet.
 - .3 Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.
- .3 Preformed Flashing-Sleeve Installation: Secure flashing sleeve to roof membrane according to flashing-sleeve manufacturer's written instructions.
- .4 Prefabricated Curb & Penetration Flashing System: Install prefabricated curb and pitch pocket system around roof penetration as per manufacturer's installation instructions.
- .5 Roof Drain: If not otherwise indicated, install roof drains in compliance with the requirements of this specification section.
 - .1 Install roof drains in accordance with manufacturer's installation instructions and requirements of roofing membrane manufacturer.
 - .2 Install drains at low points in roof in approximate locations shown in drawings.
 - .3 Ensure water tight seal.
- .6 Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.
- .7 Pipe Support Installation: Install pipe supports so top surfaces are in contact with and provide equally distributed support along length of supported item.

3.3 REPAIR AND CLEANING

- .1 Clean exposed surfaces according to manufacturer's written instructions.
- .2 Clean off excess sealants.
- .3 Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Silicone joint sealants.
 - .2 Urethane joint sealants.
 - .3 Polysulfide joint sealants.
 - .4 Latex joint sealants.
 - .5 Solvent-release-curing joint sealants.
 - .6 Preformed joint sealants.
 - .7 Acoustical joint sealants.
- .2 Types of items you will not find described in this Section:
 - .1 Masonry control and expansion joint fillers and gaskets.
 - .2 Building expansion joints.
 - .3 Sealing joints in fire-resistance-rated construction.
 - .4 Structural and other glazing sealants.
 - .5 Plastic glazing sealants.
 - .6 Sealing perimeter joints at gypsum board.
 - .7 Sealing tile joints.
 - .8 Sealing edge mouldings at perimeters with acoustical sealant at acoustical panel ceilings and acoustical tile ceilings.
 - .9 Sealing joints in pavements, walkways, and curbing.
- .3 Related Sections:
 - .1 Section 01 33 00 - *Submittal Procedures*.
 - .2 Section 01 45 00 - *Quality Control*.
 - .3 Section 01 61 00 - *Common Product Requirements*.
 - .4 Section 01 74 21 - *Construction/Demolition Waste Management and Disposal*.
 - .5 Section 08 80 00 - *Glazing* for glazing sealants.
 - .6 Section 09 29 00 - *Gypsum Board* for sealing perimeter joints.

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM C919-08, Standard Practice for Use of Sealants in Acoustical Applications.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 19-GP-5M-1984, Sealing Compound, One Component, Acrylic Base, Solvent Curing (Issue of 1976 reaffirmed, incorporating Amendment No. 1).

- .2 CAN/CGSB-19.13-M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.
- .3 CGSB 19-GP-14M-1984, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing (Reaffirmation of April 1976).
- .4 CAN/CGSB-19.17-M90, One-Component Acrylic Emulsion Base Sealing Compound.
- .5 CAN/CGSB-19.24-M90, Multi-component, Chemical Curing Sealing Compound.
- .3 General Services Administration (GSA) - Federal Specifications (FS)
 - .1 FS-SS-S-200-E(2)1993, Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold Applied, for Portland Cement Concrete Pavement.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

1.3 ACTION SUBMITTALS

- .1 Product Data: For each joint-sealant product indicated.
- .2 Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- 13 mm wide joints formed between two 6-inch-150 mm long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- .3 Joint-Sealant Schedule: Include the following information:
 - .1 Joint-sealant application, joint location, and designation.
 - .2 Joint-sealant manufacturer and product name.
 - .3 Joint-sealant formulation.
 - .4 Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

- .1 Qualification Data: For qualified Installer.
- .2 Warranties: Sample of special warranties.

1.5 SUBMITTALS

- .1 Product Data: For each joint-sealant product indicated.
- .2 Samples for Initial Selection: Manufacturer's colour charts consisting of strips of cured sealants showing the full range of colours available for each product exposed to view.
- .3 Joint-Sealant Schedule: Include the following information:

- .1 Joint-sealant application, joint location, and designation.
- .2 Joint-sealant manufacturer and product name.
- .3 Joint-sealant formulation.
- .4 Joint-sealant colour.
- .4 Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.
- .5 Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

- .1 Installer Qualifications: An experienced installer in the installation of sealants.
- .2 Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.
- .3 Mock-ups: Install sealant in mock-ups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.
- .4 Preinstallation Conference: Conduct conference at Project site.

1.7 PROJECT CONDITIONS

- .1 Do not proceed with installation of joint sealants under the following conditions:
 - .1 When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 5 deg C.
 - .2 When joint substrates are wet.
 - .3 Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - .4 Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect joint sealants from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

- .4 Develop Construction Waste Management Plan related to Work of Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .5 Packaging Waste Management: remove for reuse by manufacturer of padding, as specified in Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.9 WARRANTY

- .1 Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - .1 Warranty Period: Two years from date of Substantial Completion.
- .2 Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 - .1 Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 - .2 Disintegration of joint substrates from natural causes exceeding design specifications.
 - .3 Mechanical damage caused by individuals, tools, or other outside agents.
 - .4 Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

Part 2 PRODUCTS

2.1 MATERIALS, GENERAL

- .1 Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- .2 VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when:
 - .1 Architectural Sealants: 250 g/L.
 - .2 Sealant Primers for Nonporous Substrates: 250 g/L.
 - .3 Sealant Primers for Porous Substrates: 775 g/L.
- .3 Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
 - .1 Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have

undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

- .4 Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- .5 Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- .6 Colours of Exposed Joint Sealants: As selected by Departmental Representative from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

- .1 Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.
- .2 Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.
- .3 Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
- .4 Single-Component, Nonsag, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
- .5 Single-Component, Nonsag, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use T.
- .6 Single-Component, Pourable, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade P, Class 100/50, for Use T.
- .7 Multicomponent, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use NT.
- .8 Multicomponent, Pourable, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type M, Grade P, Class 100/50, for Use T.
- .9 Mildew-Resistant, Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
- .10 Mildew-Resistant, Single-Component, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

2.3 URETHANE JOINT SEALANTS

- .1 Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

- .2 Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.
- .3 Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
- .4 Single-Component, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use T.
- .5 Single-Component, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Use T.
- .6 Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use NT.
- .7 Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use NT.
- .8 Multicomponent, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use T.
- .9 Multicomponent, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use T.
- .10 Immersible, Single-Component, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Uses T and I.
- .11 Immersible, Single-Component, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Uses T and I.
- .12 Immersible Multicomponent, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Uses T and I.
- .13 Immersible Multicomponent, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type M, Grade P, Class 25, for Use T and I.

2.4 LATEX JOINT SEALANTS

- .1 Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

2.5 SOLVENT-RELEASE-CURING JOINT SEALANTS

- .1 Acrylic-Based Joint Sealant: ASTM C 1311.
- .2 Butyl-Rubber-Based Joint Sealant: ASTM C 1311.

2.6 SECURITY SEALANTS

- .1 Two Part: high-strength, high-modulus, non-sag epoxy gel adhesive:

- .1 Meeting or exceeding the following:
 - .1 Consistency: 0 (no flow).
 - .2 Shore D: 90.
 - .3 Pot Life: 35 minutes at 77 25 degrees C.
 - .4 Bond Strength, 2-Day Cure: 15.4 MPa per ASTM C 882.
 - .5 Bond Strength, 14-Day Cure: 17.0 MPa per ASTM C 882.
 - .6 Water Absorption: 0.63 percent per ASTM D 570.
 - .7 Linear Coefficient of Shrinkage: 0.0007 percent.
 - .8 Compressive Strength: 77.5 MPa per ASTM D 695.
 - .9 Compressive Modulus: 1,725 MPa per ASTM D 695.
 - .10 Elongation at Break: 2.56 percent per ASTM D 638.
 - .11 Shear Strength: 24.5 MPa per ASTM D 732.
 - .12 Flexural Strength: 38.5 MPa minimum, per ASTM D 790.
- .2 Consisting of:
 - .1 Component A: Modified epoxy resin adhesive of epichlorohydrin bisphenol type A, containing suitable viscosity control agents and pigments.
 - .2 Component B: Reaction product of a selected blend of amines with an epoxy resin of epichlorohydrin bisphenol type A, containing suitable viscosity control agents, pigments and accelerators.
 - .3 Mixing Ratio: 2:1 by volume, Component A to Component B.

2.7 PREFORMED JOINT SEALANTS

- .1 Preformed Silicone Joint Sealants: Manufacturer's standard sealant consisting of precured low-modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral-curing silicone sealant for bonding extrusions to substrates.
- .2 Preformed Foam Joint Sealant: Manufacturer's standard preformed, precompressed, open-cell foam sealant manufactured from urethane foam with minimum density of 160 kg/cu. m and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths indicated; coated on one side with a pressure-sensitive adhesive and covered with protective wrapping.

2.8 ACOUSTICAL JOINT SEALANTS

- .1 Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

2.9 JOINT SEALANT BACKING

- .1 General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

- .2 Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) Type O, (open-cell material), Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- .3 Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.10 MISCELLANEOUS MATERIALS

- .1 Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- .2 Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- .3 Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

Part 3 EXECUTION

3.1 EXAMINATION

- .1 Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- .2 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- .1 Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - .1 Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - .2 Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

- .1 Concrete.
- .2 Masonry.
- .3 Unglazed surfaces of ceramic tile.
- .4 Exterior insulation and finish systems.
- .3 Remove laitance and form-release agents from concrete.
- .4 Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - .1 Metal.
 - .2 Glass.
 - .3 Porcelain enamel.
 - .4 Glazed surfaces of ceramic tile.
- .2 Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- .3 Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- .1 General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- .2 Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- .3 Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - .1 Do not leave gaps between ends of sealant backings.
 - .2 Do not stretch, twist, puncture, or tear sealant backings.
 - .3 Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- .4 Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- .5 Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - .1 Place sealants so they directly contact and fully wet joint substrates.
 - .2 Completely fill recesses in each joint configuration.

- .3 Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- .6 Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - .1 Remove excess sealant from surfaces adjacent to joints.
 - .2 Use tooling agents that are approved in writing by sealant manufacturer and that do not discolour sealants or adjacent surfaces.
 - .3 Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
 - .4 Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
 - .5 Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.
 - .1 Use masking tape to protect surfaces adjacent to recessed tooled joints.
- .7 Installation of Preformed Silicone-Sealant System: Comply with the following requirements:
 - .1 Apply masking tape to each side of joint, outside of area to be covered by sealant system.
 - .2 Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than 10 mm . Hold edge of sealant bead 6 mm inside masking tape.
 - .3 Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
 - .4 Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.
- .8 Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material. Produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures, apply heat to sealant in compliance with sealant manufacturer's written instructions.
- .9 Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 CLEANING

- .1 Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- .1 Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

- .1 Joint-Sealant Colour: As selected by Departmental Representative from manufacturer's full range of colours.
- .2 Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
 - .1 Joint Locations:
 - .1 Isolation and contraction joints in cast-in-place concrete slabs.
 - .2 Tile control and expansion joints.
 - .3 Joints between different materials listed above.
 - .4 Other joints as indicated.
 - .2 Joint Sealant: any one of the following:
 - .1 Silicone Joint Sealant: Single component, nonsag, traffic grade, neutral curing; Single component, pourable, traffic grade, neutral curing.
 - .2 Urethane Joint Sealant: Single component, nonsag, traffic grade; Single component, pourable, traffic grade; Multicomponent, nonsag, traffic grade, Class 50; Multicomponent, nonsag, traffic grade, Class 25.
 - .3 Preformed Joint Sealant: Preformed foam sealant.
- .3 Joint-Sealant Application: Exterior joints in horizontal traffic surfaces subject to water immersion.
 - .1 Joint Locations:
 - .1 Joints in pedestrian plazas.
 - .2 Other joints as indicated.
 - .2 Joint Sealant: any one of the following:
 - .1 Urethane Joint Sealant: Immersible, single component, nonsag, traffic grade; Immersible, single component, pourable, traffic grade; Immersible, multicomponent, nonsag, traffic grade; Immersible, multicomponent, pourable, traffic grade.
- .4 Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
 - .1 Joint Locations:
 - .1 Construction joints in cast-in-place concrete.
 - .2 Control and expansion joints in unit masonry.
 - .3 Joints in exterior insulation and finish systems.
 - .4 Joints between metal panels.

- .5 Joints between different materials listed above.
- .6 Perimeter joints between materials listed above and frames of doors windows and louvers.
- .7 Control and expansion joints in ceilings and other overhead surfaces.
- .8 Other joints as indicated.
- .2 Joint Sealant: any one of the following:
 - .1 Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 100/50; Single component, nonsag, neutral curing, Class 50; Single component, nonsag, acid curing; Multicomponent, nonsag, neutral curing.
 - .2 Urethane Joint Sealant: Single component, nonsag, Class 100/50; Single component, nonsag, Class 50; Multicomponent, nonsag, Class 50.
 - .3 Preformed Joint Sealant: Preformed silicone; Preformed foam.
- .5 Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
 - .1 Joint Locations:
 - .1 Isolation joints in cast-in-place concrete slabs.
 - .2 .
 - .3 Control and expansion joints in tile flooring.
 - .4 Other joints as indicated.
 - .2 Joint Sealant: any one of the following:
 - .1 Silicone Joint Sealant: Single component, nonsag, traffic grade, neutral curing; Single component, pourable, traffic grade, neutral curing; Multicomponent, pourable, traffic grade, neutral curing.
 - .2 Urethane Joint Sealant: Single component, nonsag, traffic grade; Single component, pourable, traffic grade; Multicomponent, nonsag, traffic grade, Class 50.
 - .3 Preformed Joint Sealant: Preformed foam.
- .6 Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.
 - .1 Joint Locations:
 - .1 Control and expansion joints on exposed interior surfaces of exterior walls.
 - .2 Perimeter joints of exterior openings where indicated.
 - .3 Tile control and expansion joints.
 - .4 Vertical joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
 - .5 Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
 - .6 Other joints as indicated.
 - .2 Joint Sealant: any one of the following:
 - .1 Latex.
 - .2 Acrylic based.

- .3 Butyl rubber based.
- .7 Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
 - .1 Joint Sealant Location:
 - .1 Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - .2 Tile control and expansion joints where indicated.
 - .3 Other joints as indicated.
 - .2 Joint Sealant: Any one of the following:
 - .1 Silicone Joint Sealant: Mildew resistant, single component, nonsag, neutral curing; Single component, nonsag, mildew resistant, acid curing.
- .8 Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.
 - .1 Joint Location:
 - .1 Acoustical joints where indicated.
 - .2 Other joints as indicated.
 - .2 Joint Sealant: Acoustical.

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Steel frame products including frames, transom frames (glazed or paneled), side-light and window assemblies, fire-rated and non-rated.
 - .2 Steel panels, fixed or removable, flush or rebated, similar in construction to steel doors, for use in steel frame product.
 - .3 Steel doors, swing type, flush, with or without embossed face sheets, with or without glazed or louvered openings, fire-rated and non-rated.
 - .4 Louvers, fire rated and non-rated.
- .2 Related Work
 - .1 Section 01 33 00 - *Submittal Procedures*.
 - .2 Section 01 74 21 - *Construction/Demolition Waste Management and Disposal*.
 - .3 Section 08 71 00 - *Door Hardware*.
 - .4 Section 09 91 13 – *Exterior Painting* and Section 09 91 43 – *Interior Painting* on field painting of doors and frames.
- .3 Types of items you will not find described in this Section:
 - .1 Detention Doors and Frames.
 - .2 Sound Control Door Assemblies for packaged, acoustical hollow metal door and frame assemblies.
 - .3 Lead-lined, hollow metal doors and frames.
 - .4 Electrical connections including conduit and wiring for door controls and operators.

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A653/A653M-06a, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM B29-03, Standard Specification for Refined Lead.
 - .3 ASTM B749-03, Standard Specification for Lead and Lead Alloy Strip, Sheet and Plate Products.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
 - .2 CGSB 41-GP-19Ma-84, Rigid Vinyl Extrusions for Windows and Doors.
- .3 Canadian Standards Association (CSA International)

- .1 CSA-G40.20-04/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .2 CSA W59-03, Welded Steel Construction (Metal Arc Welding).
- .4 Canadian Steel Door Manufacturers' Association (CSDMA)
 - .1 CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, 2000.
 - .2 CSDMA, Selection and Usage Guide for Commercial Steel Doors, 1990.
- .5 National Fire Protection Association (NFPA)
 - .1 NFPA 80-99, Standard for Fire Doors and Fire Windows.
 - .2 NFPA 252-03, Standard Methods of Fire Tests of Door Assemblies.
- .6 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1113-04, Architectural Coatings.
 - .2 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.
- .7 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-01, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .2 CAN/ULC-S702-97, Standard for Thermal Insulation, Mineral Fibre, for Buildings.
 - .3 CAN/ULC-S704-03, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
 - .4 CAN4-S104-M80, Standard Method for Fire Tests of Door Assemblies.
 - .5 CAN4-S105-M85, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN4-S104.

1.3 DEFINITIONS

- .1 Minimum Thickness: Minimum thickness of base metal without coatings.

1.4 SUBMITTALS

- .1 Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, and finishes.
- .2 Shop Drawings: Include the following:
 - .1 Elevations of each door design.
 - .2 Details of doors, including vertical and horizontal edge details and metal thicknesses.
 - .3 Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - .4 Locations of reinforcement and preparations for hardware.
 - .5 Details of each different wall opening condition.

- .6 Details of anchorages, joints, field splices, and connections.
- .7 Details of accessories.
- .8 Details of mouldings, removable stops, and glazing.
- .9 Details of conduit and preparations for power, signal, and control systems.
- .3 Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

1.5 INFORMATIONAL SUBMITTALS

- .1 Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labelled assemblies.

1.6 QUALITY ASSURANCE

- .1 Except as otherwise specified, comply with requirements of *Canadian Manufacturing Standards for Steel Doors and Frames* published by the Canadian Steel Door and Frame Manufacturers' Association.
- .2 Source Limitations: Obtain hollow metal work from single source from single manufacturer.
- .3 Fire-Rated Door Assemblies: Assemblies complying with CAN4-S104-M that are listed and labelled by a qualified testing agency, for fire-protection ratings indicated.
 - .1 Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labelled fire-rated door assemblies except for size.
- .4 Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with CAN4-S104-M that are listed and labelled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated. Label each individual glazed lite.

1.7 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
- .2 Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- .3 Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 102 mm high wood blocking. Do not store in a manner that traps excess humidity.
 - .1 Provide minimum 6 mm space between each stacked door to permit air circulation.

.4 Waste Management and Disposal:

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.8 PROJECT CONDITIONS

- .1 Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.9 COORDINATION

- .1 Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

Part 2 PRODUCTS

2.1 MATERIALS

- .1 Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.
- .2 Steel
- .1 Commercial grade steel to ASTM A924-97 (M-97), galvanized to ASTM A653-97 (M-97), Commercial Steel (CS), Type B, A40 (ZF120) minimum unless otherwise noted.
- .2 Minimum steel thicknesses shall be in accordance with Appendix 1 of the CSDMA, *Recommended Specifications for Commercial Steel Door and Frame Products*.
- .3 Door Core Materials
- .1 Honeycomb: Structural small cell 25.4 mm maximum kraft paper 'honeycomb'. Weight: 36.3 kg per ream minimum, density: 16.5 kg/m³ minimum, sanded to required thickness.
- .2 Fibreglass: Loose batt type, density 24 kg/m³ minimum, conforming to ASTM C553 or ASTM C592.
- .3 Polystyrene: Rigid extruded, fire retardant, closed cell board, Type 1, density: 16 to 32 kg/m³, thermal values: RSI 1.06 (R 6.0) minimum, conforming to ASTM C578.
- .4 Polystyrene: Rigid extruded fire retardant, closed cell board. Density; 16 to 32 kg/m³, thermal values; RSI 1.0 (R 6.0) minimum, Type 1, in accordance with ASTM C578.
- .5 Polyisocyanurate: Rigid foam. closed cell, faced board, thermal value: RSI 2.17 (R12.3) minimum, conforming to ASTM C1289

2.2 MISCELLANEOUS

- .1 Primers
 - .1 Rust inhibitive touch-up only.
- .2 Door Silencers
 - .1 Single stud rubber/neoprene type.
- .3 Exterior Top Caps
 - .1 Rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19MA.
- .4 Frame Thermal Breaks
 - .1 Rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19MA.
- .5 Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- .6 Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.
- .7 Grout: ASTM C 476, except with a maximum slump of 102 mm, as measured according to ASTM C 143/C 143M.
- .8 Glazing: Comply with requirements in Division 08 Section *Glazing*.
- .9 Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 0.4 mm dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibres, sulphur components, and other deleterious impurities.

2.3 FABRICATION – GENERAL

- .1 Manufacturer door and frame products in accordance with the CSDMA's, *Recommended Dimensional Standards for Commercial Steel Doors and Frames*.
- .2 Selected Door and Frame Requirements, unless noted otherwise (uno)

Item	Location		
	Interior, Unless noted otherwise	Exterior, Unless noted otherwise	Steel Stiffened, where noted
Steel Coating	A40 (ZF120) minimum; uno.	A40 (ZF120) minimum, uno. Provide G90 (Z275) coating where noted.	A40 (ZF120) minimum, uno. Provide G90 (Z275) coating where noted.
Doors			
Duty / Min. Steel Thickness	Medium duty / 1.3 mm (18 gauge nominal); uno.	Heavy duty / 1.6 mm (16 gauge nominal); uno.	Extra heavy duty / 2.0 mm (14 gauge nominal), uno.
Design	Flush panel, uno.	Flush panel, uno.	Flush panel, uno

Core,	Honeycomb core, laminated under pressure to face sheets; unless noted otherwise.	Polystyrene or polyisocyanurate core, laminated under pressure to face sheets; unless otherwise noted.	Core reinforced with vertical stiffeners, securely welded to each face at 150mm on centre maximum; voids filled with fibreglass batt type insulation.
Longitudinal Seams	Mechanically interlocked, adhesive assisted with edge seams tack welded, filled and sanded flush with no visible seam; uno.	Mechanically interlocked, adhesive assisted with edge seams tack welded, filled and sanded flush with no visible seam; uno.	Continuously welded the full height of the door filled and ground smooth with no visible seams.
Caps	None, uno.	PVC, uno. Provide steel caps where noted.	Steel cap.
Thermally Broken?	No	No, uno.	No.
Frames			
Duty / Min. Steel Thickness	Medium duty / 1.3 mm (18 gauge nominal); uno. Standard duty / 1.0 mm (20 gauge nominal) for hollow core wood doors.	Heavy duty / 1.6 mm (16 gauge nominal); uno.	Heavy duty / 1.6 mm (16 gauge nominal); uno.
Construction	Full face, punch-mitred, or saw mitred welded construction; uno.	Full face welded construction.	Full face welded construction.
Thermally Broken?	No	No, uno.	No.

2.4 FABRICATION - FRAME PRODUCTS

.1 General

- .1 Provide frame mortised, blanked, reinforced, drilled, and tapped at the factory for templated hardware only, in accordance with the approved hardware schedule and templates provided by the hardware supplier.
- .2 Protect mortised cut-outs with steel guard boxes except for dry wall applications.
- .3 Reinforce frame where required, for surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated hardware.
- .4 Provide anchorage appropriate to floor, wall, and frame construction. Each wall anchor shall be located immediately above or below each hinge reinforcement on the hinge jamb and directly opposite on the strike jamb. For rebate opening heights up to and including 1520 mm provide two anchors, and an additional anchor for each additional 760 mm of height or fraction thereof, except as indicated below. Frames in previously placed concrete, masonry, or structural steel shall be

- provided with anchors located not more than 150 mm from the top and bottom of each jamb, and intermediate anchors at 660 mm on centre maximum. Fasteners for such anchors shall be provided by others.
- .5 Provide minimum reinforcing, anchor and other component gauges in accordance with Table 1 of the CSDMA, *Recommended Specifications for Commercial Steel Door and Frame Products*.
 - .6 Prepare each door opening for single stud rubber door silencers, three 3 for single
 - .7 Provide fire-rated frame products for those openings requiring fire protection. Provide frames, transom and sidelight assemblies listed for conformance with CAN4-S104. Provide window assemblies listed for conformance with CAN4-S106. Ensure all fire-rated frame products bear the label of, and be listed by a nationally recognized testing agency having a factory inspection service. Labelling shall be in accordance with NFPA 80, the listing authority's policies and label materials, and identify the manufacturer. Construct fire-rated frame products as listed for labelling in the Follow-Up Service Procedures/Factory Inspection Manuals issued by the listing agency to individual manufacturers.
 - .8 For each grade frame indicated form from a steel sheet having a minimum thickness of:
 - .1 Standard Duty grade frames: 1.0 mm
 - .2 Medium Duty grade frames: 1.3 mm
 - .3 Heavy Duty and Extra Heavy Duty grade frames: 1.6 mm
- .2 Welded Type
- .1 Accurately mitre or mechanically join frame products.
 - .2 Ensure frame product perimeter corner joints shall be as defined in Appendix 2 of the CSDMA, *Recommended Specifications for Commercial Steel Door and Frame Products*, and as follows
 - .1 Profile welded; punch-mitred - continuously welded on the profile faces, rabbets, returns and soffit intersections, or saw-mitred - continuously welded on the profile faces, rabbets, returns, stops and soffit intersections. Punch or saw-mitred, at the manufacturer's discretion. All profile welded frame product exposed faces shall be filled and ground to a smooth, uniform, seamless surface.
 - .2 Face welded; continuously welded on the profile faces, with exposed faces filled and ground to a smooth, uniform, seamless surface.
 - .3 Tack welded; welded on the faces and returns, with exposed hairline joint intersections.
 - .3 Ensure joints at mullions, sills and center rails are:
 - .1 Coped accurately, butted and tightly fitted.
 - .2 At intersecting flush profile faces, securely welded, filled and ground to a smooth, uniform, seamless surface.
 - .3 At intersecting recessed profile faces, securely welded to concealed reinforcements, with exposed hairline face seams.

- .4 At all other intersecting profile elements have exposed hairline face seams.
- .4 Welding: to CSA W59.
- .5 Ensure a floor anchor is securely attached to the inside of each jamb profile where frame product is to be installed prior to the adjacent partition. Provide each floor anchor s with two holes for securing to the floor. For conditions that do not permit the use of a floor anchor, substitute with an additional wall anchor, located within 150 mm of the base of the jamb.
- .6 Weld in two temporary jamb spreaders per door opening to maintain proper alignment during shipment and handling. Do not be used for installation.
- .7 Form glazing stops from steel channel, minimum 16 mm height, accurately fitted, butted at corners and fastened to frame sections with counter-sunk oval head sheet metal screws.
- .8 When required due to site access or due to shipping limitations, fabricate frame product for large openings in sections as designated on the submittal drawings, with splice joints for field assembly and welding.
- .9 Prior to shipment, mark each frame product with an identification number as shown on submittal drawings.
- .3 Knocked-Down Type
 - .1 Ship knocked-down type frames unassembled.
 - .2 Ensure frames have mechanical joints which inter-lock securely and provide functionally satisfactory performance when assembled and installed in accordance with the manufacturer's published instructions.
 - .3 Where frame product is to be installed prior to the adjacent partition, securely attach a floor anchor to the inside of each jamb profile. Provide each floor anchor with two 2 holes for securing to the floor. For conditions that do not permit the use of a floor anchor, substitute with an additional wall anchor, located within 150 mm of the base of the jamb.
 - .4 Prior to shipment, mark each frame product with an identification number as shown on submittal drawings.

2.5

FABRICATION - DOORS

- .1 General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with requirements of Canadian Manufacturing Standards for Steel Doors and Frames published by the Canadian Steel Door and Frame Manufacturers' Association except as noted.
 - .1 Longitudinal Edge Profile:
 - .1 Vertical Edges for Single-Acting Doors: Manufacturer's standard.
 - .2 Vertical Edges for Double-Acting Doors: Round vertical edges with 54 mm radius.

- .2 Provide doors mortised, blanked, reinforced, drilled and tapped at the factory for templated hardware only, in accordance with the approved hardware schedule and templates provided by the hardware supplier.
- .3 Factory prepare holes 12.7 mm diameter and larger, except for mounting and through-bolt holes.. Factory-prepare holes less than 12.7 mm when required for the function of the device (for knob, lever, cylinder, thumb or turn pieces) or when these holes over-lap function holes.
- .4 Reinforce doors where required for surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated hardware.
- .5 Provide top and bottom of doors with inverted, recessed, welded steel channels.
- .6 Provide minimum reinforcing and component gauges in accordance with Table 1 of the CSDMA, *Recommended Specifications for Commercial Steel Door and Frame Products*.
- .7 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.
- .8 Provide fire-rated doors for those openings requiring fire protection. Provide products listed for conformance with CAN4-S104. Provide fire-rated doors bearing label of, and be listed by a nationally recognized testing agency having a factory inspection service. Labelling shall be in accordance with NFPA 80, the listing authority's policies and label materials, and shall identify the manufacturer. Construct fire-rated doors as listed for labelling in the Follow-Up Service Procedures/Factory Inspection Manuals issued by the listing agency to individual manufacturers.
- .9 Prior to shipment, mark each door with an identification number as shown on the submittal drawings.
- .10 For each grade door indicated form both face sheets for doors from a steel sheet having a minimum thickness of:
 - .1 Standard Duty grade doors: 1.0 mm
 - .2 Medium Duty grade doors: 1.3 mm
 - .3 Heavy Duty grade doors: 1.6 mm
 - .4 Extra Heavy Duty grade doors: 2.0 mm

2.6 HOLLOW METAL PANELS

- .1 Provide hollow metal panels of same materials, construction, and finish as specified for adjoining hollow metal doors.

2.7 FRAME ANCHORS

- .1 Jamb Anchors:
 - .1 Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 1.0 mm thick, with corrugated or perforated straps not less than 50 mm wide by 250 mm long; or wire anchors not less than 4.5 mm thick.
 - .2 Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 1.0 mm thick.

- .3 Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
- .4 Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 9.5 mm diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- .2 Floor Anchors: Formed from same material as frames, not less than 1.0 mm thick, and as follows:
 - .1 Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
 - .2 Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 50 mm height adjustment. Terminate bottom of frames at finish floor surface.

2.8 STOPS AND MOULDINGS

- .1 Mouldings for Glazed Lites in Doors: Minimum 0.8 mm thick, fabricated from same material as door face sheet in which they are installed.
- .2 Fixed Frame Mouldings: Formed integral with hollow metal frames, a minimum of 16 mm high unless otherwise indicated.
- .3 Loose Stops for Glazed Lites in Frames: Minimum 0.8 mm thick, fabricated from same material as frames in which they are installed.
- .4 Terminated Stops: Where indicated on interior door frames, terminate stops 152 mm above finish floor with a 45-degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.
 - .1 Provide terminated stops only where indicated.

2.9 LOUVERS

- .1 Provide louvers for interior doors, where indicated, with blades or baffles formed of 0.5 mm thick, cold-rolled steel sheet set into 0.8 mm thick steel frame.
 - .1 Sightproof Louver: Stationary louvers constructed with inverted V-shaped or Y-shaped blades.
 - .2 Fire-Rated Automatic Louvers: Louvers constructed with movable blades closed by actuating fusible link, and listed and labelled for use in fire-rated door assemblies of type and fire-resistance rating indicated by same testing and inspecting agency that established fire-resistance rating of door assembly.

2.10 ACCESSORIES

- .1 Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- .2 Ceiling Struts: Minimum 6.4 mm thick by 25.4 mm wide steel.

- .3 Grout Guards: Formed from same material as frames, not less than 0.4 mm thick.

2.11 FABRICATION

- .1 Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- .2 Hollow Metal Doors:
- .1 Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
- .2 Glazed Lites: Factory cut openings in doors.
- .3 Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 19 mm beyond edge of door on which astragal is mounted.
- .3 Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
- .1 Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
- .2 Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
- .3 Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
- .4 Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
- .5 Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
- .6 Jamb Anchors: Provide number and spacing of anchors as follows:
- .1 Masonry Type: Locate anchors not more than 457 mm from top and bottom of frame. Space anchors not more than 813 mm o.c. and as follows:
- .1 Two anchors per jamb up to 1524 mm high.
- .2 Three anchors per jamb from 1524 to 2286 mm high.
- .3 Four anchors per jamb from 2286 to 3048 mm high.
- .4 Four anchors per jamb plus 1 additional anchor per jamb for each 610 mm or fraction thereof above 3048 mm high.
- .2 Stud-Wall Type: Locate anchors not more than 457 mm from top and bottom of frame. Space anchors not more than 813 mm o.c. and as follows:

- .1 Three anchors per jamb up to 1524 mm high.
- .2 Four anchors per jamb from 1524 to 2286 mm high.
- .3 Five anchors per jamb from 2286 to 2438 mm high.
- .4 Five anchors per jamb plus 1 additional anchor per jamb for each 610 mm or fraction thereof above 2438 mm high.
- .5 Two anchors per head for frames above 1066 mm wide and mounted in metal-stud partitions.
- .3 Compression Type: Not less than two anchors in each jamb.
- .4 Postinstalled Expansion Type: Locate anchors not more than 152 mm from top and bottom of frame. Space anchors not more than 660 mm o.c.
- .7 Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - .1 Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - .2 Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- .4 Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- .5 Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cut-outs, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section *Door Hardware*.
 - .1 Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 - .2 Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
 - .3 Coordinate locations of conduit and wiring boxes for electrical connections with Electrical sections.
- .6 Stops and Mouldings: Provide stops and mouldings around glazed lites indicated. Form corners of stops and mouldings with butted or mitred hairline joints.
 - .1 Single Glazed Lites: Provide fixed stops and mouldings welded on secure side of hollow metal work.
 - .2 Multiple Glazed Lites: Provide fixed and removable stops and mouldings so that each glazed lite is capable of being removed independently.
 - .3 Provide fixed frame mouldings on outside of exterior and on secure side of interior doors and frames.
 - .4 Provide loose stops and mouldings on inside of hollow metal work.
 - .5 Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

Part 3 EXECUTION

3.1 EXAMINATION

- .1 Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- .2 Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- .3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- .1 Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- .2 Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
 - .1 Squareness: Plus or minus 1.6 mm, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - .2 Alignment: Plus or minus 1.6 mm, measured at jambs on a horizontal line parallel to plane of wall.
 - .3 Twist: Plus or minus 1.6 mm, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - .4 Plumbness: Plus or minus 1.6 mm, measured at jambs on a perpendicular line from head to floor.
- .3 Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- .1 General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- .2 Hollow Metal Frames: Install hollow metal frames of size and profile indicated.
 - .1 Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - .1 At fire-protection-rated openings, install frames according to NFPA 80.
 - .2 Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.

- .3 Install frames with removable glazing stops located on secure side of opening.
- .4 Install door silencers in frames before grouting.
- .5 Remove temporary braces necessary for installation only after frames have been properly set and secured.
- .6 Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
- .7 Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.
- .2 Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - .1 Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
- .3 Metal-Stud Partitions: Solidly pack mineral-fibre insulation behind frames.
- .4 Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
- .5 Concrete Walls: Solidly fill space between frames and concrete with grout, but only when specifically noted. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
- .6 In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
- .7 In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
- .8 Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
- .9 Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - .1 Squareness: Plus or minus 1.6 mm, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - .2 Alignment: Plus or minus 1.6 mm, measured at jambs on a horizontal line parallel to plane of wall.
 - .3 Twist: Plus or minus 1.6 mm, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - .4 Plumbness: Plus or minus 1.6 mm, measured at jambs at floor.
- .3 Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
 - .1 Non-Fire-Rated Standard Steel Doors:

- .1 Jambs and Head: 3 mm plus or minus 1.6 mm.
- .2 Between Edges of Pairs of Doors: 3 mm plus or minus 1.6 mm.
- .3 Between Bottom of Door and Top of Threshold: Maximum 9.5 mm.
- .4 Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 19 mm.
- .2 Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- .4 Glazing: Comply with installation requirements in Division 08 Section *Glazing* and with hollow metal manufacturer's written instructions.
 - .1 Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 230 mm o.c. and not more than 50 mm o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- .1 Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- .2 Remove grout and other bonding material from hollow metal work immediately after installation.
- .3 Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

Part 1 GENERAL

1.1 RELATED DOCUMENTS

- .1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- .1 Types of items described in this Section:
- .1 Manually and electrically operated steel sectional overhead doors.
 - .1 Standard lift.
 - .2 High lift.
 - .3 Vertical lift.
 - .4 Low lift.
 - .2 Types of items you will not find described in this Section:
 - .1 Wood, aluminum, and translucent sectional overhead doors.
 - .2 Miscellaneous steel supports.
 - .3 Lock cylinders and keying.
 - .4 Electrical service and connections for powered operators and accessories.
 - .5 Exterior painting and interior painting for finish painting of factory-primed doors.
 - .6 Parking control equipment interlocked to sectional doors.
 - .3 Related Requirements:
 - .1 Section 01 33 00 - *Submittal Procedures*.
 - .2 Section 01 74 21 - *Construction/Demolition Waste Management and Disposal*.
 - .3 Section 01 78 00 - *Closeout Submittals*.
 - .4 Section 05 50 00 - *Metal Fabrications* for miscellaneous steel supports.
 - .5 Section 08 80 50 - *Glazing*.
 - .6 Section 09 91 13 - *Exterior Painting* and Section 09 91 23 - *Interior Painting* for finish painting of factory-primed doors.

1.3 REFERENCES

- .1 American Architectural Manufacturers Association (AAMA)
- .1 AAMA 609/610-09, Cleaning and Maintenance Guide for Architecturally Finished Aluminum.
- .2 ASTM International

- .1 ASTM E330-02, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- .3 Canadian General Standards Board (CGSB)
 - .1 CGSB 1.40-97, Anticorrosive Structural Steel Alkyd Primer.
 - .2 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.
 - .3 CAN/CGSB-12.20-M89, Structural Design of Glass for Buildings.
- .4 CSA International
 - .1 CSA G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .5 Environmental Choice Program (ECP)
 - .1 CCD-045-95, Sealants and Caulking Compounds.
- .6 Green Seal Environmental Standards (GS)
 - .1 GS-11-2008, 2nd Edition, Paints and Coatings.
- .7 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

1.4 DEFINITIONS

- .1 Operation Cycle: One cycle of a door is complete when it is moved from the closed position to the fully open position and returned to the closed position.

1.5 PERFORMANCE REQUIREMENTS

- .1 Structural Performance: Provide sectional overhead doors capable of withstanding the effects of gravity loads and the following loads and stresses without evidencing permanent deformation of door components:
 - .1 Wind Loads: Determine loads based on the following minimum design wind pressures:
 - .1 Wind loads as determined in accordance with the National Building Code of Canada for the particular site location and configuration, but in no case less than 1.5kPa acting inward and outward.
 - .2 Deflection: design doors to maximum horizontal deflection under full load of not greater than L/240.
 - .2 Operation-Cycle Requirements: Provide sectional overhead door components and operators capable of operating for not less than 25,000 cycles.

1.6 SUBMITTALS

- .1 Product Data: For each type and size of sectional overhead door and accessory. Include the following:
 - .1 Summary of forces and loads on walls and jambs.
 - .2 Motors: For electric door installations show nameplate data and ratings, characteristics, and mounting arrangements.
- .2 Shop Drawings: For special components and installations not dimensioned or detailed in manufacturer's product data.

1.7 QUALITY ASSURANCE

- .1 Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.
- .2 Source Limitations: Obtain sectional overhead doors through one source from a single manufacturer.
 - .1 Obtain operators and controls from sectional overhead door manufacturer.
- .3 Product Options: Drawings indicate size, profiles, and dimensional requirements of sectional overhead doors and accessories and are based on the specific system indicated. Other manufacturers' systems with equal performance and dimensional characteristics may be considered. Refer to Division 01 Section Product Requirements.
- .4 Electrical Components, Devices, and Accessories: Listed and labelled as defined in NFPA 70, Article 100.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 PRODUCTS

2.1 STEEL DOOR SECTIONS

- .1 Construct door sections including face sheets and frames from zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, Z275 coating to ASTM A 653/A 653M.
 - .1 Minimum Base-Metal (Uncoated) Thickness for Section Faces: 0.85 mm.
 - .2 Section Face: Manufacturer's standard grooved, ribbed, or fluted.
- .2 Fabricate door panels from a single sheet to provide sections not more than 600 mm high and nominally 51 mm deep. Roll horizontal meeting edges to a continuous, interlocking,

- keyed, rabbeted, shiplap, or tongue-in-groove weathertight seal, with a reinforcing flange return.
- .1 For insulated doors, provide door sections with continuous thermal-break construction, separating faces of door.
 - .3 Enclose open sections with channel end stiles formed from not less than 1.6 mm thick galvanized steel sheet and weld end stiles to door section in place. Provide intermediate stiles formed from not less than 1.6 mm thick galvanized steel sheet, cut to door section profile, and welded in place.
 - .1 Stile Spacing: Not more than 1200 mm apart.
 - .4 Reinforce sections with continuous horizontal and diagonal reinforcement, as required to stiffen door and for wind loading. Provide galvanized steel bars, struts, trusses, or strip steel, formed to depth and bolted or welded in place.
 - .5 Provide reinforcement for hardware attachment.
 - .6 Thermal Insulation: Insulate inner core of steel sections with door manufacturer's standard polyurethane insulation, foamed in place to completely fill inner core of section and pressure bonded to face sheets to prevent delamination under wind load. Enclose insulation completely within steel sections face sheets with no exposed insulation material evident.
 - .7 Fabricate sections so finished door assembly is rigid and aligned, with tight hairline joints and free of warp, twist, and deformation.
 - .8 Finish: Comply with NAAMM's Metal Finishes Manual for Architectural and Metal Products for recommendations for applying and designating finishes.
 - .1 Surface Preparation: Clean galvanized surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants.
 - .1 Pretreat zinc-coated steel, after cleaning, with a conversion coating of type suited to organic coating applied over it.
 - .2 Apply manufacturer's standard primer and finish coats to interior- and exterior-door faces after forming, according to coating manufacturer's written instructions for application, thermosetting, and minimum dry film thickness.
 - .1 Colour: Chosen by Departmental Representative from manufacturer's full line of standard colours, unless otherwise indicated in Schedule.

2.2 TRACKS, SUPPORTS, AND ACCESSORIES

- .1 Tracks: Manufacturer's standard, galvanized steel track system, sized for door size and weight, designed for lift type indicated and clearances shown, and complying with ASTM A 653/A 653M for minimum Z180 zinc coating. Provide complete track assembly including brackets, bracing, and reinforcement for rigid support of ball-bearing roller guides for required door type and size. Slope tracks at proper angle from vertical or design to ensure tight closure at jambs when door unit is closed. Weld or bolt to track supports.

- .1 Provide tracks configured for the following lift types:
 - .1 Standard, unless otherwise indicated.
 - .2 Low headroom, when required due to site conditions and when specifically indicated on drawings or Schedule.
 - .3 High, only when specifically indicated on drawings or Schedule.
 - .4 Vertical, only when specifically indicated on drawings or Schedule.
- .2 Track Reinforcement and Supports: Galvanized steel track reinforcement and support members, complying with ASTM A 36/A 36M and ASTM A 123/A 123M. Secure, reinforce, and support tracks as required for door size and weight to provide strength and rigidity without sag, sway, and vibration during opening and closing of doors.
 - .1 Support and attach tracks to opening jambs with continuous angle welded to tracks and attached to wall. Support horizontal (ceiling) tracks with continuous angle welded to track and supported by laterally braced attachments to overhead structural members at curve and end of tracks.
 - .1 Repair galvanized coating on tracks according to ASTM A 780.
 - .3 Weatherseals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom and top of overhead door.
 - .1 Provide motor-operated doors with combination bottom weatherseal and sensor edge.
 - .2 Provide continuous flexible seals at door jambs for a weathertight installation.
 - .4 Windows: Type and size indicated and in arrangement shown. Set glazing in vinyl, rubber, or neoprene glazing channel for metal-framed doors and elastic glazing compound for wood doors, as required. Provide removable stops of same material as door-section frames.
 - .1 Size: Manufacturer's standard for type of glazing indicated.

2.3 **HARDWARE**

- .1 General: Provide heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless-steel, or other corrosion-resistant fasteners, to suit door type.
- .2 Hinges: Heavy-duty galvanized steel hinges of not less than 1.9 mm thick, uncoated steel at each end stile and at each intermediate stile, according to manufacturer's written recommendations for door size. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is not possible. Provide double-end hinges where required, for doors exceeding 4.87 m in width, unless otherwise recommended by door manufacturer.
- .3 Rollers: Heavy-duty rollers with steel ball bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Provide 75 mm diameter roller tires for 75 mm wide track and 51 mm diameter roller tires for 51 mm wide track.
 - .1 Tire Material: Case-hardened steel.

- .4 Push/Pull Handles: For push-up-operated or emergency-operated doors, provide galvanized steel lifting handles on each side of door.
- .5 Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on single-jamb side, operable from inside only.
- .6 Chain Lock Keeper: Suitable for padlock.
- .7 Exhaust Port: Manufacturer's standard.
- .8 If door unit is power operated, provide safety interlock switch to disengage power supply when door is locked.

2.4 COUNTERBALANCE MECHANISM

- .1 Torsion Spring: Counterbalance mechanism consisting of adjustable-tension torsion springs fabricated from oil-tempered-steel wire complying with ASTM A 229/A 229M, Class II, mounted on a cross-header tube or steel shaft. Connect to door with galvanized aircraft-type lift cables with cable safety factor of at least 5 to 1. Provide springs calibrated to suit door's duty cycle indicated.
- .2 Bracket: Provide anchor support bracket as required to connect stationary end of spring to the wall and to level shaft and prevent sag.
- .3 Provide a spring bumper at each horizontal track to cushion door at end of opening operation.

2.5 MANUAL DOOR OPERATORS

- .1 Reduction-Drive, Chain-Hoist Operation: Side-mounted unit consisting of endless steel hand chain, chain pocket wheel with at least 3:1 reduction unit, and roller chain-and-sprocket drive or suitable gearing, end mounted on counterbalance shaft; operating with a maximum 155 N pull.
 - .1 Locations: Where specifically indicated on drawings or Schedule.

2.6 ELECTRIC DOOR OPERATORS

- .1 General: Provide electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycle requirements specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
 - .1 Locations: Where specifically indicated on drawings or Schedule.
- .2 Disconnect Device: Hand-operated disconnect device or mechanism for automatically engaging chain-and-sprocket operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount disconnect device and operator so they are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

- .3 Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.
- .4 Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70, Class 2 control circuit, maximum 24-V, ac or dc.
- .5 Door-Operator Type: Unit consisting of electric motor and the following:
 - .1 Electrical jack shaft type operator.
 - .1 Locations: High lift and vertical lift doors, and as required.
 - .2 Electrical interlock switch to disconnect power to operator when in manual operation.
 - .2 Electrical trolley type operator.
 - .1 Locations: All other locations.
 - .3 Chain-and-sprocket secondary drive, and quick release for manual operation.
- .6 Electric Motors: High-starting torque, reversible, continuous-duty, insulated, electric motors, with overload protection, sized to start, accelerate, and operate door in either direction from any position, at not less than 0.2 m/s and not more than 0.3 m/s , without exceeding nameplate ratings or service factor.
 - .1 Coordinate wiring requirements and electrical characteristics of motors with building electrical system.
 - .2 Provide open dripproof-type motor, and controller with NEMA ICS 6, Type 1 enclosure.
 - .1 Locations: dry, heated, interior locations.
 - .3 Provide totally enclosed, nonventilated or fan-cooled motor, fitted with plugged drain, and controller with NEMA ICS 6, Type 4 enclosure.
 - .1 Locations: exterior, wet, or unheated locations.
- .7 Manual Control Station: Momentary-contact, three-button control station with push-button controls labelled Open, Close, and Stop; in English and French.
 - .1 Provide full-guarded, surface-mounted, heavy-duty-type interior unit with general-purpose, NEMA ICS 6, Type 1 enclosure.
 - .1 Locations: dry interior locations.
 - .2 Provide full-guarded, surface-mounted, heavy-duty-type, weatherproof-type exterior unit with NEMA ICS 6, Type 4, key-operated control station.
 - .1 Locations: wet or exterior locations, unless otherwise noted.
- .8 Obstruction Detection Device: Provide each motorized door with external automatic safety sensor capable of protecting full width of door opening. Activation of sensor immediately stops and reverses downward door travel. Provide both of the following:
 - .1 Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
 - .1 Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensor device. When self-

- monitoring feature is activated, door closes only with sustained pressure on close button.
- .2 Pressure-Sensor Edge: Provide each motorized door with an automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor immediately stops and reverses downward door travel. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
 - .1 Provide manufacturer's standard pneumatically or electrically actuated automatic bottom bar.
 - .1 Self-Monitoring Type: Four-wire configured device.
 - .9 Traffic Loop and Transponder System: provide each motorized door, only if specifically indicated, with an embedded traffic loop, Track 100 system as marketed by Nortec. Complete with loop, for embedding into driving surface, vehicle receiver, and associated accessories for complete operating system.
 - .1 Provide 75 vehicle transponders that can be detected if located 1200 mm above the embedded loop.
 - .2 Provide other accessories required for operational system, including but not limited to adapter plates, boxes, powers supplies, relays, and controls.
 - .10 Limit Switches: Adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
 - .11 Electrical Components, Devices, and Accessories: ULc or CSA listed and labelled.
 - .12 Conduit for Low Voltage Wiring: rigid metallic conduit, meeting requirements for rigid conduits contained in Electrical Divisions.

Part 3 EXECUTION

3.1 INSTALLATION

- .1 General: Install door, track, and operating equipment complete with necessary hardware, jamb, and head moulding strips, anchors, inserts, hangers, and equipment supports according to Shop Drawings, manufacturer's written instructions, and as specified.
- .2 Fasten vertical track assembly to framing, spaced not less than 600 mm apart. Hang horizontal track from structural overhead framing with angle or channel hangers fastened to framing by welding or bolting or both. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.

3.2 CONTROLS FOR MOTORIZED DOORS

- .1 Equip each door with a manual control station to manually open, close, and stop door. Have manual controls override automatic controls. Equip control station with keyed switch to disengage all electric controls. Locate in locations shown on drawings or determined on site with Departmental Representative.

- .2 Equip each door with a set of photoelectric sensors mounted 900 mm above the finished floor.
- .3 Equip only those doors, if indicated on drawings, with an additional set of photoelectric sensors mounted 2400 mm above the floor and 1200 mm out from the face of the door.
- .4 Equip only those doors, if indicated on drawings, with its own traffic loop embedded in the driving surface, in locations indicated on drawings.
- .5 Have door automatically open and remain open for a predetermined amount of time whenever any of the photoelectric sensors associated with the door is interrupted. Have door automatically close when a predetermined amount of time has lapsed. Automatically reset timer should there be any additional interruptions of the photoelectric sensors so the predetermined amount of time lapses from the last interruption before door starts to close. Permit user to set the predetermined amount of time.
- .6 Have door automatically open and remain open for a predetermined amount of time whenever the traffic loop is activated. Have door automatically close when a predetermined amount of time has lapsed. If photoelectric sensors are interrupted, automatically close doors based on sequences outlined for photoelectric sensors. Permit user to set the predetermined amount of time.

3.3 TRAFFIC LIGHTS

- .1 Equip only those doors, if indicated on the drawings, with traffic lights. Display a red light when the door is within a predetermined amount of time of the door automatically closing, and whenever the door is not in the fully-opened position. Display a green light all other times. Permit user to set the predetermined amount of time.

3.4 STARTUP SERVICES

- .1 Engage a factory-authorized service representative to perform startup services.
 - .1 Complete installation and startup checks according to manufacturer's written instructions.
 - .2 Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 ADJUSTING

- .1 Lubricate bearings and sliding parts; adjust doors to operate easily, free from warp, twist, or distortion, and with weathertight fit around entire perimeter.
- .2 Touch-up Painting: Immediately after welding galvanized track to track supports, clean field welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A 780.

3.6 MAINTENANCE SERVICE

- .1 Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by manufacturer's authorized service representative. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies shall be manufacture's authorized replacement parts and supplies.

3.7 DEMONSTRATION

- .1 Engage a factory-authorized service representative to train Departmental's maintenance personnel to adjust, operate, and maintain sectional overhead doors.

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Fixed and operable vinyl-framed windows.
- .2 Types of items you will not find described in this Section:
 - .1 Air/vapour barrier seals.
 - .2 Building wrap.

1.2 DEFINITIONS

- .1 Performance class designations according to AAMA/WDMA/CSA 101/I.S.2/A440-05:
 - .1 AW: Architectural.
 - .2 HC: Heavy Commercial.
 - .3 C: Commercial.
 - .4 LC: Light Commercial.
 - .5 R: Residential.
- .2 Minimum Test Size: Smallest size permitted for performance class (gateway test size). Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class.

1.3 PERFORMANCE REQUIREMENTS

- .1 General: Provide vinyl windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified, and that are of minimum test size indicated below:
 - .1 Size required by AAMA/WDMA/CSA 101/I.S.2/A440-05 for gateway performance.
- .2 Energy ratings: windows to be Energy Star certified to Canadian Standards Association as follows:
 - .1 Zone D.

1.4 SUBMITTALS

- .1 Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of vinyl window indicated.
- .2 Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances, installation details, and the following:
 - .1 Mullion details, including reinforcement and stiffeners.
 - .2 Joinery details.
 - .3 Expansion provisions.

- .4 Flashing and drainage details.
- .5 Weather-stripping details.
- .6 Glazing details.
- .7 Window cleaning provisions.
- .3 Samples for Verification: For vinyl windows and components required, prepared on Samples of size indicated below.
 - .1 Operable Window: Full-size unit with factory-applied finish.
- .4 Product Schedule: For vinyl windows. Use same designations indicated on Drawings.
- .5 Qualification Data: For manufacturer.
- .6 Product Test Reports: Based on evaluation of comprehensive tests performed within the last four years by a qualified testing agency for each type, class, grade, and size of vinyl window. Test results based on use of downsized test units will not be accepted.
- .7 Maintenance Data: For operable window sash, operating hardware, weather stripping and finishes to include in maintenance manuals.
- .8 Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

- .1 Manufacturer Qualifications: A manufacturer capable of fabricating vinyl windows that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.
- .2 Source Limitations: Obtain vinyl windows through one source from a single manufacturer.
- .3 Product Options: Information on Drawings and in Specifications establishes requirements for vinyl windows' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
- .4 Fenestration Standard: Comply with AAMA/WDMA 101/I.S.2/NAFS, *North American Fenestration Standard Voluntary Performance Specification for Windows, Skylights and Glass Doors*, for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
 - .1 Provide CSA-certified vinyl windows with an attached label.
- .5 Glazing Publications: Comply with published recommendations of glass manufacturers and with GANA's *Glazing Manual* unless more stringent requirements are indicated.

1.6 PROJECT CONDITIONS

- .1 Field Measurements: Verify vinyl window openings by field measurements before fabrication and indicate measurements on Shop Drawings.

- .1 Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating vinyl windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.7 WARRANTY

- .1 Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace vinyl windows that fails in materials or workmanship within specified warranty period.
 - .1 Failures include, but are not limited to, the following:
 - .1 Failure to meet performance requirements.
 - .2 Structural failures including excessive deflection, water leakage, air infiltration, or condensation.
 - .3 Faulty operation of movable sash and hardware.
 - .4 Deterioration of vinyl, other materials, and finishes beyond normal weathering.
 - .5 Failure of insulating glass.
 - .2 Warranty Period:
 - .1 Window: Two years from date of Substantial Completion.
 - .2 Glazing: 10 years from date of Substantial Completion.

Part 2 PRODUCTS

2.1 MATERIALS

- .1 Vinyl Extrusions: Rigid (unplasticized) hollow PVC extrusions, formulated and extruded for exterior applications, complying with AAMA/WDMA 101/LS.2/NAFS and the following:
 - .1 PVC Resins: 100 percent virgin resin.
 - .2 PVC Formulation: High impact, low heat build-up, lead free, nonchalking, and colour and UV stabilized.
 - .3 Extrusion Wall Thickness: Not less than 3.2 mm.
 - .4 Multichamber Extrusions: Profile designed with multichambers between interior and exterior faces of the extrusions.
- .2 Vinyl Trim and Glazing Stops: Material and finish to match frame members.
- .3 Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be noncorrosive and compatible with vinyl window members, cladding, trim, hardware, anchors, and other components.
 - .1 Exposed Fasteners: Unless unavoidable for applying hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.
- .4 Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions;

- .5 Reinforcing Members: Aluminum, or nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
- .6 Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action, and for complete concealment when vinyl window is closed.
 - .1 Weather-Stripping Material: Manufacturer's standard system and materials complying with AAMA/WDMA 101/I.S.2/NAFS.
- .7 Sliding-Type Weather Stripping: Provide woven-pile weather stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric. Comply with AAMA 701/702.
 - .1 Weather Seals: Provide weather stripping with integral barrier fin or fins of semi rigid, polypropylene sheet or polypropylene-coated material. Comply with AAMA 701/702.
- .8 Replaceable Weather Seals: Comply with AAMA 701/702.

2.2 WINDOW

- .1 Window Type: As indicated on Drawings.
 - .1 Provide integral and continuous nailing flange around all four sides of window.
 - .2 Do not provide brick moulding around windows, unless noted otherwise.
- .2 AAMA/WDMA Performance Requirements: Provide vinyl windows of performance indicated that comply with AAMA/WDMA/CSA 101/I.S.2/A440-05 unless more stringent performance requirements are indicated.
 - .1 Air Tightness: A3 / Fixed
 - .2 Water Tightness: B5
 - .3 Wind Load Resistance: C4
 - .4 Temperature Index: 54
 - .5 Forced Entry: F20
 - .6 Insect Screen Rating: S2

2.3 GLAZING

- .1 Glass: Clear, insulating-glass units, unless otherwise indicated on drawings; complying with Division 08 Section *Glazing*.
- .2 Glazing System: Manufacturer's standard factory-glazing system that produces weather tight seal.

2.4 HARDWARE

- .1 General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907 or other corrosion-resistant material compatible with vinyl; designed to smoothly operate, tightly close, and securely lock vinyl

windows, and sized to accommodate sash or ventilator weight and dimensions. Do not use aluminum in frictional contact with other metals. Where exposed, provide solid bronze or nonmagnetic stainless steel.

- .2 Counterbalancing Mechanism: Comply with AAMA 902.
- .3 Push-Bar Operators: Provide telescoping-type, push-bar operator designed to open and close ventilators with fixed screens.
- .4 Gear-Type Rotary Operators: Comply with AAMA 901 when tested according to ASTM E 405, Method A.
 - .1 Operation Function: All ventilators move simultaneously and securely close at both jambs without using additional manually controlled locking devices.
- .5 Four- or Six-Bar Friction Hinges: Comply with AAMA 904.
 - .1 Locking mechanism and handles for manual operation.
 - .2 Friction Shoes: Provide friction shoes of nylon or other nonabrasive, nonstaining, noncorrosive, durable material.
- .6 Limit Devices: Provide limit devices designed to restrict sash or ventilator opening.
 - .1 Safety Devices: Limit clear opening to 100 mm for ventilation; with custodial key release.

2.5 INSECT SCREENS

- .1 General: Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches. Fabricate insect screens to fully integrate with window frame. Locate screens on inside of window and provide for each operable exterior sash or ventilator.
 - .1 Aluminum Tubular Frame Screens: Comply with SMA 1004, *Specifications for Aluminum Tubular Frame Screens for Windows*, Architectural C-24 class or better.
 - .2 Aluminum Insect Screen Frames: Manufacturer's standard aluminum alloy complying with SMA 1004. Fabricate frames with mitred or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.
 - .1 Aluminum Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet with minimum wall thickness as required for class indicated.
 - .2 Finish: Manufacturer's standard.
 - .3 Glass-Fibre Mesh Fabric: 0.85-by-0.85 mm or 0.85-by-0.42 mm mesh of PVC-coated, glass-fibre threads; woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration, in the following colour. Comply with ASTM D 3656.

2.6 FABRICATION

- .1 Fabricate vinyl windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

- .1 Welded Frame and Sash/Ventilator Corners: Mitre-cut and fusion or chemically welded.
- .2 Fabricate vinyl windows that are reglazable without dismantling sash or ventilator framing.
- .3 Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator, unless otherwise indicated.
 - .1 Double-Hung Windows: Provide weather stripping only at horizontal rails of operable sash.
- .4 Factory-Glazed Fabrication: Except for light sizes in excess of 2500 mm width plus length, glaze vinyl windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 08 Section *Glazing* and with AAMA/WDMA 101/I.S.2/NAFS.
- .5 Glazing Stops: Provide nailed or snap-on glazing stops coordinated with Division 08 Section *Glazing* and glazing system indicated. Provide glazing stops to match sash and ventilator frames.
- .6 Hardware: Mount hardware through double walls of vinyl extrusions or provide corrosion-resistant steel reinforcement complying with requirements for reinforcing members, or do both.
- .7 Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.

2.7 VINYL FINISHES

- .1 Colour: integral, uniform, and homogenous colour. If not otherwise indicated, provide white interior and exterior.

Part 3 EXECUTION

3.1 EXAMINATION

- .1 Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate, and operational clearances. Examine wall flashings, vapour retarders, water and weather barriers, and other built-in components to ensure a coordinated, weather tight window installation.
 - .1 Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
 - .2 Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 76 mm of opening.
 - .3 Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.

- .4 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- .1 Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing windows, hardware, accessories, and other components.
- .2 Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.
- .3 Set sill members in bed of sealant or with gaskets, as indicated, for weather tight construction.
- .4 Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 ADJUSTING, CLEANING, AND PROTECTION

- .1 Adjust operating sashes and ventilators, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weather tight closure. Lubricate hardware and moving parts.
- .2 Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
- .3 Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.
- .4 Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- .5 Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

- .1 Section includes the following products:
 - .1 Float glass
 - .2 Safety glass, including laminated and tempered glass.
 - .3 Insulated Units
- .2 Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - .1 Windows.
 - .2 Doors.
 - .3 Glazed curtain walls.
 - .4 Storefront framing.
 - .5 Glazed entrances.
 - .6 Sloped glazing.
 - .7 Skylights.
 - .8 Interior borrowed lites.
 - .9 Fire-resistant glazing.
- .3 Types of items not described in this Section:
 - .1 Glass panels in decorative metal railings.
 - .2 Patterned glass.
 - .3 Decorative glass glazing.
 - .4 All-glass entrances and storefronts.
 - .5 Structural-sealant-glazed curtain walls.
 - .6 Mirrors.
 - .7 Fire-resistant glazing.
 - .8 Security glazing.
- .4 Related Requirements
 - .1 Section 01 33 00 - *Submittal Procedures.*
 - .2 Section 01 45 00 - *Quality Control.*
 - .3 Section 01 74 21 - *Construction/Demolition Waste Management and Disposal.*
 - .4 Section 01 78 00 - *Closeout Submittals.*
 - .5 Section 07 92 00 - *Joint Sealants.*
 - .6 Section 08 11 13 - *Hollow Metal Doors & Frames.*

1.2 REFERENCES

- .1 ASTM International

- .1 ASTM C542-05, Standard Specification for Lock-Strip Gaskets.
- .2 ASTM D790-07e1, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- .3 ASTM D1003-07e1, Standard Test Method for Haze and Luminous Transmittance of Plastics.
- .4 ASTM D1929-96(R2001)e1, Standard Test Method for Determining Ignition Temperature of Plastics.
- .5 ASTM D2240-05, Standard Test Method for Rubber Property - Durometer Hardness.
- .6 ASTM E84-10, Standard Test Method for Surface Burning Characteristics of Building Materials.
- .7 ASTM E330-02, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- .8 ASTM E 119, Fire Tests of Building Construction and Materials.
- .9 ASTM E2074-00, Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies.
- .10 ASTM E2010-01, Standard Test Method for Positive Pressure Fire Tests of Window Assemblies.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.
 - .2 CAN/CGSB-12.2-M91, Flat, Clear Sheet Glass.
 - .3 CAN/CGSB-12.3-M91, Flat, Clear Float Glass.
 - .4 CAN/CGSB-12.4-M91, Heat Absorbing Glass.
 - .5 CAN/CGSB-12.6-M91, Transparent (One-Way) Mirrors.
 - .6 CAN/CGSB-12.8-97, Insulating Glass Units.
 - .7 CAN/CGSB-12.8-97 (Amendment), Insulating Glass Units.
 - .8 CAN/CGSB-12.9-M91, Spandrel Glass.
 - .9 CAN/CGSB-12.10-M76, Glass, Light and Heat Reflecting.
 - .10 CAN/CGSB-12.11-M90, Wired Safety Glass.
 - .11 CAN/CGSB-12.12-M90, Plastic Safety Glazing Sheets.
- .3 Environmental Choice Program (ECP)
 - .1 CCD-045-95(R2005), Sealants and Caulking Compounds.
- .4 American National Standards Institute (ANSI):
 - .1 ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings
- .5 Glass Association of North American (GANA)
 - .1 GANA Glazing Manual - 2008.
 - .2 GANA Laminated Glazing Reference Manual - 2009.

- .6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.
- .7 National Fire Protection Association (NFPA):
 - .1 NFPA 80: Fire Doors and Windows.
- .8 Underwriters Laboratories, Inc. (UL):
 - .1 UL 263: Fire tests of Building Construction and Materials
- .9 Standard Council of Canada:
 - .1 ULC Standard CAN4-S104: Fire Tests of Door Assemblies.
 - .2 ULC Standard CAN4-S106: Fire Tests of Window Assemblies.
 - .3 CAN/ULC-S101M: Standard Methods of Fire Endurance Tests.

1.3 DEFINITIONS

- .1 Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- .2 Glass Thicknesses: Indicated by thickness designations in millimetres according to ASTM C 1036.
- .3 Interspace: Space between lites of an insulating-glass unit.

1.4 PERFORMANCE REQUIREMENTS

- .1 General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- .2 Delegated Design: For glass panels having a dimension in any one direction 1500 mm or greater design glass, including comprehensive engineering analysis according to CAN/CGSB-12.20 by a qualified professional engineer, using the following design criteria:
 - .1 Design Wind Loads: Calculated as per the National Building Code of Canada for project location, type of building and adjacent site conditions, but in no case less than 1.4 KPa and in no case less than loadings containing in *Cladding Wind Load Estimates*, if so attached with this project Manual.
 - .2 Design Snow Loads: As per the National Building Code of Canada for project location, type of building and adjacent site conditions.
 - .3 Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
 - .4 Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint colour indicated throughout Project.

- .5 Probability of Breakage for Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, design glass for a probability of breakage not greater than 0.001.
- .6 Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 25 mm, whichever is less.
- .7 Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- .8 Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - .1 Temperature Change: 67 deg C, ambient; 100 deg C, material surfaces.

1.5 ACTION SUBMITTALS

- .1 Product Data: For each glass product and glazing material indicated.
- .2 Glass Samples: For each type of [glass product other than clear monolithic vision glass] [the following products]; 300 mm square.
 - .1 Insulating glass.
- .3 Glazing Accessory Samples: For gaskets and sealants, in 300-mm lengths. Install sealant Samples between two strips of material representative in colour of the adjoining framing system.
- .4 Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

- .1 Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for tinted glass, coated glass, and insulating glass.
 - .1 For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- .2 Warranties: Sample of special warranties.

1.7 QUALITY ASSURANCE

- .1 Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance.
- .2 Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.
- .3 Source Limitations for Glass: Obtain all insulating glass from single source from single manufacturer.

- .4 Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
- .5 Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - .1 GANA Publications: GANA's *Laminated Glazing Reference Manual* and GANA's *Glazing Manual*.
 - .2 IGMA Publication for Insulating Glass: SIGMA TM-3000, *North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use*.
- .6 Insulating Glass Certification Program: Permanently marked either on spacers or at least one insulating unit component with appropriate certification label of inspecting and testing agency indicated below:
 - 1. Insulating Glass Manufacturers Alliance (IGMA) or Insulating Glass Manufacturers Association of Canada (IGMAC)
- .7 Provide safety glass permanently marked with the company name or logo and CAN/CGSB-12.1-M if the product meets categories 1 and 2, or mark as CAN/CGSB 12.1-M-1 if the product meets the requirements of Category 1 only.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- .2 Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.
- .3 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .4 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .5 Storage and Handling Requirements:
 - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect glazing and frames from nicks, scratches, and blemishes.
 - .3 Protect prefinished aluminum surfaces with wrapping.
 - .4 Replace defective or damaged materials with new.
- .6 Develop Waste Reduction Workplan related to Work of Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

- .7 Packaging Waste Management: remove for reuse and return of crates, as specified in Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.9 PROJECT CONDITIONS

- .1 Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
- .1 Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 4.4 deg C.

1.10 WARRANTY

- .1 Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
- .1 Warranty Period: Five years from date of Substantial Completion.
- .2 Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
- .1 Warranty Period: 10 years from date of Substantial Completion.

Part 2 PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

- .1 Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
- .1 Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
- .2 Strength: Where float glass is indicated, provide annealed float glass, heat-treated float glass, or fully tempered float glass as needed to comply with *Performance Requirements* Article. Where heat-strengthened glass is indicated, provide heat-treated float glass or fully tempered float glass as needed to comply with *Performance Requirements* Article. Where tempered glass is indicated, provide fully tempered float glass.

2.2 GLASS PRODUCTS

- .1 General
 - .1 Thickness: Unless otherwise indicated, provide 6 mm.
- .2 Float Glass: CAN/CGSB-12.3, Quality, Glazing.
- .3 Safety Glass: CAN/CGSB 12.1-M, and one of the following:
 - .1 Laminate float glass.
 - .2 Fully tempered float glass
 - .3 Laminated fully tempered float glass.
- .4 Fully Tempered Glass: CAN/CGSB 12.1-M, Type 2, Tempered Glass, Class B-Float Glass.

2.3 LAMINATED GLASS PRODUCTS

- .1 Laminated Glass: CAN/CGSB 12.1-M, Type 1. Use materials that have a proven record of no tendency to bubble, discolour, or lose physical and mechanical properties after fabrication and installation.
 - .1 Glass:
 - .1 Glass Type: float glass, unless otherwise noted, or otherwise required to meet performance criteria.
 - .2 Glass thickness: As required to meet the performance criteria but in no case less than 6 mm.
 - .2 Construction: Laminate glass with polyvinyl butyral interlayer or cast-in-place and cured-transparent-resin interlayer to comply with interlayer manufacturer's written recommendations.
 - .3 Interlayer:
 - .1 Interlayer Thickness: Provide thickness as required to comply with performance requirements but in no case less than 1.52 mm for sloped glazing and 0.76 mm for all other glazing.
 - .2 Interlayer Colour: Clear, unless otherwise indicated.
 - .4 Coatings: Unless otherwise noted, no coatings are required.
- .2 Provide safety glazing labelling.

2.4 INSULATING GLASS PRODUCTS

- .1 Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to CAN/CGSB-12.8, and complying with other requirements specified.
 - .1 Sealing System: Dual seal, with manufacturer's standard primary and secondary.
 - .2 Spacer: Manufacturer's standard high-performance spacer material and construction.
 - .3 Desiccant: Molecular sieve or silica gel, or blend of both.
 - .4 Overall Unit Thickness: 25 mm.

- .5 Thickness of Each Glass Lite: as required to meet the performance criteria but in no case less than 6.0 mm.
- .6 Interspace Content: Unless otherwise indicated, provide Argon gas.
- .7 Low-E Coating: applied to third surface.
 - .1 Light transmittance:
 - .1 Ultraviolet: 19%
 - .2 Visible: 70%
 - .3 Total Solar Energy: 33%
 - .2 Shading co-efficient: 0.44
 - .3 U-Value: winter 0.29 maximum, summer 0.27 maximum.
- .8 Glass Type:
 - .1 Doors, sidelights, and glass lites between heated and unheated paces and within 900 mm of finished floor: Safety glass.
 - .2 Provide float glass, unless a stronger glass is required to meet the performance criteria.

2.5 GLAZING GASKETS

- .1 Dense Compression Gaskets: Moulded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
 - .1 Neoprene complying with ASTM C 864.
 - .2 EPDM complying with ASTM C 864.
 - .3 Silicone complying with ASTM C 1115.
 - .4 Thermoplastic polyolefin rubber complying with ASTM C 1115.
- .2 Soft Compression Gaskets: Extruded or moulded, closed-cell, integral-skinned neoprene, EPDM, silicone, or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.
 - .1 Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.
- .3 Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with moulded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.6 GLAZING SEALANTS

- .1 General:
 - .1 Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

- .2 Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
- .3 Sealants used inside the weatherproofing system, shall have a VOC content of not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- .4 Colours of Exposed Glazing Sealants: As selected by Departmental Representative from manufacturer's full range.
- .2 Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

2.7 GLAZING TAPES

- .1 Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and non-migrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 - .1 AAMA 804.3 tape, where indicated.
 - .2 AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 - .3 AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- .2 Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
 - .1 AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 - .2 AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.8 MISCELLANEOUS GLAZING MATERIALS

- .1 General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- .2 Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- .3 Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- .4 Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- .5 Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

- .6 Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.9 FABRICATION OF GLAZING UNITS

- .1 Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- .2 Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- .3 Grind smooth and polish exposed glass edges and corners.

Part 3 EXECUTION

3.1 EXAMINATION

- .1 Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - .1 Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - .2 Presence and functioning of weep systems.
 - .3 Minimum required face and edge clearances.
 - .4 Effective sealing between joints of glass-framing members.
- .2 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- .1 Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- .2 Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

- .1 Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- .2 Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

- .3 Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- .4 Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- .5 Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- .6 Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- .7 Provide spacers for glass lites where length plus width is larger than 1270 mm.
 - .1 Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - .2 Provide 3-mm minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- .8 Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- .9 Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- .10 Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- .11 Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- .12 Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

- .1 Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- .2 Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- .3 Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

- .4 Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- .5 Do not remove release paper from tape until right before each glazing unit is installed.
- .6 Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.5 GASKET GLAZING (DRY)

- .1 Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- .2 Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints mitre cut and bonded together at corners.
- .3 Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weather tight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- .4 Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weather tight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- .5 Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- .1 Use sealant glazing method only if all other glazing methods are inappropriate.
- .2 Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- .3 Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- .4 Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 LOCK-STRIP GASKET GLAZING

- .1 Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system unless otherwise indicated.

3.8 CLEANING AND PROTECTION

- .1 Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove non-permanent labels and clean surfaces.
- .2 Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- .3 Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- .4 Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- .5 Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.9 GLAZING SCHEDULE

- .1 Provide glass units fabricated from clear, uncoated float glass, unless noted otherwise.
 - .1 Provide glass units installed in doors and frames located within 900 mm of the finished floor fabricated using safety glass, unless noted otherwise.
 - .1 Provide glass units installed in doors and frames located in fire separations fabricated from polished wired glass, unless noted otherwise.
 - .2 Provide heat-strength or fully tempered glass where required to meet performance requirements.
 - .2 Provide insulated glass units between heated and unheated spaces, and where noted otherwise.
 - .1 Provide monolithic glass units in all other locations, unless noted otherwise.

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

- .1 Interior Gypsum Board
 - .1 Gypsum wallboard, Regular, Type X.
 - .2 Trim accessories, including trims at window mullion interface.
 - .3 Joint treatment materials and spackling.
 - .4 Access doors in non-rated ceiling with lids made of gypsum board.

.2 Related Work:

- .1 Section 01 33 00 - *Submittal Procedures*
- .2 Section 01 74 21 - *Construction/Demolition Waste Management and Disposal*.
- .3 Section 06 10 53 - *Miscellaneous Rough Carpentry* for wood studs.
- .4 Section 09 91 23 - *Interior Painting*.

1.2 Types of Items not described in this Section:

- .1 Blanket insulation.
- .2 Metal access doors and frames.
- .3 Non-structural framing and suspension systems that support gypsum board panels.
- .4 Gypsum panels used in exterior applications.
- .5 Gypsum sheathing.
- .6 Metal shaft-wall framing, gypsum shaft liners, and other components of shaft-wall assemblies.
- .7 Textured finish.
- .8 Aluminum trims.
- .9 Wood and plywood blocking.

1.3 REFERENCES

.1 Aluminum Association (AA)

- .1 AA DAF 45-03(R2009), Designation System for Aluminum Finishes.

.2 ASTM International

- .1 ASTM C475-02(2007), Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- .2 ASTM C514-04(2009e1), Standard Specification for Nails for the Application of Gypsum Board.
- .3 ASTM C557-03(2009)e1, Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.

- .4 ASTM C840-08, Standard Specification for Application and Finishing of Gypsum Board.
- .5 ASTM C954-07, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
- .6 ASTM 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.
- .7 ASTM C1047-09, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
- .8 ASTM C1280-99, Standard Specification for Application of Gypsum Sheathing.
- .9 ASTM C1177/C1177M-08, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- .10 ASTM C1178/C1178M-08, Standard Specification for Glass Mat Water-Resistant Gypsum Backing Board.
- .11 ASTM C1396/C1396M-09a, Standard Specification for Gypsum Wallboard.
- .3 Association of the Wall and Ceilings Industries International (AWCI)
 - .1 AWCI Levels of Gypsum Board Finish-97.
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
 - .2 CAN/CGSB-71.25-M88, Adhesive, for Bonding Drywall to Wood Framing and Metal Studs.
- .5 Green Seal Environmental Standards (GS)
 - .1 GS-11-2008, 2nd Edition, Paints and Coatings.
- .6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1113-A2007, Architectural Coatings.
 - .2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.
- .7 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-07, Standard Method of Test of Surface Burning Characteristics of Building Materials and Assemblies.

1.4 ACTION SUBMITTALS

- .1 Product Data: For each type of product.
- .2 Samples: Submit samples for the following products:
 - .1 Trim Accessories: Full-size Sample in 300 mm long length for each trim accessory indicated or required.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

- .1 Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- .2 Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- .3 Do not install panels that are wet, those that are moisture damaged, and those that are mould damaged.
 - .1 Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - .2 Indications that panels are mould damaged include, but are not limited to, fuzzy or splotchy surface contamination and discolouration.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store gypsum board materials level in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect gypsum board assemblies from nicks, scratches, and blemishes.
 - .3 Protect from weather, elements and damage from construction operations.
 - .4 Handle gypsum boards to prevent damage to edges, ends or surfaces.
 - .5 Protect prefinished aluminum surfaces with strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.
 - .6 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section 01 35 21 - LEED Requirements.
- .5 Packaging Waste Management: remove for reuse by manufacturer of packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- .1 Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to CAN/ULC-S101 by an independent testing agency.
- .2 STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

- .1 Recycled Content of Gypsum Panel Products: (For LEED projects only) Postconsumer recycled content plus one-half of preconsumer recycled content not less than 15 percent.
- .2 Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
- .3 Long Edges: Tapered.

2.3 INTERIOR GYPSUM BOARD

- .1 Gypsum Board, Regular: ASTM C 1396/C 1396M.
- .2 Gypsum Board, Type X: ASTM C 1396/C 1396M.

2.4 TRIM ACCESSORIES

- .1 Interior Trim: ASTM C 1047.
 - .1 Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
 - .2 Shapes:
 - .1 Cornerbead.
 - .2 Bullnose bead.
 - .3 LC-Bead: J-shaped; exposed long flange receives joint compound.
 - .4 L-Bead: L-shaped; exposed long flange receives joint compound.
 - .5 U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - .6 Expansion (control) joint.
 - .7 Curved-Edge Cornerbead: With notched or flexible flanges.
- .2 Trim for Non-Rated Ceiling Access Hatches with lids made of Gypsum Board:
 - .1 PVC T-shaped Access Door Beads with 16mm flange for access door to rest on and longer exposed long flange for receiving joint compound.
- .3 Trim at Wall Interface with Window Mullions

- .1 Frame End Cap with snap on PVC battens, clear anodized aluminum, size to suit.
 - .1 Provide continuous black neoprene gasket between end cap and window mullion.

2.5 JOINT TREATMENT MATERIALS

- .1 General: Comply with ASTM C 475/C 475M.
- .2 Joint Tape:
 - .1 Interior Gypsum Board: Paper.
 - .2 Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
- .3 Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - .1 Prefilling: At open joints, rounded or bevelled panel edges, and damaged surface areas, use setting-type taping compound.
 - .2 Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
 - .1 Use setting-type compound for installing paper-faced metal trim accessories.
 - .3 Fill Coat: For second coat, use drying-type, all-purpose compound.
 - .4 Finish Coat: For third coat, use drying-type, all-purpose compound.
 - .5 Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

2.6 AUXILIARY MATERIALS

- .1 General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- .2 Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 - .1 For LEED projects only:
 - .1 Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - .2 Laminating adhesive shall comply with the testing and product requirements of the California Department of Health Services' *Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers*.
- .3 Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - .1 Use screws complying with ASTM C 954 for fastening panels to steel members from 0.84 to 2.84 mm thick.
 - .2 For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

- .4 Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 - .1 For LEED projects only:
 - .1 Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - .2 Acoustical joint sealant shall comply with the testing and product requirements of the California Department of Health Services' *Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers*.

Part 3 EXECUTION

3.1 EXAMINATION

- .1 Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- .2 Examine panels before installation. Reject panels that are wet, moisture damaged, and mould damaged.
- .3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- .1 Comply with ASTM C 840.
- .2 Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- .3 Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1.5 mm of open space between panels. Do not force into place.
- .4 Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- .5 Form control and expansion joints with space between edges of adjoining gypsum panels.
- .6 Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

- .1 Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 0.7 sq. m in area.
- .2 Fit gypsum panels around ducts, pipes, and conduits.
- .3 Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 6.4 to 9.5 mm wide joints to install sealant.
- .7 Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 6.4 to 12.7 mm wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- .8 Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- .9 Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.
- .10 STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

3.3 APPLYING INTERIOR GYPSUM BOARD

- .1 Single-Layer Application:
 - .1 On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 - .2 On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - .1 Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - .2 At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 - .3 On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 - .4 Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- .2 Multilayer Application:
 - .1 On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers

- at right angles to framing members and offset face-layer joints one framing member, 400 mm minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
- .2 On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
 - .3 On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
 - .4 Fastening Methods: Fasten base layers and face layers separately to supports with screws.
- .3 Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.
- .4 Curved Surfaces:
- .1 Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 300 mm long straight sections at ends of curves and tangent to them.
 - .2 For double-layer construction, fasten base layer to studs with screws 400 mm o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 300 mm o.c.

3.4 INSTALLING TRIM ACCESSORIES

- .1 General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- .2 Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Departmental Representative for visual effect.
- .3 Interior Trim: Install in the following locations:
 - .1 Cornerbead: Use at outside corners unless otherwise indicated.
 - .2 Bullnose Bead: Use where indicated.
 - .3 LC-Bead: Use at exposed panel edges.
 - .4 L-Bead: Use where indicated.
 - .5 U-Bead: Use where indicated.
 - .6 Curved-Edge Cornerbead: Use at curved openings.
- .4 Install wall end cap where gypsum board partition intersects with window mullion.

3.5 CEILING ACCESS HATCHES

- .1 Install ceiling access hatches in non-rated gypsum board ceilings as required to access mechanical or electrical devices.
- .2 Construct access hatches as per manufacturer's instructions for concealed hatches.
- .3 Construct access hatches parallel and perpendicular to adjacent wall surfaces and in alignment with each other whenever possible.
- .4 Construct access hatches 450 x 450 mm in size or larger as required for proper access. Limit variation in hatch sizes.

3.6 FINISHING GYPSUM BOARD

- .1 General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- .2 Prefill open joints, rounded or bevelled edges, and damaged surface areas.
- .3 Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- .4 Gypsum Board Finish Levels: Finish panels to according to ASTM C 840:
- .5 Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.
- .6 Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 PROTECTION

- .1 Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- .2 Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- .3 Remove and replace panels that are wet, moisture damaged, and mould damaged.
 - .1 Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - .2 Indications that panels are mould damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

3.8 SCHEDULES

- .1 Gypsum Board: Utilize the following gypsum board panels for the following applications::

- .1 Regular Type: Typical, unless noted otherwise.
- .2 Type X: Where required for fire-resistance-rated assembly.
- .3 Type C: Only where required for specific fire-resistance-rated assembly indicated.
- .4 Flexible Type: Installed at curved assemblies in two-layer application.
- .5 Abuse-Resistant Type: Only if noted on drawings, Regular and Type X as required.
- .6 Moisture- and Mould-Resistant Type, Regular and Type X as required, as follows:
 - .1 Throughout school building interiors.
 - .2 Interior face of exterior walls.
 - .3 Interior of locker rooms.
 - .4 Interior of washrooms.
 - .5 Interior of shower rooms.
 - .6 Interior of janitorial closet and storage rooms not otherwise tiled.
 - .7 In other locations specifically indicated on drawings.
- .2 Gypsum Board Finish Levels: Provide the following finish levels in the following locations.
 - .1 Level 1: Ceiling plenum areas, concealed areas, and where noted.
 - .2 Level 2: Panels that are substrate for tile.
 - .3 Level 3: Panels that are substrate for epoxy wall coatings.
 - .4 Level 4: At panel surfaces exposed to view when completed, unless noted otherwise.
 - .1 Primer and its application to surfaces are specified in Division 09 Section *Interior Painting*.
 - .5 Level 5: At panel surfaces scheduled for a semi-gloss or high-gloss paint finish but not within designated M&E rooms; and in other locations noted on Drawings.
 - .1 Primer and its application to surfaces are specified in other Division 09 Section *Interior Painting*.
 - .2 If drawings do not note the required paint gloss level then assume, for pricing purposes, that a Level 5 finish will not be required.

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Surface preparation and the application of paint systems on the following exterior substrates:
 - .2 Steel.
 - .3 Galvanized metal.
 - .4 Aluminum (not anodized or otherwise coated).
 - .5 Unfinished wood, including wood treated with tinted wood preservative.
 - .6 Shop-primed items.
 - .7 Pipe supports, valves, valve operator and appurtenances except:
 - .1 Aluminum jacket
 - .2 PVC piping or jacket
 - .3 Stainless steel
 - .2 Types of items not described in this Section:
 - .1 Shop priming of metal substrates with primers specified in this Section.
 - .2 Shop priming carpentry with primers specified in this Section.
 - .3 Factory priming and finishing specified in other Sections..
 - .4 Special-use coatings.
 - .5 Surface preparation and the application of paint systems on interior substrates.
 - .6 Surface preparation and the application of wood stains and transparent finishes on exterior wood substrates.
 - .3 Related Requirements:
 - .1 Section 01 33 00 - *Submittal Procedures*.
 - .2 Section 01 74 21 - *Construction/Demolition Waste Management and Disposal*.
 - .3 Section 01 78 00 - *Closeout Submittals*.
 - .4 Section 09 91 23 - *Interior Painting* for surface preparation and the application of paint systems on interior substrates
 - .4 Scope of Work of this Contract
 - .1 While drawings and schedules identify locations for some finishes, the scope of work entails painting all of the following exterior surfaces:
 - .1 All surfaces explicitly noted.
 - .2 All unfinished exterior surfaces that are either exposed-to-view or semi-exposed-to-view, unless otherwise noted.
 - .2 Specifically, do not paint:
 - .1 Grating.
 - .2 Concrete, brick, stone, or masonry, unless specifically indicated.
 - .3 Roofing membranes.

- .4 Stainless steel.
- .5 Aluminum handrail and aluminum stair and ladder components unless specifically indicated.
- .6 Anodized aluminum and factory-painted aluminum.
- .7 Glass.
- .8 Asphalt.
- .9 Exterior wood pressure treated with wood preservative, unless explicitly noted on drawings.

1.2 REFERENCES

- .1 Environmental Protection Agency (EPA)
 - .1 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings).
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual - February 2004.
 - .2 Standard GPS-1-05, MPI Green Performance Standard for Painting and Coatings.
- .4 National Fire Code of Canada.
- .5 Society for Protective Coatings (SSPC)
 - .1 Systems and Specifications, SSPC Painting Manual 2005.

1.3 DEFINITIONS

- .1 Concealed Surface: A surface that cannot be seen because the view from any angle is obstructed by an immovable object.
- .2 Exposed and semi-exposed surface: Any surface that is not a concealed surface.
- .3 Finish: a final surface treatment intended to enhance the appearance of a substrate or protect it from the adverse effects of its environmental, or both, and includes but is not limited to paint, stains, and coatings.
 - .1 Primer finish is not considered a finish.
 - .2 Gloss Levels:
 - .1 Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
 - .2 Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
 - .3 Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
 - .4 Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
 - .5 Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

- .6 Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

- .1 Product Data: For each type of product. Include preparation requirements and application instructions.
- .2 Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
- .1 Submit Samples on rigid backing, 200 mm square.
- .2 Step coats on Samples to show each coat required for system.
- .3 Label each coat of each Sample.
- .4 Label each Sample for location and application area.
- .3 Product List: For each product indicated, include the following:
- .1 Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
- .2 Printout of current *MPI Approved Products List* for each product category specified in Part 2, with the proposed product highlighted.
- .3 VOC content.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- .1 Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
- .1 Paint: 5 percent, but not less than 3.8 L of each material and color applied.

1.6 QUALITY ASSURANCE

- .1 MPI Standards:
- .1 Products: Complying with MPI standards indicated and listed in *MPI Approved Products List*.
- .2 Preparation and Workmanship: Comply with requirements in *MPI Architectural Painting Specification Manual* for products and paint systems indicated.
- .2 Mock-ups: Apply benchmark samples of each paint system indicated and each colour and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
- .1 Departmental Representative will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
- .1 Vertical and Horizontal Surfaces: Provide samples of at least 9 sq. m.
- .2 Other Items: Departmental Representative will designate items or areas required.
- .2 Final approval of colour selections will be based on benchmark samples.

- .1 If preliminary colour selections are not approved, apply additional benchmark samples of additional colours selected by Departmental Representative at no added cost to Owner.
- .3 Compatibility:
 - .1 Ensure type of paint used is compatible with the substrate being painted.
 - .2 If manufacturer of substrate being painted recommends use of selected paint products, limit use to these products only.
 - .1 Use only paints recommended by manufacturer of Division 07 *Mineral Fibre Cement Siding* products.

1.7 DELIVERY, STORAGE, AND HANDLING

- .1 Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 7 deg C.
 - .1 Maintain containers in clean condition, free of foreign materials and residue.
 - .2 Remove rags and waste from storage areas daily.
- .2 Fire Safety Requirements:
 - .1 Provide Type ABC fire extinguisher adjacent to storage area.
 - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
 - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada requirements.
- .3 Waste Management and Disposal:
 - .1 Separate waste materials for reuse in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal polystyrene packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan (WMP).
 - .4 Separate for recycling and place in designated containers Steel waste in accordance with Waste Management Plan (WMP).
 - .5 Place materials defined as hazardous or toxic in designated containers.
 - .6 Handle and dispose of hazardous materials in accordance with CEPA, regulations.
 - .7 Ensure emptied containers are sealed and stored safely.
 - .8 Unused coating materials must be disposed of at official hazardous material collections site as approved by Consultant.
 - .9 Paint, stain and wood preservative finishes and related materials (thinners, and solvents) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.
 - .10 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.

- .11 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
- .12 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into ground follow these procedures:
 - .1 Retain cleaning water for water-based materials to allow sediments to be filtered out.
 - .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
 - .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
 - .4 Dispose of contaminants in approved legal manner in accordance with hazardous waste regulations.
 - .5 Empty paint cans are to be dry prior to disposal or recycling (where available).
- .13 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.

1.8 PROJECT CONDITIONS

- .1 Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 10 and 35 deg C.
- .2 Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 3 deg C above the dew point; or to damp or wet surfaces.

Part 2 PRODUCTS

2.1 PAINT, GENERAL

- .1 Material Compatibility:
 - .1 Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - .2 For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- .2 Colours: In not noted otherwise, then selected by Departmental Representative from full range of colours.
- .3 Gloss Levels: As determined by Departmental Representative.

2.2 PRIMERS/SEALERS

- .1 Alkali-Resistant Primer: MPI #3.
- .2 Bonding Primer (Water Based): MPI #17.

- .3 Bonding Primer (Solvent Based): MPI #69.
- .4 Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint system indicated.

2.3 METAL PRIMERS

- .1 Alkyd Anticorrosive Metal Primer: MPI #79.
- .2 Quick-Drying Alkyd Metal Primer: MPI #76.
- .3 Cementitious Galvanized-Metal Primer: MPI #26.
- .4 Waterborne Galvanized-Metal Primer: MPI #134.
- .5 Quick-Drying Primer for Aluminum: MPI #95.

2.4 WOOD PRIMERS

- .1 Exterior Latex Wood Primer: MPI #6.
- .2 Exterior Alkyd Wood Primer: MPI #5.
- .3 Exterior Oil Wood Primer: MPI #7.

2.5 EXTERIOR LATEX PAINTS

- .1 Exterior Latex (Flat): MPI #10 (Gloss Level 1).
- .2 Exterior Latex (Semi gloss): MPI #11 (Gloss Level 5).
- .3 Exterior Latex (Gloss): MPI #119 (Gloss Level 6, except minimum gloss of 65 units at 60 deg).

2.6 EXTERIOR ALKYD PAINTS

- .1 Exterior Alkyd Enamel (Flat): MPI #8 (Gloss Level 1).
- .2 Exterior Alkyd Enamel (Semi gloss): MPI #94 (Gloss Level 5).
- .3 Exterior Alkyd Enamel (Gloss): MPI #9 (Gloss Level 6).

2.7 QUICK-DRYING ENAMELS

- .1 Quick-Drying Enamel (Semi gloss): MPI #81 (Gloss Level 5).
- .2 Quick-Drying Enamel (High Gloss): MPI #96 (Gloss Level 7).

2.8 TEXTURED AND HIGH-BUILD COATINGS

- .1 Latex Stucco and Masonry Textured Coating: MPI #42.

- .2 High-Build Latex (Exterior): MPI #40.

2.9 ALUMINUM PAINT

- .1 Aluminum Paint: MPI #1.

Part 3 EXECUTION

3.1 EXAMINATION

- .1 Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- .2 Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - .1 Wood: 15 percent.
- .3 Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- .4 Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - .1 Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- .1 Comply with manufacturer's written instructions and recommendations in *MPI Architectural Painting Specification Manual* applicable to substrates and paint systems indicated.
- .2 Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - .1 After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 - .2 Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- .3 Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
 - .1 Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- .4 Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- .5 Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

- .6 Wood Substrates:
 - .1 Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - .2 Sand surfaces that will be exposed to view, and dust off.
 - .3 Prime edges, ends, faces, undersides, and backsides of wood.
 - .4 After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION

- .1 Apply paints according to manufacturer's written instructions.
 - .1 Use applicators and techniques suited for paint and substrate indicated.
 - .2 Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
- .2 Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match colour of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- .3 If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, colour, and appearance.
- .4 Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and colour breaks.

3.4 CLEANING AND PROTECTION

- .1 At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- .2 After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- .3 Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Departmental Representative, and leave in an undamaged condition.
- .4 At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINTING SCHEDULE (Also referred on drawings as PTx)

- .1 Propose paint system for any surfaces not listed. Propose paint system consisting of a minimum of a prime coat, intermediate coat, and topcoat.
- .2 Steel Substrates:
 - .1 Alkyd System: MPI EXT 5.1D.

- .1 Prime Coat: Alkyd anticorrosive metal primer.
- .2 Intermediate Coat: Exterior alkyd enamel matching topcoat.
- .3 Topcoat: Exterior alkyd enamel.
- .3 Galvanized-Metal Substrates:
 - .1 Latex Over Water-Based Primer System: MPI EXT 5.3H.
 - .1 Prime Coat: Waterborne galvanized-metal primer.
 - .2 Intermediate Coat: Exterior latex matching topcoat.
 - .3 Topcoat: Exterior latex.
 - .4 Dressed Lumber Substrates: Including e Architectural woodwork and doors.
(Confirm with Departmental Representative prior to application.)
 - .1 Latex System: MPI EXT 6.3L.
 - .1 Prime Coat: Exterior latex wood primer.
 - .2 Intermediate Coat: Exterior latex matching topcoat.
 - .3 Topcoat: Exterior latex.
 - .5 Wood Panel Substrates: Including plywood siding, fascia, and soffits.
(Confirm with Departmental Representative prior to application.)
 - .1 Latex System: MPI EXT 6.4K.
 - .1 Prime Coat: Exterior latex wood primer.
 - .2 Intermediate Coat: Exterior latex matching topcoat.
 - .3 Topcoat: Exterior latex.
 - .6 Dimension Lumber Substrates, Nontraffic Surfaces: Including board siding, fencing, and undersides of decking. (Confirm with Departmental Representative prior to application.)
 - .1 Latex System: MPI EXT 6.2M.
 - .1 Prime Coat: Exterior latex wood primer.
 - .2 Intermediate Coat: Exterior latex matching topcoat.
 - .3 Topcoat: Exterior latex.

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Surface preparation and the application of paint systems on the following interior substrates:
 - .1 Steel.
 - .2 Galvanized metal.
 - .3 Wood.
 - .4 Gypsum board.
 - .5 Cotton or canvas insulation covering.
 - .2 Types of items not described in this Section:
 - .1 Wood stains and transparent finishes.
 - .2 Shop priming of metal substrates with primers specified in this Section.
 - .3 Shop priming carpentry with primers specified in this Section.
 - .4 Factory finishing of steel doors and frames and of wood doors; where specified.
 - .5 Gypsum board spackling.
 - .6 Special-use coatings, including epoxy coatings.
 - .7 Intumescent painting.
 - .8 Surface preparation and the application of paint systems on exterior substrates.
 - .9 Surface preparation and the application of wood stains and transparent finishes on interior wood substrates.
 - .3 Related Requirements:
 - .1 Section 01 33 00 - *Submittal Procedures*.
 - .2 Section 01 74 21 - *Construction/Demolition Waste Management and Disposal*.
 - .3 Section 01 78 00 - *Closeout Submittals*.
 - .4 Section 09 9113 - *Exterior Painting* for surface preparation and the application of paint systems on exterior substrates.
 - .4 Scope of Work of this Contract
 - .1 While drawings and schedules identify locations for some finishes, the scope of work entails painting all of the following interior surfaces:
 - .1 All surfaces explicitly noted to be painted.
 - .2 All surfaces scheduled to be covered with wall coverings.
 - .3 All unfinished surfaces that are either exposed-to-view or semi-exposed-to-view and not otherwise scheduled to receive another type of finish, excluding finished hardwood; unless otherwise noted.
 - .2 Specifically, do not paint any of the following surfaces:

- .1 Grating.
- .2 Concrete floors, unless specifically indicated.
- .3 Stainless steel.
- .4 Aluminum handrail and aluminum stair and ladder components.
- .5 PVC, rubber, copper, bronze or brass surfaces.

1.2 REFERENCES

- .1 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33
- .2 Environmental Protection Agency (EPA)
 - .1 EPA Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 - 1995, (for Surface Coatings).
- .3 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .4 Master Painters Institute (MPI)
 - .1 MPI Architectural Painting Specifications Manual, 2004.
- .5 National Fire Code of Canada - 1995
- .6 Society for Protective Coatings (SSPC)
 - .1 SSPC Painting Manual, Volume Two, 8th Edition, Systems and Specifications Manual.
- .7 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34 .

1.3 DEFINITIONS

- .1 Concealed Surface: A surface that cannot be seen because the view from any angle is obstructed by an immovable object.
- .2 Exposed and semi-exposed surface: Any surface that is not a concealed surface.
- .3 Finish: a final surface treatment intended to enhance the appearance of a substrate or protect it from the adverse effects of its environmental, or both, and includes but is not limited to paint, stains, coatings, laminates, tiles, fabrics and carpets.
 - .1 Primer finish is not considered a finish.
- .4 Unfinished Surface: A surface having no Finish.
- .5 Gloss Levels:

- .1 Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- .2 Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- .3 Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- .4 Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- .5 Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- .6 Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- .7 Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

- .1 Product Data: For each type of product. Include preparation requirements and application instructions.
- .2 Samples for Verification: For each type of paint system and in each colour and gloss of topcoat.
 - .1 Submit Samples on rigid backing, 200 mm square.
 - .2 Step coats on Samples to show each coat required for system.
 - .3 Label each coat of each Sample.
 - .4 Label each Sample for location and application area.
- .3 Product List: For each product indicated, include the following:
 - .1 Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 - .2 Printout of current *MPI Approved Products List* for each product category specified in Part 2, with the proposed product highlighted.
 - .3 VOC content.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- .1 Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - .1 Paint: 5 percent, but not less than 3.8 L of each material and colour applied.

1.6 QUALITY ASSURANCE

- .1 MPI Standards:
 - .1 Products: Complying with MPI standards indicated and listed in *MPI Approved Products List*.
 - .2 Preparation and Workmanship: Comply with requirements in *MPI Architectural Painting Specification Manual* for products and paint systems indicated.

- .2 Mock-ups: While paint colours may be specifically indicated in the documents, still proceed with mock-ups. Apply benchmark samples of each paint system indicated and each colour and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - .1 Departmental Representative will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - .1 Wall and Ceiling Surfaces: Provide samples of at least 9 sq. m.
 - .2 Other Items: Departmental Representative will designate items or areas required.
 - .2 Apply benchmark samples after permanent lighting and other environmental services have been activated.
 - .3 Final approval of colour selections will be based on benchmark samples.
 - .1 If preliminary colour selections are not approved, apply additional benchmark samples of additional colours selected by Departmental Representative at no added cost to Owner.

1.7 DELIVERY, STORAGE, AND HANDLING

- .1 Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 7 deg C.
 - .1 Maintain containers in clean condition, free of foreign materials and residue.
 - .2 Remove rags and waste from storage areas daily.
- .2 Fire Safety Requirements:
 - .1 Provide Type ABC fire extinguisher adjacent to storage area.
 - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
 - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada requirements.
- .3 Waste Management and Disposal:
 - .1 Separate waste materials for reuse in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal polystyrene packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan (WMP).
 - .4 Separate for recycling and place in designated containers Steel waste in accordance with Waste Management Plan (WMP).
 - .5 Place materials defined as hazardous or toxic in designated containers.
 - .6 Handle and dispose of hazardous materials in accordance with CEPA, regulations.
 - .7 Ensure emptied containers are sealed and stored safely.

- .8 Unused coating materials must be disposed of at official hazardous material collections site as approved by Consultant.
- .9 Paint, stain and wood preservative finishes and related materials (thinners, and solvents) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.
- .10 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
- .11 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
- .12 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into ground follow these procedures:
 - .1 Retain cleaning water for water-based materials to allow sediments to be filtered out.
 - .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
 - .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
 - .4 Dispose of contaminants in approved legal manner in accordance with hazardous waste regulations.
 - .5 Empty paint cans are to be dry prior to disposal or recycling (where available).
- .13 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.

1.8 PROJECT CONDITIONS

- .1 Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 10 and 35 deg C.
- .2 Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 3 deg C above the dew point; or to damp or wet surfaces.

Part 2 PRODUCTS

2.1 PAINT, GENERAL

- .1 Material Compatibility:
 - .1 Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - .2 For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

- .2 VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colourants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:
 - .1 Flat Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
 - .2 Nonflat Paints, Coatings, and Primers: VOC content of not more than 150 g/L.
 - .3 Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
 - .4 Floor Coatings: VOC not more than 100 g/L.
 - .5 Shellacs, Clear: VOC not more than 730 g/L.
 - .6 Shellacs, Pigmented: VOC not more than 550 g/L.
 - .7 Flat Topcoat Paints: VOC content of not more than 50 g/L.
 - .8 Nonflat Topcoat Paints: VOC content of not more than 150 g/L.
 - .9 Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
 - .10 Floor Coatings: VOC not more than 100 g/L.
 - .11 Shellacs, Clear: VOC not more than 730 g/L.
 - .12 Shellacs, Pigmented: VOC not more than 550 g/L.
 - .13 Primers, Sealers, and Undercoaters: VOC content of not more than 200 g/L.
 - .14 Dry-Fog Coatings: VOC content of not more than 400 g/L.
 - .15 Zinc-Rich Industrial Maintenance Primers: VOC content of not more than 340 g/L.
 - .16 Pre-Treatment Wash Primers: VOC content of not more than 420 g/L.
- .3 Chemical Components of Field-Applied Interior Paints and Coatings: Provide topcoat paints and anti-corrosive and anti-rust paints applied to ferrous metals that comply with the following chemical restrictions; these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:
 - .1 Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
 - .2 Restricted Components: Paints and coatings shall not contain any of the following:
 - .1 Acrolein.
 - .2 Acrylonitrile.
 - .3 Antimony.
 - .4 Benzene.
 - .5 Butyl benzyl phthalate.
 - .6 Cadmium.
 - .7 Di (2-ethylhexyl) phthalate.
 - .8 Di-n-butyl phthalate.

- .9 Di-n-octyl phthalate.
 - .10 1,2-dichlorobenzene.
 - .11 Diethyl phthalate.
 - .12 Dimethyl phthalate.
 - .13 Ethylbenzene.
 - .14 Formaldehyde.
 - .15 Hexavalent chromium.
 - .16 Isophorone.
 - .17 Lead.
 - .18 Mercury.
 - .19 Methyl ethyl ketone.
 - .20 Methyl isobutyl ketone.
 - .21 Methylene chloride.
 - .22 Naphthalene.
 - .23 Toluene (methylbenzene).
 - .24 1,1,1-trichloroethane.
 - .25 Vinyl chloride.
- .4 Colours: In not noted otherwise, then selected by Departmental Representative from full range of colours.
- .1 M&E equipment: Assume no colour coding required unless otherwise indicated in mechanical and electrical specification sections.
- .5 Gloss Levels: As determined by Departmental Representative.

2.2 **BLOCK FILLERS**

- .1 Interior/Exterior Latex Block Filler: MPI #4.
 - .1 VOC Content: E Range of E3.

2.3 **PRIMERS/SEALERS**

- .1 Interior Latex Primer/Sealer: MPI #50.
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 3.
- .2 Interior Alkyd Primer/Sealer: MPI #45.
 - .1 VOC Content: E Range of E2.
- .3 Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.

2.4 METAL PRIMERS

- .1 Alkyd Anticorrosive Metal Primer: MPI #79.
 - .1 VOC Content: E Range of E2.
- .2 Quick-Drying Alkyd Metal Primer: MPI #76.
 - .1 VOC Content: E Range of E3.
- .3 Rust-Inhibitive Primer (Water Based): MPI #107.
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 3.
- .4 Cementitious Galvanized-Metal Primer: MPI #26.
 - .1 VOC Content: E Range of E1.
- .5 Waterborne Galvanized-Metal Primer: MPI #134.
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 3.
- .6 Vinyl Wash Primer: MPI #80.
 - .1 VOC Content: E Range of E3.
- .7 Quick-Drying Primer for Aluminum: MPI #95.
 - .1 VOC Content: E Range of E3.

2.5 WOOD PRIMERS

- .1 Interior Latex-Based Wood Primer: MPI #39.
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 3.

2.6 LATEX PAINTS

- .1 Interior Latex (Flat): MPI #53 (Gloss Level 1).
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 2.5.
- .2 Interior Latex (Low Sheen): MPI #44 (Gloss Level 2).
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 3.
- .3 Interior Latex (Eggshell): MPI #52 (Gloss Level 3).
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 3.

- .4 Interior Latex (Satin): MPI #43 (Gloss Level 4).
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 3.5.
- .5 Interior Latex (Semigloss): MPI #54 (Gloss Level 5).
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 4.
- .6 Interior Latex (Gloss): MPI #114 (Gloss Level 6, except minimum gloss of 65 units at 60 deg).
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 4.
- .7 Institutional Low-Odour/VOC Latex (Flat): MPI #143 (Gloss Level 1).
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 5.5.
- .8 Institutional Low-Odour/VOC Latex (Low Sheen): MPI #144 (Gloss Level 2).
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 4.5.
- .9 Institutional Low-Odour/VOC Latex (Eggshell): MPI #145 (Gloss Level 3).
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 4.5.
- .10 Institutional Low-Odour/VOC Latex (Semigloss): MPI #147 (Gloss Level 5).
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 5.5.
- .11 High-Performance Architectural Latex (Low Sheen): MPI #138 (Gloss Level 2).
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 6.
- .12 High-Performance Architectural Latex (Eggshell): MPI #139 (Gloss Level 3).
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 6.
- .13 High-Performance Architectural Latex (Satin): MPI #140 (Gloss Level 4).
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 6.5.
- .14 High-Performance Architectural Latex (Semigloss): MPI #141 (Gloss Level 5).
 - .1 VOC Content: E Range of E3.

- .2 Environmental Performance Rating: EPR 7.
- .15 Exterior Latex (Flat): MPI #10 (Gloss Level 1).
 - .1 VOC Content: E Range of E3.
- .16 Exterior Latex (Semigloss): MPI #11 (Gloss Level 5).
 - .1 VOC Content: E Range of E3.
- .17 Exterior Latex (Gloss): MPI #119 (Gloss Level 6, except minimum gloss of 65 units at 60 deg).
 - .1 VOC Content: E Range of E3.

2.7 ALKYD PAINTS

- .1 Interior Alkyd (Flat): MPI #49 (Gloss Level 1).
 - .1 VOC Content: E Range of E3.
- .2 Interior Alkyd (Eggshell): MPI #51 (Gloss Level 3).
 - .1 VOC Content: E Range of E2.
- .3 Interior Alkyd (Semigloss): MPI #47 (Gloss Level 5).
 - .1 VOC Content: E Range of E2.
 - .2 Environmental Performance Rating: EPR 3.
- .4 Interior Alkyd (Gloss): MPI #48 (Gloss Level 6).
 - .1 VOC Content: E Range of E2.

2.8 QUICK-DRYING ENAMELS

- .1 Quick-Drying Enamel (Semigloss): MPI #81 (Gloss Level 5).
 - .1 VOC Content: E Range of E3.
- .2 Quick-Drying Enamel (High Gloss): MPI #96 (Gloss Level 7).
 - .1 VOC Content: E Range of E3.

2.9 TEXTURED COATING

- .1 Latex Stucco and Masonry Textured Coating: MPI #42.
 - .1 VOC Content: E Range of E3.

2.10 DRY FOG/FALL COATINGS

- .1 Latex Dry Fog/Fall: MPI #118.
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 3.
- .2 Waterborne Dry Fall: MPI #133.

- .1 VOC Content: E Range of E3.
- .2 Environmental Performance Rating: EPR 3.
- .3 Interior Alkyd Dry Fog/Fall: MPI #55.

- .1 VOC Content: E Range of E3.

2.11 ALUMINUM PAINT

- .1 Aluminum Paint: MPI #1.

- .1 VOC Content: E Range of E3.

2.12 FLOOR COATINGS

- .1 Interior Concrete Floor Stain: MPI #58.

- .1 VOC Content: E Range of E3.

- .2 Environmental Performance Rating: EPR 2.

- .2 Interior/Exterior Clear Concrete Floor Sealer (Water Based): MPI #99.

- .1 VOC Content: E Range of E3.

- .3 Interior/Exterior Clear Concrete Floor Sealer (Solvent Based): MPI #104.

- .1 VOC Content: E Range of E2.

- .4 Interior/Exterior Latex Floor and Porch Paint (Low Gloss): MPI #60 (maximum Gloss Level 3).

- .1 VOC Content: E Range of E3.

- .2 Environmental Performance Rating: EPR 3.

- .5 Exterior/Interior Alkyd Floor Enamel (Gloss): MPI #27 (Gloss Level 6).

- .1 VOC Content: E Range of E2.

- .2 Additives: Manufacturer's standard additive to increase skid resistance of painted surface.

Part 3 EXECUTION

3.1 EXAMINATION

- .1 Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

- .2 Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

- .1 Concrete: 12 percent.

- .2 Masonry (Clay and CMU): 12 percent.

- .3 Wood: 15 percent.
- .4 Gypsum Board: 12 percent.
- .5 Plaster: 12 percent.
- .3 Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- .4 Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - .1 Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- .1 Comply with manufacturer's written instructions and recommendations in MPI Architectural Painting Specification Manual applicable to substrates indicated.
- .2 Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - .1 After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 - .2 Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- .3 Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
 - .1 Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- .4 Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- .5 Clay Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content of surfaces or alkalinity of mortar joints to be painted exceed that permitted in manufacturer's written instructions.
- .6 Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- .7 Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.
 - .1 SSPC-SP 11, "Power Tool Cleaning to Bare Metal."

- .8 Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- .9 Aluminum Substrates: Remove surface oxidation.
- .10 Wood Substrates:
 - .1 Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - .2 Sand surfaces that will be exposed to view, and dust off.
 - .3 Prime edges, ends, faces, undersides, and backsides of wood.
 - .4 After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- .11 Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.
- .12 Plaster Substrates: Do not begin paint application until plaster is fully cured and dry.
- .13 Spray-Textured Ceiling Substrates: Do not begin paint application until surfaces are dry.
- .14 Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

- .1 Apply paints according to manufacturer's written instructions.
 - .1 Use applicators and techniques suited for paint and substrate indicated.
 - .2 Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - .3 Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- .2 Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match colour of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- .3 If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, colour, and appearance.
- .4 Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and colour breaks.
- .5 Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:
 - .1 Mechanical Work:

- .1 Uninsulated metal piping.
- .2 Uninsulated plastic piping.
- .3 Pipe hangers and supports.
- .4 Tanks that do not have factory-applied final finishes.
- .5 Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
- .6 Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
- .7 Mechanical equipment that is indicated to have a factory-primed finish for field painting.
- .2 Electrical Work:
 - .1 Galvanized and steel conduits.
 - .2 Electrical equipment that is indicated to have a factory-primed finish for field painting.

3.4 CLEANING AND PROTECTION

- .1 At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- .2 After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- .3 Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Departmental Representative, and leave in an undamaged condition.
- .4 At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR PAINTING SCHEDULE

- .1 Propose paint system for any surfaces not listed. Propose paint system consisting of a minimum of a prime coat, intermediate coat, and topcoat.
- .2 Steel Substrates:
 - .1 High-Performance Architectural Latex System: MPI INT 5.1R.
 - .1 Prime Coat: Alkyd anticorrosive metal primer.
 - .2 Intermediate Coat: High-performance Architectural latex matching topcoat.
 - .3 Topcoat: High-performance Architectural latex.
- .3 Galvanized-Metal Substrates:
 - .1 High-Performance Architectural Latex System: MPI INT 5.3M.

- .1 Prime Coat: Waterborne galvanized-metal primer.
- .2 Intermediate Coat: High-performance Architectural latex matching top-coat.
- .3 Topcoat: High-performance Architectural latex .
- .4 Dressed Lumber Substrates: Including Architectural woodwork and doors.
 - .1 High-Performance Architectural Latex System: MPI INT 6.3A.
 - .1 Prime Coat: Interior latex-based wood primer.
 - .2 Intermediate Coat: High-performance Architectural latex matching top-coat.
 - .3 Topcoat: High-performance Architectural latex.
- .5 Wood Panel Substrates: Including painted plywood, medium-density fiberboard, and hardboard.
 - .1 High-Performance Architectural Latex System: MPI INT 6.4S.
 - .1 Prime Coat: Interior latex-based wood primer.
 - .2 Intermediate Coat: High-performance Architectural latex matching top-coat.
 - .3 Topcoat: High-performance Architectural latex.
- .6 Dimension Lumber Substrates, Nontraffic Surfaces: Including exposed joists and exposed beams.
 - .1 High-Performance Architectural Latex System: MPI INT 6.2B.
 - .1 Prime Coat: Interior alkyd primer/sealer.
 - .2 Intermediate Coat: High-performance Architectural latex matching top-coat.
 - .3 Topcoat: High-performance Architectural latex.
- .7 Gypsum Board Substrates:
 - .1 High-Performance Architectural Latex System: MPI INT 9.2B.
 - .1 Prime Coat: Interior latex primer/sealer.
 - .2 Intermediate Coat: High-performance Architectural latex matching top-coat.
 - .3 Topcoat: High-performance Architectural latex.
- .8 Cotton or Canvas Insulation-Covering Substrates: Including pipe and duct coverings.
 - .1 Latex System: MPI INT 10.1A.
 - .1 Prime Coat: Interior latex matching topcoat.
 - .2 Intermediate Coat: Interior latex matching topcoat.
 - .3 Topcoat: Interior latex.

END OF SECTION

