



ARCHITECTURAL SPECIFICATION

DASHWOOD FIREHALL

230 HOBBS ROAD, QUALICUM BEACH BC
V9K 2B2

ISSUED FOR TENDER

JULY 22, 2022

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APPENDIX 1 GEOTECHNICAL

Report of Geotechnical Assessment (19 pages) dated June 21, 2021
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APPENDIX 2 ENERGY MODELLING REPORT

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STRUCTURAL	Refer to Drawings
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CIVIL	Refer to Drawings

END OF SECTION 00 01 10

PART 1 GENERAL

1.1 GENERAL NOTES

- .1 The Architect is not responsible for construction that does not follow these documents, unless revisions have been approved in entirety by the Architect.
- .2 All work shall comply with all provincial and municipal codes and by-laws.
- .3 The Contractor shall visit the site and become familiar with all conditions. The Contractor shall verify all dimensions and conditions shown on these drawings with those at the site. Any variation which requires physical change shall be brought to the attention of the Architect before commencement of the work.
- .4 Field review by Praxis Architects Inc: Praxis Architects Inc. provides field review only for the work shown on architectural drawings. This review is not a 'full time' review but is a periodic review at the sole discretion of Praxis Architects Inc.' representatives in order to ascertain that the work is in general conformance with the plans and supporting documents prepared by Praxis Architects Inc. Field review by Praxis Architects Inc. is not carried out for the Contractor's benefit, nor does it make Praxis Architects Inc. guarantors of the Contractor's Work. It remains the Contractor's responsibility to build the work in conformance with the Contract Documents.
- .5 Supervision notes:
 - .1 The General Contractor shall ensure that all shop drawings requiring the Architect's review are submitted to the Architect totally complete and early enough to avoid overtime work. Shop drawings are required for all items that are fabricated off-site that are to be incorporated into the Work.
 - .2 Provide 24 hr. notice prior to each field inspection. Our working hours are Monday to Friday, 9 AM to 5:00 PM. Any work outside normal working hours or on statutory holidays shall be requested a minimum of 48 hrs. in advance.
 - .3 The work to be reviewed by Praxis Architects Inc. shall be 100% complete. Time spent on re-checking caused by incomplete work at the time of inspection will be billed to the Owner.
 - .4 The scheduling of work by the Contractor shall be such that the number of field inspections requested is not greater than one in any one week of construction. Praxis Architects Inc. reserves the right to charge the Contractor directly for extra visits to suit their schedule.
- .6 This set of documents shows the completed project. They do not include the necessary components for safety. Safety, care of adjacent properties during construction and compliance with local regulations regarding safety shall be solely the responsibility of the Contractor, including the design and erection of all temporary structures, formwork, falsework, shoring, etc. required to complete the work.
- .7 The use of these drawings is limited to that identified in the revisions column. Do not construct from these drawings unless marked "Issued for Construction" by Praxis Architects Inc.
- .8 All dimensions are to the centre of stud on interior walls or to the face of sheathing on exterior walls - unless otherwise noted. All dimensions are metric and are to be checked and confirmed on site. Any variation shall be brought to the attention of the Architect.
- .9 Do not scale drawings.
- .10 All workmanship is to be of a standard equal in all respects to good building practice.
- .11 Caulk and seal over and around all exterior openings, ensuring that openings and gaps designed for pressure equalization and drainage of the rain screen system remain open. Refer to sealant section.
- .12 26 ga. step flashings to be installed at all locations where a sloped roof abuts a wall.

1.2 SUMMARY OF WORK

- .1 The work consists of the following:
A new 2 storey building w. surface parking.
Construction is a combination of pre-engineered steel building, insulated metal wall and roof panels w. steel stud interior framing. There is a small deck over occupied space that will receive SBS roof membrane assembly.

1.3 RELATED REQUIREMENTS

- .1 Definitions and General Conditions of the Stipulated Price Contract of the Standard Construction Document CCDC2 – latest edition, and the Supplementary Conditions shall govern all Work.
- .2 Protection of penetrations of required fire separations shall conform to tested assemblies and materials per ULC or Warnock-Hersey publications. The Architect and Municipal / Regional Building Official are to be provided copies of the test report information for each system used.
- .3 In accordance with the General Conditions of the Contract, whenever standards of the laws, ordinances, rules, regulations, codes and orders relating to the Work differ, the most stringent standards shall govern.

1.4 PROJECT COORDINATION

- .1 Coordinate progress of the work, progress schedules, submittals, use of site temporary utilities and construction facilities.

1.5 CUTTING AND PATCHING

- .1 Approvals: Submit a written request in advance of cutting or alteration, which affects:
 - Structural integrity of any element of the Project.
 - Integrity of weather-exposed or moisture-resistant elements.
 - Efficiency, maintenance, or safety of any operational element.
 - Visual qualities of sight-exposed elements.
- .2 Execute Work to avoid damage to other Work.
- .3 Employ experienced workers, experienced in the Work to be cut or patched to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .4 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .5 At penetration of fire-rated walls, floors and ceilings completely seal voids with fire-rated material, full thickness of the construction element per ULC and manufacturer's recommendations. At penetrations of floor and ceiling construction, completely seal voids against air-borne noises, to the full thickness of construction.
- .6 Refinish surfaces to match adjacent finishes; for continuous surfaces refinish to nearest intersection; for an assembly, refinish entire unit.

1.6 PROJECT MEETINGS

- .1 Administrative:
 - .1 The Contractor will schedule regular construction meetings and notify those required to attend a minimum of 4 days in advance.
 - .2 The Contractor shall review and stamp submittals prior to submission to the Architect. This review represents that necessary requirements have been determined and verified, or will be, and that each

submission has been checked and coordinated with the requirements of the Work and the Contract Documents.

- .3 Verify field measurements and affected adjacent Work are coordinated.

- .2 Shop Drawings and Product Data:

- .1 Submit shop drawings, product data sheets and samples as the Architect may reasonably request.

- .2 It is understood that the following is to apply to every shop drawing submitted for review:

"This review by the Architect is for the sole purpose of ascertaining conformance with the general design concept. This review shall not mean that the Architect approves the detail design inherent in the shop drawings, responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the Contractor of his responsibility for errors or omissions in the shop drawings or of his responsibility for meeting all requirements of the Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for coordination of the work of all Subtrades".

1.7 **QUALITY CONTROL**

- .1 Conform to British Columbia Building Code 2018, British Columbia Occupational Health and Safety Act, and current editions of all other Standards and Regulations noted.
- .2 All electrical equipment, fixtures to be CSA approved and carry the appropriate CSA label.

1.8 **MATERIAL AND EQUIPMENT**

- .1 Product and Material Quality:

- .1 Defective products will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is a precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

- .2 Storage, Handling and Protection:

- .1 Handle and store products in a manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

- .3 Manufacturer's Instructions:

- .1 Unless otherwise indicated in the Specifications, install products in accordance with manufacturer's instructions.

- .4 Hazardous Materials Information:

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labeling and provision of material safety data sheets (MSDS) in accordance with jurisdictional authorities.

- .1 Deliver copies of Material Safety Data Sheets (MSDS) to Owner on all products intended for use in the building.

- .5 Workmanship: Workmanship shall be the best quality, executed by workers experienced and skilled in the respective duties for which they are employed. Immediately notify the Architect if required Work is such as to make it impractical to produce required results.

- .6 Concealment: In finished areas, conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise. Remove debris, sawdust, and waste materials from inside walls, pipe chases, and other concealed spaces.

1.9 PROJECT CLOSEOUT

- .1 Final Cleaning:
 - .1 Remove waste materials and debris from the site at regularly scheduled times or dispose of as directed. Do not burn waste materials on site.
 - .2 Leave the Work broom clean before the inspection process commences.
 - .3 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, mechanical and electrical fixtures as applicable. Replace broken, scratched or disfigured glass.
 - .4 Remove stains, spots, marks and dirt from decorative Work, electrical and mechanical fixtures, furniture fittings and walls.
 - .5 Vacuum clean and dust building interiors, behind grilles, louvers and screens and interiors of cabinetry and millwork.
 - .6 Prepare floor finishes, as recommended by the manufacturer.
 - .7 Broom clean and wash exterior walks, steps and surfaces.
 - .8 Remove dirt and other disfigurements from exterior surfaces.
- .2 Systems Demonstration: Prior to final inspection, demonstrate operation of each system to Owner.

END OF SECTION 01 00 00

PART 1 GENERAL

1.1 WORK COVERED BY CONSTRUCTION DOCUMENTS

- .1 Project Number 20-007 is entitled Dashwood Firehall Replacement. It is located in Qualicum Beach, British Columbia.

1.2 SUMMARY OF WORK

- .1 The construction of a firehall located at 230 Hobbs Road in accordance with the Construction Documents.
- .2 The Authority having jurisdiction for this project is:

Regional District of Nanaimo
6300 Hammond Bay Road
Nanaimo, BC
V9T 6N2
- .3 The Project consists of a new 2-storey firehall, with concrete aprons front and rear of apparatus bays and surface parking at grade. The building shall be a pre-engineered steel building of materials that include but are not limited to the following: Concrete foundations, slab on grade, and floor topping (over q-deck). Exterior cladding is insulated metal panel. Storefront glazing systems will be installed for windows and doors on both levels of the building. Roof deck at level 2 will receive concrete or porcelain pavers on pedestals over SBS membrane assembly. Roof over level 2 and apparatus bays will be insulated metal roof panel. Refer to drawings for size of building.

1.3 LEGAL DESCRIPTION

Lot 1, District Lot 80, Newcastle District, Plan 41282

1.4 PRECEDENCE OF DOCUMENTS

- .1 If there is a conflict within the Construction Documents:
 - .1 Drawings of a larger scale shall govern over those of smaller scale of the same date.
 - .2 Dimensions shown on Drawings shall govern over dimensions scaled from Drawings
 - .3 Later dated documents shall govern over earlier documents of the same type

1.5 CONSTRUCTION RESPONSIBILITY

- .1 The contractor shall be responsible for construction means, methods, techniques, sequences, and procedures employed in the performance of the work.
- .2 The Architect is not responsible for construction that does not follow the construction documents, unless revisions have been approved in entirety by the Architect.
- .3 Work to conform with latest provincial and municipal codes and by-laws, including those pertaining to health and safety.
- .4 The Contractor shall verify all dimensions and conditions shown on these drawings with those at the site. Any variation which requires physical change shall be brought to the attention of the Architect before commencement of the work.
- .5 This set of documents shows the completed project. They do not include the necessary components for safety. Safety, care of adjacent properties during construction and compliance with local regulations regarding safety shall be solely the responsibility of the Contractor, including the design and erection of all temporary structures, formwork, falsework, shoring, etc. required to complete the work.

- .6 The use of these drawings is limited to that identified in the revisions column. Do not construct from these drawings unless marked "Issued for Construction" by Praxis Architects Inc.
- .7 All dimensions are to the centre of stud on interior walls or to the face of sheathing on exterior walls - unless otherwise noted. All dimensions are metric and to be checked and confirmed on site. Any variation shall be brought to the attention of the Architect.
- .8 Do not scale drawings.
- .9 All workmanship is to be of a standard equal in all respects to good building practice.
- .10 Caulk and seal over and around all exterior openings, ensuring that openings and gaps designed for pressure equalization and drainage of the rain screen system remain open. Refer to sealant section.
- .11 All concealed roof spaces are to be vented per latest B.C. Building Code standards, unless insulation is entirely above deck.
- .12 Tree protection as applicable is the responsibility of the contractor.

END OF SECTION 01 11 00

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Requests for alternatives during period of construction.

1.2 CHANGES TO BASIS OF DESIGN SPECIFIED PRODUCTS AND MANUFACTURERS

- .1 Prior to any changes in basis of design specified products and manufacturers, provide information to Architect for review to ensure performance and other relevant data is in general conformance with the construction documents.

END OF SECTION 01 23 00

PART 1 GENERAL

1.1 ADMINISTRATIVE

- .1 Schedule and administer project meetings throughout the progress of the work as required.
- .2 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.
- .3 Distribute copies of minutes within a timely fashion to meeting participants and affected parties not in attendance.

END OF SECTION 01 31 19

PART 1 GENERAL

1.1 ADMINISTRATIVE

- .1 Submit to Consultant submittals listed for review. Submit to allow adequate time for review by Consultant.
 1. Provide submittal schedule as soon as possible for scheduling and management.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Review submittals prior to submission to Consultant. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Construction Documents. Submittals to be stamped, signed, dated and identified to specific project prior to submission to Consultant.
- .5 Identify deviations from requirements of Construction Documents as outlined in section 01 23 00 Alternatives.
- .6 Verify field measurements and affected adjacent Work are coordinated.
- .7 Contractor's responsibility for errors and omissions or deviations in submission is not relieved by Consultant's review of submittals.

1.2 SHOP DRAWING AND PRODUCT DATA

- .1 As required, submit drawings stamped and signed by professional engineer registered or licensed in British Columbia, Canada. Include for provision of Schedules.
- .2 Allow 5 working days for Consultant's review of each submission.
- .3 Make changes in shop drawings as Consultant may require, consistent with Contract Documents. When resubmitting, notify Consultant in writing of revisions other than those requested.
- .4 Submissions include:
 - .a Date and revision dates.
 - .b Project title and number.
 - .c Name and address of: .i Subcontractor, .ii Supplier, .iii Manufacturer.
 - .d Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Construction Documents.
- .5 Submit electronic copy of shop drawings for each requirement requested in specification sections and as Consultant may reasonably request.
- .6 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Consultant where shop drawings will not be prepared due to standardized manufacture of product.
- .7 The review of shop drawings by Consultant is for sole purpose of ascertaining conformance with general concept.
 - .a This review shall not mean that Consultant approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
 - .b Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.3 SAMPLES

- .1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Notify Consultant in writing, at time of submission of deviations in samples from requirements of Construction Documents.
- .3 Where colour, pattern or texture is criterion, submit full range of samples.
- .4 Make changes in samples which Consultant may require, consistent with Contract Documents.
- .5 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.4 MOCK-UPS

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

END OF SECTION 01 33 00

PART 1 GENERAL

1.1 INSPECTION

- .2 Allow Consultant access to Work.
- .3 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Consultant instructions, or law of Place of Work
- .4 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.
- .5 Consultant will order part of Work to be examined if Work is suspected to be not in accordance with Construction Documents.

1.2 INDEPENDENT INSPECTION AGENCIES

- .1 Independent Inspection/Testing Agencies may be required for purpose of inspecting and/or testing portions of Work.
- .2 Provide equipment required for executing inspection and testing by appointed agencies.
- .3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Construction Documents.
- .4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Consultant based on inspection and/or testing reports.

1.3 ACCESS TO WORK

- .1 Allow inspection/testing agencies access to Work.
- .2 Co-operate to provide reasonable facilities for such access.

1.4 PROCEDURES

- .1 Notify appropriate agency and Consultant 48 hours in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.5 REJECTED WORK

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

1.6 REPORTS

- .1 Submit copies of inspection and test reports to Consultant as applicable.

1.7 TESTS AND MIX DESIGNS

- .1 Furnish test results and mix designs as requested.

1.8 MOCK-UPS

- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.
- .2 Allow time for adequate notice and Consultant review of mock-ups.
- .3 Mock-ups may remain as part of Work as applicable.
- .4 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when

1.9 EQUIPMENT AND SYSTEMS

- .1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems as indicated in applicable specification section.

END OF SECTION 01 45 00

PART 1 GENERAL

1.1 QUALITY

- .1 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.
- .2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .3 Should disputes arise as to quality or fitness of products, decision rests strictly with Consultant based upon requirements of Construction Documents.
- .4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.2 STORAGE, HANDLING AND PROTECTION

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

1.3 MANUFACTURER'S INSTRUCTIONS

- .1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Consultant in writing, of conflicts between specifications and manufacturer's instructions, so that course of action can be established.

1.4 QUALITY OF WORK

- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Consultant if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties.

1.5 COORDINATION

- .1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.6 CONCEALMENT

- .1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
- .2 Before installation inform Consultant if there is interference. Install as directed by Consultant.

1.7 REMEDIAL WORK

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

1.8 LOCATION OF FIXTURES

- .1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.
- .2 Inform Consultant of conflicting installation. Install as directed.

1.9 FASTENINGS

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

1.10 FASTENINGS – EQUIPMENT

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.11 PROTECTION OF WORK IN PROGRESS

- .1 Prevent overloading of parts of building. Do not cut, drill or sleeve load bearing structural member, unless specifically indicated without written approval of Consultant.

1.12 EXISTING UTILITIES

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and/or building occupants and pedestrian and vehicular traffic.
- .2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

END OF SECTION 01 61 00

PART 1 GENERAL

1.1 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris.
- .2 Remove and dispose of waste materials from site at periodic intervals and in conformance with legal requirements.
- .3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .4 Provide on-site containers for collection of waste materials and debris.
- .5 Provide and use marked separate bins for recycling. Refer to Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .6 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .7 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .8 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .9 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .10 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.2 FINAL CLEANING

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste products and debris including that caused by other Contractors.
- .5 Skilled workers to be employed for final cleaning.
- .6 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.
- .7 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, floors and ceilings
- .9 Clean lighting reflectors, lenses, and other lighting surfaces.
- .10 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .11 Prepare floor finishes, as recommended by manufacturer.
- .12 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

- .13 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .14 Remove dirt and other disfiguration from exterior surfaces.
- .15 Sweep and wash clean paved areas.
- .16 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .17 Clean roofs, downspouts, and drainage systems.
- .18 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

1.3 WASTE MANAGEMENT AND DISPOSAL

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

END OF SECTION 01 74 11

PART 1 GENERAL

1.1 WASTE MANAGEMENT GOALS

- .1 Minimize amount of non-hazardous solid waste generated by project and accomplish maximum source reduction, reuse and recycling of solid waste produced by construction activities.
- .2 Protect environment and prevent environmental pollution damage.
- .3 Conform to applicable codes and regulations for disposal of non-hazardous, hazardous, and banned materials.

1.2 REFERENCE STANDARDS

- .1 British Columbia Environmental Management Act (EMA)
- .2 British Columbia Hazardous Waste Regulation (HWR)

1.3 USE OF SITE AND FACILITIES

- .1 Execute Work with minimal interference and disturbance to normal use of surroundings.
- .2 Provide temporary security measures as applicable to secure the site.

1.4 STORAGE, HANDLING AND PROTECTION

- .1 Provide on-site facilities and containers for collection and storage of reusable and recyclable materials.
- .2 Protect surface drainage, mechanical and electrical from damage and blockage.
- .3 Separate and store materials produced during project in designated areas.

1.5 DISPOSAL OF WASTES

- .1 Do not bury rubbish or waste materials.
- .2 Remove materials on-site as Work progresses.

1.6 SCHEDULING

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

END OF SECTION 01 74 21

PART 1 GENERAL

1.1 ADMINISTRATIVE REQUIREMENTS

.1 Acceptance of Work Procedures:

.1 Contractor's Inspection: Contractor to conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Construction Documents.

.i Notify Consultant in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.

.ii Request Consultant's inspection.

.2 Consultant's Inspection:

.i Consultant and Contractor to inspect Work and identify defects and deficiencies.

.ii Contractor to correct Work as directed.

.3 Completion Tasks: submit written certificates that tasks have been performed as follows:

.i Work: completed and inspected for compliance with Contract Documents.

.ii Defects: corrected and deficiencies completed.

.iii Equipment and systems: tested, adjusted, balanced and fully operational.

.iv Certificates required by third parties as applicable: submitted.

.v Operation of systems: demonstrated to Owner's personnel.

.vi Commissioning of mechanical systems: completed in accordance with 22 00 00 and copies of final Commissioning Report submitted to Consultant.

.vii Work: complete and ready for final inspection.

.4 Final Inspection:

.i When completion tasks are done, request final inspection of Work by Consultant and Contractor.

.ii When Work is incomplete according to Consultant, complete outstanding items and request re-inspection.

1.2 FINAL CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for and recycling in accordance with Section 01 74 21 – Construction Waste Management and Disposal.

END OF SECTION 01 77 00

PART 1 GENERAL

1.1 ACTION AND INFORMATION SUBMITTALS

- .1 Submit digital copy of operating and maintenance manuals.
- .2 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.

1.2 FORMAT

- .1 Organize data as instructional manual.
- .2 Arrange content by systems, under Section numbers and sequence of Table of Contents.
- .6 Provide section for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Include manufacturer's printed data, or typewritten data.
- .8 Include construction drawings.

1.3 CONTENTS – PROJECT RECORD DOCUMENTS

- .1 Table of Contents: provide title of project;
 - .1 Date of submission; names.
 - .2 Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
 - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data.
 - .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

1.4 RECORDING INFORMATION OF PROJECT RECORD DOCUMENTS

- .1 Record information on set of drawings
- .2 Maintain separate colours for recording information of each major system.
- .3 Record information concurrently with construction progress.
 - .1 Do not conceal Work until required information is recorded.
- .4 Construction Drawings and shop drawings: mark each item to record actual construction, including:
 - .1 Measured depths of elements of foundation in relation to finish first floor datum.

- .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
- .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.

1.5 FINAL SURVEY

- .1 Submit final site survey certificate, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

1.6 EQUIPMENT AND SYSTEMS

- .1 For each item of equipment and each system include description of unit or system, and component parts.
 - .1 Give function, normal operation characteristics and limiting conditions.
 - .2 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.
 - .1 Include regulation, control, stopping, shut-down, and emergency instructions.
 - .2 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 Include manufacturer's printed operation and maintenance instructions.
- .7 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .8 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.
- .9 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .10 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .11 Include test and balancing reports as specified in referenced specification Section.
- .12 Additional requirements: as specified in individual specification sections.

1.7 MATERIALS AND FINISHES

- .1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
 - .1 Provide information as applicable 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.

1.8 MAINTENANCE MATERIALS

- .1 Spare Parts:
 - .1 Provide spare parts, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to site; place and store.
 - .4 Receive and catalogue items.
 - .i Submit inventory listing to Consultant.
 - .ii Include approved listings in Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
- .2 Extra Stock Materials:
 - .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to site; place and store.
 - .4 Receive and catalogue items.
 - .i Submit inventory listing to Consultant.
 - .ii Include approved listings in Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
- .3 Special Tools:
 - .1 Provide special tools, in quantities specified in individual specification section.
 - .2 Provide items with tags identifying their associated function and equipment.
 - .3 Deliver to [site] [location as directed]; place and store.
 - .4 Receive and catalogue items.
 - .i Submit inventory listing to Consultant.
 - .ii Include approved listings in Maintenance Manual.

1.9 DELIVERY, STORAGE AND HANDLING

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

1.10 WARRANTIES AND BONDS

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Warranty management plan to include required actions and documents to assure that Owner receives warranties to which it is entitled.
- .3 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .4 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:

- .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
 - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
 - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
 - .4 Verify that documents are in proper form, contain full information, and are notarized.
 - .5 Co-execute submittals when required.
 - .6 Retain warranties and bonds until time specified for submittal.
-
- .5 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
 - .6 Conduct joint 1 year warranty inspection, measured from time of acceptance, by Consultant.
 - .7 Include information contained in warranty management plan as follows:
 - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
 - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include, but not necessarily be limited to roofs, HVAC balancing, pumps, motors, commissioned systems such as fire protection, alarm systems, lightning protection systems.
 - .3 Provide list for each warranted equipment, item, feature of construction or system indicating:
 - .i Name of item.
 - .ii Model and serial numbers.
 - .iii Location where installed.
 - .iv Name and phone numbers of manufacturers or suppliers.
 - .v Names, addresses and telephone numbers of sources of spare parts.
 - .vi Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
 - .vii Cross-reference to warranty certificates as applicable.
 - .viii Starting point and duration of warranty period.
 - .ix Summary of maintenance procedures required to continue warranty in force.
 - .x Cross-Reference to specific pertinent Operation and Maintenance manuals.
 - .xi Organization, names and phone numbers of persons to call for warranty service.
 - .xii Typical response time and repair time expected for various warranted equipment.
 - .4 Contractor's plans for attendance at 1 year post-construction warranty inspections.
 - .5 Procedure and status of tagging of equipment covered by extended warranties.
 - .6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
 - .10 Respond in timely manner to oral or written notification of required construction warranty repair work.
 - .11 Written verification to follow oral instructions.
 - .1 Failure to respond will be cause for the Owner to proceed with action against Contractor.

END OF SECTION 01 78 00

PART 1 GENERAL

1.1 SECTION INCLUDES

1. Cast-in-place architectural concrete, including form facings, reinforcement accessories, concrete materials, concrete mixtures, concrete placement, and concrete finishes.

1.2 RELATED REQUIREMENTS

- .1 Section 03 30 00 Cast-in-Place Concrete

1.3 DEFINITIONS

- .1 Aggregate Exposure: Projection of coarse aggregate from matrix or mortar after completion of exposure operations.
- .2 Cast-in-Place Architectural Concrete: Concrete that is exposed to view, is designated as architectural concrete, and that requires special concrete materials, formwork, placement, or finishes to obtain specified architectural appearance.
- .3 Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume or metakaolin; materials subject to compliance with requirements.
- .4 Design Reference Sample: Sample designated by Architect in the Contract Documents that reflects acceptable surface quality and appearance of cast-in-place architectural concrete.
- .5 w/cm: The ratio by mass of water to that of cementitious materials.

1.4 SUBMITTALS

- .1 Comply with Section 01 33 00 - Submittal Procedures.

ACTION SUBMITTALS

- .2 Product Data: for each of the following:
 - .1 Form-facing panels.
 - .2 Form liners.
 - .3 Form joint tape.
 - .4 Form joint sealant.
 - .5 Wood sealer.
 - .6 Form-release agent.
 - .7 Surface retarder.
 - .8 Form ties.
 - .9 Bar supports.
 - .10 Portland cement.
 - .11 Fly ash.
 - .12 Slag cement.
 - .13 Blended hydraulic cement.
 - .14 Silica fume.
 - .15 Performance-based hydraulic cement.
 - .16 Aggregates.
 - .17 Admixtures:
 - a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
 - .18 Color pigments.
 - .19 Repair materials.

- .3 Design Mixtures: For each concrete mixture, include the following:
 - .1 Mixture identification.
 - .2 Minimum 28-day compressive strength.
 - .3 Durability exposure class.
 - .4 Maximum w/cm.
 - .5 Calculated equilibrium unit weight, for lightweight concrete.
 - .6 Slump limit.
 - .7 Air content.
 - .8 Nominal maximum aggregate size.
 - .9 Steel-fiber reinforcement content.
 - .10 Synthetic microfiber content.
 - .11 Amounts of mixing water to be withheld for later addition at Project site if permitted.
 - .12 Intended placement method.
 - .13 Alternative design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- .4 Shop Drawings:
 - .1 Formwork: Prepared by, and signed and sealed by, a qualified professional engineer responsible for their preparation, detailing fabrication, assembly, and support of forms.
 - a. Show formwork construction, including form-liner layout, form-liner termination details, dimensioned locations of form-facing material joints, rustications, construction and contraction joints, form joint-sealant details, form-tie locations and patterns, inserts and embedments, cutouts, cleanout panels, and other items that visually affect cast-in-place architectural concrete.
 - 1) Included separate layout for formwork used in field sample panels and mockups.
 - 2) Indicate proposed schedule and sequence of stripping of forms, shoring removal, and reshoring installation and removal.
 - 3) Location of construction joints is subject to approval of Architect.
- .5 Samples: For each of the following materials:
 - .1 Form ties.
 - .2 Form liners, 305 x 305mm sample, indicating texture.
 - .3 Manufacturer's standard colors for color pigment.
 - .4 Exposed aggregates.
 - .5 Chamfers and rustications.
- .6 Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:
 - .1 Concrete Class designation.
 - .2 Location within Project.
 - .3 Exposure Class designation.
 - .4 Formed Surface Finish designation and final finish.
 - .5 Curing process.
- .7 Placement Schedule: Submit before start of placement of operations.

INFORMATIONAL SUBMITTALS

- .1 Qualification Data: For the following"
 - .1 Installer: Include copies of applicable ACI certificates.
 - .2 Ready-mixed concrete manufacturer.

- .2 Material Certificates: For each of the following:
 - .1 Cementitious materials.
 - .2 Admixtures.
 - .3 Form materials and form-release agents.
 - .4 Repair materials.
- .3 Material Test Reports: For the following, by a qualified testing agency:
 - .1 Portland cement.
 - .2 Fly ash.
 - .3 Slag cement.
 - .4 Blended hydraulic cement.
 - .5 Silica fume.
 - .6 Performance-based hydraulic cement.
 - .7 Aggregates (Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity).
- .4 Research Reports: For concrete admixtures in accordance with ICC AC198.
- .5 Preconstruction Test Reports: For each mix design.
- .6 Concrete Repair: Submit a written, detailed description of materials, methods, equipment, and sequence of operations to be used for repairing architectural concrete, including protection of surrounding materials and Project site.
 - .1 If materials and methods other than those indicated are proposed for any repairs to architectural concrete, add a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project and Installer's ability to use such materials and methods properly.

1.5 **QUALITY ASSURANCE**

- .1 Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
 - .1 Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- .2 Installer Qualifications: An experienced cast-in-place architectural concrete installer, as evidenced by not less than five consecutive years' experience, specializing in installing cast-in-place architectural concrete similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
 - .1 Provide written evidence of qualifications and experience.
 - .2 Include locations, descriptions, and photographs of completed projects, including name of architect, substantiating the quality of the installer's experience.
- .3 Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Technical Manager.
 - .1 Personnel performing laboratory tests shall be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Level I.
 - .2 Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Level II.
- .4 Field Sample Panels: After approval of verification sample and before casting architectural concrete, produce field sample panels to demonstrate the approved range of selections made under Sample submittals. Produce a minimum

of three sets of full-scale panels, cast vertically, approximately 1200 by 1200 by 150 mm minimum, to demonstrate the expected range of finish, color, and texture variations.

- .1 Locate panels as indicated or, if not indicated, as directed by Architect.
 - .2 Demonstrate methods of curing, aggregate exposure, wood sealers, and coatings, as applicable.
 - .3 In presence of Architect, damage part of an exposed-face surface for each finish, color, and texture, and demonstrate materials and techniques proposed for repair of tie holes and surface blemishes to match adjacent undamaged surfaces.
 - .4 Maintain field sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
 - .5 Demolish and remove field sample panels when directed.
- .5 Mockups: Before casting architectural concrete, build mockups, using the same procedures, equipment, materials, finishing procedures, and curing procedures that will be used for producing architectural concrete, to verify selections made under Sample submittals and to demonstrate typical joints, surface finish, color, texture, tolerances, and standard of workmanship. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
- .1 Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
 - .2 Build mockups of typical wall of cast-in-place architectural concrete as indicated on Drawings, including vertical and horizontal rustication joints, and any sculptured features.
 - .3 Construct mockups to include at least two lifts having heights equal to those anticipated for construction.
 - .4 Demonstrate curing, cleaning, and protecting of cast-in-place architectural concrete, finishes, and contraction joints, as applicable.
 - .5 In presence of Architect, damage part of the exposed-face surface for each finish, color, and texture, and demonstrate materials and techniques proposed for repair to match adjacent undamaged surfaces.
 - .6 In presence of Architect, demonstrate materials and techniques proposed for repair of tie holes and surface blemishes to match adjacent undamaged surfaces.
 - .7 Obtain Architect's approval of mockups before casting architectural concrete.
 - .8 Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 PRECONSTRUCTION TESTING

- .1 Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.
 - .1 Include the following information in each test report:
 - a. Admixture dosage rates.
 - b. Slump.
 - c. Air content.
 - d. Seven-day compressive strength.
 - e. 28-day compressive strength.
 - f. Permeability.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Comply with ASTM C94/C94M and ACI 301M.

1.8 ENVIRONMENTAL REQUIREMENTS

- .1 Cold-Weather Placement: Comply with Section 033000 "Cast-in-Place Concrete."
- .2 Hot-Weather Placement: Comply with Section 033000 "Cast-in-Place Concrete."

PART 2 PRODUCTS

2.1 CONCRETE, GENERAL

- .1 ASTM Publications: Comply with ACI 301M unless modified by requirements in the Contract Documents.

2.2 FORM-FACING MATERIALS

- .1 Comply with Section 031000 "Concrete Forming and Accessories" for formwork and other form-facing material requirements, and as specified in this Section.
- .2 Source Limitations: Obtain each type of form-facing material from single source from single manufacturer.
- .3 Form-Facing Panels for As-Cast Finishes:
 - .1 Exterior-grade plywood panels, nonabsorptive, that will provide continuous, true, and smooth architectural concrete surfaces, medium-density overlay, Class 1, or better, mill-applied release agent and edge sealed, complying with DOC PS 1.
- .4 Form Liners: Units of face design, texture, arrangement, and configuration to match design reference sample. Furnish with manufacturer's recommended liquid-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent surface treatments and finishes of concrete.
- .5 Rustication Strips: Metal, dressed wood or rigid plastic, with sides beveled and back kerfed; nonstaining; in longest practicable lengths.
- .6 Chamfer Strips: Metal, rigid plastic, elastomeric rubber, or dressed wood, 19 x 19 mm, minimum; nonstaining; in longest practicable lengths.
- .7 Form Joint Tape: Compressible foam tape; pressure sensitive; AAMA 800; minimum 6 mm thick.
- .8 Form Joint Sealant: Elastomeric sealant complying with ASTM C920, Type M or Type S, Grade NS, that adheres to form joint substrates, does not stain, does not adversely affect concrete surfaces, and does not impair subsequent treatments and finishes of concrete surfaces.
- .9 Wood Sealer: Penetrating, clear, polyurethane wood sealer formulated to reduce absorption of bleed water and prevent migration of set-retarding chemicals from wood and does not stain, does not adversely affect concrete surfaces, and does not impair subsequent treatments and finishes of concrete surfaces.
- .10 Form-Release Agent: Commercially formulated, colorless form-release agent that does not bond with, stain, or adversely affect architectural concrete surfaces and will not impair subsequent treatments and finishes of architectural concrete surfaces.
 - .1 Basis-of-Design Product: Subject to compliance with requirements, provide Master Builders Solutions; MasterFinish Series (Pre-2014: Cast Off and Rheofinish Series) or comparable product.
 - .2 Formulate form-release agent with rust inhibitor for steel form-facing materials.
 - .3 Form-release agent for form liners shall be acceptable to form-liner manufacturer.
- .11 Surface Retarder: Water-soluble chemical liquid set retarder, for application on form-facing materials, capable of temporarily delaying final hardening of newly placed architectural concrete surface to depth of aggregate exposure specified.
 - .1 Basis-of-Design Product: Subject to compliance with requirements, provide Master Builders Solutions; MasterFinish Series or comparable product.
 - .2 Source Limitations: Obtain surface retarder from single source from single manufacturer.

- .12 Form Ties: Factory-fabricated, removable ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - .1 Furnish ties with tapered tie cone spreaders that, when removed, will leave holes no larger than 19 mm in diameter on architectural concrete surface.
 - .2 Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 REINFORCEMENT ACCESSORIES

- .1 Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire fabric in place.
 - .1 Manufacture bar supports in accordance with CRSI's "Manual of Standard Practice."
 - .2 Where legs of wire bar supports contact forms, use gray, all-plastic bar supports.

2.4 CURING MATERIALS

- .1 Comply with Section 0330000 "Cast-in-Place Concrete."
 - .1 For integrally colored concrete, curing materials shall be approved by color pigment manufacturer.
 - .2 For concrete indicated to be sealed, curing materials shall be compatible with sealer.

2.5 REPAIR MATERIALS

- .1 Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
- .2 Epoxy Bonding Adhesive: ASTM C881/C881M two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade and class to suit requirements.
 - .1 Basis-of-Design Product: Subject to compliance with requirements, provide Master Builders Solutions; MasterEmaco ADH (Pre-2014: Concreseive Series) or comparable product.
 - .2 Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.6 CONCRETE MIXTURES, GENERAL

- .1 Obtain each color, size, type, and variety of concrete mixture from single manufacturer with resources to provide cast-in-place architectural concrete of consistent quality in appearance and physical properties.
- .2 Prepare design mixtures for each type and strength of cast-in-place architectural concrete proportioned on basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301M.
 - .1 Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs, based on laboratory trial mixtures.
 - .2 Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - .1 Fly Ash or Other Pozzolans: 25 percent by mass.
 - .2 Slag Cement: 50 percent by mass.
 - .3 Silica Fume: 10 percent by mass.
 - .4 Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
 - .5 Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.

- .3 Admixtures: Use admixtures in accordance with manufacturer's written instructions.
- .4 Color Pigment: Add color pigment to concrete mixture in accordance with manufacturer's written instructions and to result in hardened concrete color consistent with approved field sample panel / mockups.

2.7 CONCRETE MIXING

- .1 Ready-Mixed Architectural Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M and ASTM C1116/C1116M, and furnish batch ticket information.
 - .1 Clean equipment used to mix and deliver cast-in-place architectural concrete to prevent contamination from other concrete.
 - .2 For mixer capacity of 0.76 cu. m or smaller, continue mixing at least 1-1/2 minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
 - .3 For mixer capacity larger than 0.76 cu. m, increase mixing time by 15 seconds for each additional 0.76 cu. m.
 - .4 Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 EXECUTION

3.1 INSTALLATION OF FORMWORK

- .1 Comply with Section 031000 "Concrete Forming and Accessories" for formwork, embedded items, and shoring and reshoring, and as specified in this Section.
- .2 Limit deflection of form-facing panels to not exceed ACI 301M requirements.
- .3 Limit cast-in-place architectural concrete surface irregularities, as follows:
 - .1 Surface Finish-1.0: ACI 117M Class D, 25 mm.
 - .2 Surface Finish-2.0: ACI 117M Class B, 6 mm.
 - .3 Surface Finish-3.0: ACI 117M Class A, 3.0 mm.
- .4 Construct forms to result in cast-in-place architectural concrete that complies with ACI 117M.
- .5 Seal form joints, chamfers, rustication joints, and penetrations at form ties with form joint tape or form joint sealant to prevent cement paste leakage.
 - .1 Provide closure backing materials if indented rustication is used over a ribbed form line, and seal joint between rustication strip and form with joint sealant.
- .6 Chamfer exterior corners and edges of cast-in-place architectural concrete.
- .7 Coat contact surfaces of wood rustications and chamfer strips with wood sealer before placing reinforcement, anchoring devices, and embedded items.
- .8 For surfaces that do not require surface retarding, coat contact surfaces of forms with form-release agent, in accordance with manufacturer's written instructions, before placing reinforcement, anchoring devices, and embedded items.
- .9 For exposed-aggregate surfaces needing surface retarder to achieve required finish, coat contact surfaces of forms with surface retarder, in accordance with manufacturer's written instructions, before placing reinforcement, anchoring devices, and embedded items.

- .10 Place form liners accurately to provide finished surface texture indicated.

- .1 Provide solid backing and attach securely to prevent deflection and maintain stability of liners during concreting.
- .2 Secure form liners in place using fasteners that will not transfer impressions onto surface of concrete.
- .3 Prevent form liners from sagging and stretching in hot weather.
- .4 Seal joints of form liners and form-liner accessories to prevent mortar leaks.
- .5 Coat form liner with form-release agent.

3.2 **INSTALLATION OF REINFORCEMENT AND ACCESSORIES**

- .1 Comply with Section 032000 "Concrete Reinforcing" for fabricating and installing steel reinforcement and accessories.

3.3 **REMOVING AND REUSING FORMS**

- .1 Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 10 deg C for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
 - .1 Schedule form removal to maintain surface appearance that matches approved field sample panels / mockups.
 - .2 Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved its 28-day design compressive strength.
 - .3 Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
 - .4 Cut off tie at embedded tip of cone.
- .2 Clean and repair surfaces of forms to be reused in the Work.
 - .1 Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed surfaces.
 - .2 Apply new form-release agent.
- .3 When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.
 - .1 Align and secure joints to avoid offsets.
 - .2 Do not use patched forms for cast-in-place architectural concrete surfaces.

3.4 **JOINTS**

- .1 Construction Joints: Install construction joints true to line, with faces perpendicular to surface plane of cast-in-place architectural concrete, so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - .1 Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated
 - .2 Form keyed joints as indicated. Embed keys at least 38 mm into concrete. Align construction joint within rustications attached to form-facing material.
 - .3 Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - .4 Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at top of footings or floor slabs.
 - .5 Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

- .6 Use bonding agent or epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces. Verify acceptance of use with Structural Engineer.
- .7 Contraction Joints: Form weakened-plane contraction joints true to line, with faces perpendicular to surface plane of cast-in-place architectural concrete, so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.

3.5 CONCRETE PLACEMENT

- .1 Comply with Section 033000 "Cast-in-Place Concrete."

3.6 FINISHING FORMED SURFACES

- .1 Comply with Section 033000 "Cast-in-Place Concrete."
- .2 Architectural Concrete Finish: Match Architect's design reference sample, identified and described as indicated, to satisfaction of Architect.
- .3 As-Cast Surface Finishes: Comply with Section 033000 "Cast-in-Place Concrete" for the following:
 - .1 ACI 301M Surface Finish-1.0 (SF-1.0).
 - .2 ACI 301M Surface Finish-2.0 (SF-2.0).
 - .3 ACI 301M Surface Finish-3.0 (SF-3.0).
- .4 Final Concrete Finish: Comply with Section 033000 "Cast-in-Place Concrete" for the following:
 - .1 Smooth-rubbed finish.
 - .2 Grout-cleaned rubbed finish.
 - .3 Cork-floated finish.
 - .4 Abrasive-blast finish.
 - .5 Scrubbed finish.
 - .6 High-pressure water-jet finish.
 - .7 Bushhammer finish.
- .5 Form-Liner Finish: Produce a textured surface free of pockets, streaks, and honeycombs, and of uniform appearance, color, and texture.
- .6 Maintain uniformity of architectural concrete finishes over construction joints unless otherwise indicated.

3.7 CONCRETE CURING

- .1 Comply with Section 033000 "Cast-in-Place Concrete" using identical curing procedures to that used for field sample panels / mockups.

3.8 REPAIR

- .1 Comply with ACI 301M.
- .2 Repair damaged finished surfaces of cast-in-place architectural concrete when repairing is approved by Architect.
- .3 Match repairs to color, texture, and uniformity of surrounding surfaces and to repairs on approved field sample panels / mockups.
- .4 Remove and replace cast-in-place architectural concrete that cannot be repaired to Architect's approval.

3.9 FIELD QUALITY CONTROL

- .1 Comply with Section 033000 "Cast-in-Place Concrete".

3.10 CLEANING

- .1 Clean cast-in-place architectural concrete surfaces after finish treatment to remove stains, markings, dust, and debris.
- .2 Wash and rinse surfaces in accordance with concrete finish applicator's written instructions.
 - .1 Protect other Work from staining or damage due to cleaning operations.
 - .2 Do not use cleaning materials or processes that could change the appearance of cast-in-place architectural concrete finishes.

3.11 PROTECTION

- .1 Protect corners, edges, and surfaces of cast-in-place architectural concrete from damage; use guards and barricades.
- .2 Protect cast-in-place architectural concrete from staining, laitance, and contamination during remainder of construction period.

3.12 FINAL ACCEPTANCE

- .1 Final acceptance of completed architectural concrete Work will be determined by Architect by comparing approved field sample panels / mockups with installed Work, when viewed at a distance of **6 m**.

END OF SECTION 03 33 00

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Surface preparation.
- .2 Application of clear, water-based acrylic curing and sealing compound.

1.2 RELATED REQUIREMENTS

- .1 Section 03 30 00 Cast-in-Place Concrete

1.3 REFERENCES

- .1 All materials and execution of work shall conform to the latest edition of the following standards or as otherwise specified:
 - .1 ASTM C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .2 ASTM C 1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
 - .3 AASHTO M 148 - Liquid Membrane Forming Compounds for Curing Concrete.

1.4 SUBMITTALS

- .1 Comply with Section 01 33 00 - Submittal Procedures.
- .2 Submit manufacturer's product data and application instructions.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- .2 Store materials in a clean, dry area in accordance with manufacturer's instructions.
- .3 Keep product from freezing.
- .4 Avoid direct contact with this product as it may cause mild-to-moderate irritation of the eyes and/or skin.
- .5 Protect materials during handling and application to prevent damage or contamination.
- .6 Do not mix any compound containing solvent.
- .7 Do not mix or agitate aggressively as foaming can occur.

1.6 ENVIRONMENTAL REQUIREMENTS

- .1 Do not apply product when air, surface, or material temperatures are expected to fall below 4° C (40° F) within four hours of expected application.
- .2 Do not apply to frozen concrete.
- .3 Do not use on dense or porous surfaces.

PART 2 PRODUCTS

2.1 MANUFACTURER

- .1 W. R. MEADOWS, INC., PO Box 338, Hampshire, Illinois 60140-0338. (800) 342-5976. (847) 683-4500. Fax (847) 683-4544. Website www.wrmeadows.com.

2.2 MATERIALS

- .1 Performance Based Specification: Water-based acrylic curing and sealing compound shall be a non-yellowing, clear, acrylic curing and sealing compound meeting the following requirements:
 - 1. ASTM C 309, Type 1, Class B
 - 2. AASHTO M 148, Type 1, Class B
 - 3. ASTM C 1315, Class A, Section 6.4.1 – non-yellowing
 - 4. ASTM C 1315, Section 6.6 – exceed 50 MPa (70 psi) adhesion requirements
- .2 Proprietary Based Specification: VOCOMP-20 acrylic curing and sealing compound by W. R. MEADOWS.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Examine surfaces to receive curing and sealing compound. Notify architect if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.

3.2 SURFACE PREPARATION

- .1 Protect adjacent surfaces not designated to receive curing and sealing compound.
- .2 Clean and prepare surfaces to receive curing and sealing compound in accordance with manufacturer's instructions.
- .3 Ensure concrete surface is clean and dry, with all stains, oil, grease, dust, and dirt removed.
- .4 Concrete surface water should be dissipated when used on new concrete.
- .5 Concrete surfaces should not be marred by walking workers.

3.3 APPLICATION

- .1 Apply curing and sealing compound in accordance with manufacturer's instructions.
- .2 Ensure product is mixed for optimum performance. Avoid aggressive mixing as foaming may occur.
- .3 Use an industrial sprayer with a 5916 tip that produces a flow rate of 1/10 of one gallon per minute under 0.276 MPa (40 psi) of pressure.
- .4 Spray on in a fine, fog pattern, without spurts and dribbles, to form a thin, continuous film.
- .5 Alternatively apply using a lint-free roller or lamb's wool roller.
- .6 Avoid puddling in low areas.

3.4 PROTECTION

- .1 Restrict foot traffic for at least four hours, 12 hours is preferable.

END OF SECTION 03 35 00

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Provide labour, materials, tools and equipment necessary to complete the Work of this Section including, but not limited to:
 - .1 HD Galvanized Exterior Metal Canopies (East and West Elevations)
 - .2 Exterior Stair Assembly
 - .3 Interior Gate

1.2 RELATED REQUIREMENTS

- .1 Section 07 46 00 Metal Siding

1.3 DESIGN / PERFORMANCE REQUIREMENTS

- .1 Structural Performance: Engineer, fabricate and install trellis + framework, canopies and privacy screens to withstand the environmental and structural loading in accordance with British Columbia Building Code (current edition)
- .2 Allow for thermal movement resulting from changes in temperature.
- .3 Decking Material and System Design: to be included as part of this Section.
- .4 Corrosion Resistance: Separate dissimilar materials to prevent galvanic corrosion.

1.4 SUBMITTALS

- .1 Shop Drawings: Layout of trellis + framework, canopies and privacy screens dimensions, details, and finishes shall be submitted for review and shall be reviewed prior to installation. Include plans, elevations, sections, details, and attachments to other work.
Shop Drawings, including layout, all components, fastening systems, and tie-in to rainscreen flashing, to be prepared, sealed and signed by a Professional Structural Engineer licensed in the province of British Columbia. This includes field review in order to provide Schedules S-B and S-C to Consultant at project completion.

1.5 QUALITY ASSURANCE

- .1 Manufacturer Qualifications: Company specializing in providing products of the type specified in this section, with minimum of 15 years documented experience with products in use.
- .2 Installer Qualifications: Company specializing in installing products of the type specified for a minimum of 5 years.
- .3 Qualified Professional Engineer: A professional engineer licensed in the province of British Columbia who is qualified to design the portion of the work described in this Section.
- .4 Source Limitations: Obtain each type of system through one source from a single manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver systems and related components in protective packaging.
- .2 Store components to avoid damage from abrasion and other construction activities.

1.7 PROJECT CONDITIONS

- .1 Field Measurements: Verify actual locations of walls and other construction contiguous with systems by field measurements before fabrication and indicate measurements on shop drawings.

1.8 COORDINATION AND SCHEDULING

- .1 Coordinate installation of anchorages for systems. Furnish setting drawings, templates and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts and items with integral anchors that are to be embedded in concrete and masonry as applicable. Deliver such items to the project site in time for installation
- .2 Schedule installation so wall attachments are made to coordinate with cladding system and provide flashing at components as required. Do not support systems temporarily by means that do not satisfy structural performance requirements.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21.
- .2 Do not dispose of unused materials into landfill. Divert unused materials from landfill to recycling facility.
- .3 Collect and separate packaging material for recycling in accordance with Construction Waste Management Plan.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Provide metal free from pitting, seam marks, roller marks, grinding marks and stains at areas exposed to view on completed units.

2.2 FINISHES

- .1 Exterior: Steel shapes and plates to be HD Galvanized.
- .2 Interior: Steel shapes and plates to be painted in accordance w. Section 09 90 00

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Verify that field conditions are acceptable and ready to receive work.

3.2 PREPARATION

- .1 Take field measurements after permanent end terminations are in place and prior to preparation of shop drawings and fabrication, to ensure fitting of work.
- .2 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- .3 Coordinate installation of system components with related work under other sections.

3.2 INSTALLATION

- .1 Install systems in accordance with manufacturer's instructions.
- .2 Repair minor damages to finish in accordance with manufacturer's instructions.
- .3 Remove and replace defective or damaged components that cannot be successfully repaired as determined by Architect.

3.3 PROTECTION AND CLEAN UP

- .1 Protect during installation any adjacent surfaces from damage due to the work of this section.
- .2 Protect items installed under this section from damage resulting from the work of other sections.
- .3 Promptly as the work proceeds and on completion, remove all crating, surplus materials, and equipment.

END OF SECTION 05 40 00

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Handrails, guardrails, and railing systems, including connectors, fasteners, and required accessories including the following types and applications:
 - .1 Ornamental welded aluminum railing system.
 - .2 Ornamental component aluminum railing system.
 - .3 Handrail system.

1.2 RELATED REQUIREMENTS

- .1 Section 06 10 00 – Rough Carpentry
- .2 Section 07 62 00 – Sheet Metal Flashing and Trim

1.3 REFERENCES

- .1 British Columbia Building Code (current edition).
- .2 National Building Code
- .3 CSA Standard CAN3-S157-M83 "Strength Design in Aluminum"
- .4 CSA Standard S190-1969 "Design of Light Gauge Aluminum Products"
- .5 CSA Standard S244-1969 "Welded Aluminum Design And Workmanship"
- .6 CAN/CSA-086.1 S066.1 - M89 "Engineering Design in Wood"
- .7 CSA Standard CAN3-A23.3 "Design of Concrete Structures for Buildings"
- .8 CSA Standard CAN3-S304 "Masonry Design for Buildings"
- .9 CSA HA Series - M1980 "Steel Structures for Building - Limit States Design"
- .10 CSA Standard W47.2 - M1987 "Certification of Companies for Fusion Welding Of Aluminum"
- .11 CSA Standard - W59 - M1989 "Welded Steel Construction"
- .12 CSA Standard - W59.2 - M1991 "Welded Aluminum Construction"
- .13 CSA - CAN3 - 516.1 - M78 "Steel Structures for Buildings - Limit States Design"
- .14 ASTM E985 "Standard Specification for Permanent Metal Railing Systems and Rails for Buildings"
- .15 CAN3-S157-M & ASTM E935 "Standard Test Methods for Performance of Metal Railing Systems for Buildings"
- .16 ANSI Z97.1 Safety Performance Specifications and Methods of Test for Safety Glazing Materials in Buildings.
- .17 ASTM A123/A123M-13 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .18 ASTM A 307-14 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rods 60,000 psi Tensile Strength.
- .19 ASTM A500/A500m-13 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- .20 ASTM B221-14 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
- .21 ASTM B921-08 (2013) Standard Specification for Non-hexavalent Chromium Conversion Coatings on Aluminum and Aluminum Alloys.
- .22 ASTM D1730-09 (2014) Standard Practices for Preparation of Aluminum and Aluminum-Alloy Surfaces for Painting
- .23 ASTM E8/8M-13a Standard Test Methods for Tension Testing of Metallic Materials.
- .24 ASTM E488/E488M-10 Standard Test Method for Strength of Anchors in Concrete Elements.
- .25 ASTM E894-88 (2010) Standard Test Method for Anchorage of Permanent Metal Railing Systems and Rails for Buildings.
- .26 ASTM E935-13e1 Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
- .27 ASTM E1481-00a(2014)e1 - Standard Terminology of Railing Systems and Rails for Buildings
- .28 ASTM E2358-04 (2010) Standard Specifications for the Performance of Glass in Permanent Glass Railing Systems, Guards and Balustrades.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

- .1 Structural Performance: Engineer, fabricate and install handrails, guardrails, privacy screens and railing systems to withstand the environmental and structural loading in accordance with British Columbia Building Code (current edition)
- .2 Allow for thermal movement resulting from changes in temperature.
- .3 Glazing Material and System Design: to be included as part of this Section.
- .4 Corrosion Resistance: Separate incompatible materials to prevent galvanic corrosion.

1.5 SUBMITTALS

- .1 Shop Drawings: Layout of railings components with dimensions, details, and finishes shall be submitted for approval and shall be approved prior to installation. Include plans, elevations, sections, details, and attachments to other work. Shop Drawings, including glazing systems, to be prepared, sealed and signed by a Professional Structural Engineer licensed in the province of British Columbia. This includes field review in order to provide Schedules to Consultant at project completion.

1.6 QUALITY ASSURANCE

- .1 Manufacturer Qualifications: Company specializing in providing products of the type specified in this section, with minimum of 15 years documented experience with products in use.
- .2 Installer Qualifications: Company specializing in installing products of the type specified for a minimum of 5 years.
- .3 Qualified Professional Engineer: A professional engineer licensed in the province of British Columbia who is qualified to design the portion of the work described in this Section.
- .4 Source Limitations: Obtain each type of system through one source from a single manufacturer.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver handrails, guardrails, railing systems, and related components in protective packaging.
- .2 Store components to avoid damage from abrasion and other construction activities.

1.8 PROJECT CONDITIONS

- .1 Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on shop drawings. Provide allowance for trimming and fitting as site.

1.9 COORDINATION AND SCHEDULING

- .1 Coordinate installation of anchorages for railings. Furnish setting drawings, templates and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts and items with integral anchors that are to be embedded in concrete and masonry. Deliver such items to the project site in time for installation
- .2 Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by means that do not satisfy structural performance requirements.

1.10 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 Construction Waste Management and Disposal.
- .2 Do not dispose of unused materials into landfill. Divert unused materials from landfill to recycling facility.
- .3 Collect and separate packaging material for recycling in accordance with Construction Waste Management Plan.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Provide metal free from pitting, seam marks, roller marks, grinding marks and stains at areas exposed to view on completed rail units.
 - .1 Aluminum
 - .1 Extruded pipe: ASTM B 221 alloy 6063-T6.
 - .2 Extruded tube: ASTM B 221 alloy 6063-T6.
 - .3 Extruded bar, plate and sheet: ASZTM B 221 alloy 6061-T6/T52.
 - .4 Castings: ASTM B 26 Almag 35.
 - .2 Steel Shapes and Plates
 - .1 Conforming to CAN/CSA G40.21-98 Type 300W.
 - .2 Stainless Steel
 - .1 Fittings: ASTM A 276/ A 479 Type 304 or Type 316.
 - .3 Tempered Glass
 - .1 ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated), Type 1 (transparent flat glass), Quality R3. Provide products that have been tested for surface and edge compression according to ASTM C 1048 and for impact strength according to 16 CFR 1201 for Category II materials. Thickness as required for structural loads, but not less than 12mm. Standard color to be clear.
 - .4 Laminated Tempered Glass
 - (1) ASTM C 1172, Condition A (uncoated), Type 1 (transparent flat glass), Quality Q-3 with two plies of glass and polyvinyl butyral interlayer not less than 0.060 inch (1.52 mm) thick. Standard glass to be clear with one layer of polyvinyl butyral interlayer to comply with manufacturers written recommendations.

2.2 FINISHES

- .1 Aluminum
 - .1 AA 204 or AA 215 R1 Clear satin anodize.
 - .2 Kynar 500 High-performance organic coating.
 - .3 Powder coating with pre-treatment and average 3 mil film thickness per AAMA 2604 in standard color and gloss.
- .2 Steel
 - .1 HD Galvanized
 - .2 Paint in accordance w. Section 09 90 00

2.3 FABRICATION

- .1 Fabricate handrails and guardrails in accordance to approved shop drawing and field dimensions using mitered and welded joints with bends where indicated on shop drawings.
- .2 Shop fabricate in greatest possible lengths to eliminate field splicing, but not to exceed 20'-0" in length.
- .3 Form bends to uniform radius, free of distortion, twists, cracks and grain separation.
- .4 Top rails shall be continuous over posts for strength with splices for expansion located within 6 to 12 inches of post.
- .5 Splices and expansion joints shall utilize internal splice connectors with set screws to allow for rail expansion over ambient temperature change.
- .6 Weld all shop assembled connections continuous without undercut and or distortion of rail materials.
- .7 Grind and or dress exposed welds smooth and flush to corner or fillet without weakening rail connection.

- .8 Remove all burrs and sharp edges from exposed ends of final rail assemblies.
- .9 Lightly sand and blend with fine grit paper all light scratches prior to rail finishing.
- .10 Provide drainage and weep holes within rail assemblies to prevent entrapment of water within rail assemblies. Note that caution should be used when pressure washing rails assemblies to prevent water entry to non-vented areas under pressure.
- .11 Provide post inserts where required due to loading within long post spans.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Verify that field conditions are acceptable and ready to receive work.

3.2 PREPARATION

- .1 Take field measurements after permanent end terminations are in place and prior to preparation of shop drawings and fabrication, to ensure fitting of work.
- .2 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- .3 Coordinate installation of railing system components with related work under other sections.

3.2 INSTALLATION

- .1 Install railing system in accordance with manufacturer's instructions.
- .2 Install railing system plumb, level, square, true to line, and rigid.
- .3 Ensure that wire ropes are parallel to each other, free of kinks, sags or other defects, and clean.
- .4 Attach railing system securely in place using fasteners supplied or approved by manufacturer. Embedded anchor plates and supporting steel shall be provided by another trade and coordinated with the railing supplier.
- .5 Attach railing system to supports approved by manufacturer.
- .6 Coordinate installation of glass infill panels as specified.
- .7 Connect components with one part epoxy adhesive as approved by manufacturer.
- .8 Use manufacturer's supplied hardware.
- .9 Repair minor damages to finish in accordance with manufacturer's instructions.
- .10 Remove and replace defective or damaged components that cannot be successfully repaired as determined by Architect.

3.3 CLEANING

- .1 Remove temporary coverings and protection of adjacent work areas.
- .2 Clean railing system promptly after installation in accordance with manufacturer's instructions.

- .3 Do not use harsh cleaning materials or methods that would damage finish.
- .4 Do not use abrasive cleaners.

3.4 PROTECTION

- .1 Protect installed products until completion of project.
- .2 Replace defective or damaged components as directed by Architect.
- .3 Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 05 73 00

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 All material, labour, tools, plant and equipment necessary to supply and install all cabinets, vanities and countertops.

1.2 RELATED REQUIREMENTS

- .1 Section 06 20 00 – Finish Carpentry
- .2 Section 09 21 16 – Gypsum Board Assemblies
- .3 Section 09 65 00 – Resilient Flooring
- .4 Mechanical
- .5 Electrical

1.3 REFERENCE STANDARDS

- .1 Work to be conformance with the current edition of all standards at date of tender:
 - .1 American National Standards Institute (ANSI)
 - .1 ANSI A208.2, Medium Density Fiberboard (MDF) for Interior Applications.
 - .2 Architectural Woodwork Manufacturers Association of Canada (AWMAC)
 - .1 Architectural Woodwork Standards (AWS).
 - .2 AWS Manual
 - .3 American Society for Testing and Materials (ASTM)
 - .1 ASTM D5116, Standard Guide For Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products.
 - .2 ASTM D2832, Standard Guide for Determining Volatile and Nonvolatile Content of Paint and Related Coatings.
 - .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-71.20, Adhesive, Contact, Brushable.
 - .5 National Electrical Manufacturers Association (NEMA)
 - .1 ANSI/NEMA LD-3, High-Pressure Decorative Laminates (HPDL)

1.4 SUBMITTALS

- .1 Product Data: Manufacturer's specifications, data and installation instructions for each manufactured product specified.
- .2 Shop Drawings:
 - .1 Submit digital copy of shop drawings conforming to AWMAC's Standards (NAAWS)
 - .2 On casework and countertop elevations show location of backing required for attachment within walls

- .3 Samples:
 - .1 Submit three sets of samples of each species and cut of wood as applicable. Veneer samples minimum 305mm x 305mm. Each sample set of three to represent range of colour and grain expected as applicable.
 - .2 Samples may not be necessary for painted or HPDL covered doors.

1.5 QUALITY ASSURANCE

- .1 Work in accordance with Grade or Grades specified in AWMAC's Standards (NAAWS).
- .2 Guarantee and Inspection Service: TBC if required by Client.
- .3 Woodwork Manufacture Qualifications:
 - .1 Member in Good Standing of AWMAC.
 - .2 Minimum 5 years of production experience similar to this project, whose qualifications indicate ability to comply with requirements of this Section.
 - .3 Minimum one project in past 5 years where value of woodwork within 20 percent of cost of woodwork for this project.

1.6 PRE-INSTALLATION MEETING

- .1 Before framing completed, hold a meeting with the contractor, casework manufacturer, casework installer and framing sub-contractor.
 - .1 Review locations of backing required for casework installation as shown on casework shop drawings.
 - .2 Review method of attachment for backing to wall system as shown on architectural drawings.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials only when project ready for installation and clean storage area provided.
 - .1 Delivery of architectural millwork made only when area of operation enclosed, plaster and concrete work dry and area broom clean.
 - .2 Maintain indoor temperature and humidity within range recommended by AWMAC's Standards (NAAWS) for location of project.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 Construction Waste Management and Disposal.
- .2 Do not dispose of unused materials into landfill. Divert unused materials from landfill to recycling facility.
- .3 Collect and separate packaging material for recycling in accordance with Construction Waste Management Plan.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Lumber: In accordance with AWMAC's Standards (NAAWS) Grade specified for product being fabricated.
- .2 Veneers: As required by AWMAC's Standards (NAAWS) for its use and Grade specified.

- .3 Core:
 - .1 MDF meeting requirements of AWMAC's Standards (NAAWS).
- .4 Plastic Laminate:
 - .1 Of NEMA LD-3 Grade required by AWMAC's STANDARDS (NAAWS) for its use.
 - .2 Cabinet Liner (semi-exposed surfaces): type CLS.
- .5 Edgeband:
 - .1 For Plastic Laminate Casework: ABS
- .6 Adhesive:
 - .1 Type I for very wet environment, otherwise Type II is satisfactory.
- .7 Hardware:
 - .1 Unless otherwise specified: Meeting requirements of AWMAC's STANDARDS (NAAWS) for grade specified
 - .2 Finish:
 - .1 Exposed hardware: to be confirmed by Architect.
 - .2 Semi exposed hardware: Manufacturer's standard finish.
 - .3 Pulls: Richelieu Functional Metal Pull BP33285195, finish: brushed nickel.
 - .4 Cabinet Locks: Richelieu Cam Lock BP 140 100 140
 - .5 Drawer Guides: Full extension meeting requirements of AWMAC's STANDARDS (NAAWS) for type and size of drawer.
 - .6 Drawer Locks: Richelieu Cam Lock BP 140 100 140
 - .7 Hinges: Concealed European style Grade II hinges minimum 120° opening. Soft closing.
 - .8 Shelf Supports:
 - .1 Millwork: Bored hole system (5mm).
 - .2 Glass: Shelf support rail + shelf supports (chrome)
 - .9 Concealed Aluminum Rollertrack for Glass Panels:
 - .1 Top Track + Side Jambs – CR Laurence 16795
 - .2 Bottom Track – CR Laurence 16785
 - .3 Lock – CR Laurence LK50 (to suit)

2.2 FABRICATION

- .1 General:
 - .1 Materials and methods of construction to meet requirements of AWMAC's STANDARDS (NAAWS) for grade or grades specified.
 - .2 Provide 1 adjustable shelf in both base and wall cabinets UNO.
- .2 Plastic Laminate Casework:
 - .1 Grade: AWMAC's STANDARDS (NAAWS) Premium Grade.
 - .2 Construction Type: AWMAC's STANDARDS (NAAWS) construction type, Frameless.
 - .3 Cabinet and door interface: flush overlay.
 - .4 Exposed Surfaces High Pressure Decorative Laminate (HPDL), color, finish and pattern direction meeting requirements of AWMAC's STANDARDS (NAAWS) for Grade specified.
 - .1 All millwork to be White Maple veneer on plywood UNO.
 - .2 Washroom millwork to be white.

- .5 Exposed interior surfaces: HPDL matching exposed surfaces.
- .6 Semi-exposed surfaces: LPDL (melamine)
- .7 Edgeband: ABS
 - .1 Edgeband at doors, drawer fronts, and false fronts: 2mm thick.
- .3 Drawers:
 - .1 Sides
 - .1 Plastic Laminate Casework: seven ply veneer core with HPDL faces.
 - .2 Bottoms: MDF with melamine surfaces.
 - .3 Joinery: Meeting requirements of AWMAC's STANDARDS (NAAWS) for Grade specified.
- .4 Countertops:
 - .1 Solid Surface
 - .1 Basis of Design: Avonite
 - .2 Colour: to be selected from standard range by Architect
 - .3 Thickness: 12 mm
 - .4 Edge Profile: Eased (6mm radius)
 - .5 Finish: Satin
 - .6 Backsplash: n/a
 - .2 Furniture Linoleum
 - .1 Basis of Design: Desktop by Forbo
 - .2 Colour: to be selected from standard range by Architect
 - .3 Edge Profile: Solid Clear White Maple (applied before linoleum)
 - .4 Finish: Matte
 - .5 Backsplash: n/a
 - .3 Stainless Steel
 - .1 Type: 304
 - .2 Gauge: 14
 - .3 Edge Profile: Marine
 - .4 Finish: Brushed
 - .5 Backsplash: 100mm + sheet to u/s cabinets (refer to millwork drawings)
 - .6 Include for integrated sink as noted on drawings
- .5 Factory Finishing
 - .1 Grade: AWMAC's STANDARDS (NAAWS) Premium Grade.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Verify mechanical, electrical, plumbing, HVAC and other building components, affecting work in this Section are in place and ready.

3.2 INSTALLATION

- .1 Install work in conformance with AWMAC's STANDARDS (NAAWS).
- .2 Conform to AWMAC's STANDARDS (NAAWS) Grade(s).

- .3 Secure all work in place, square, plumb, and level.
- .4 Fit and scribe work abutting other building components.
- .5 Countersink mechanical fasteners used at exposed and semi-exposed surfaces, excluding installation attachment screws and those securing cabinets end to end.
- .6 Cut equipment cutouts shown on plans using templates provided.

3.3 ADJUSTING & TOUCH UP

- .1 Adjust all moving and operating parts to function smoothly and correctly.
- .2 Fill and retouch all nicks, chips and scratches. Replace all un-repairable damaged items.

3.4 CLEANUP

- .1 Upon completion of installation, clean installed items of pencil and ink marks and broom clean the area of operation.

END OF SECTION 06 41 00

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Furnishing of all labor, materials, services and equipment necessary for the supply and installation of crystalline waterproofing additive to concrete as indicated on the drawings and as specified herein.

1.2 RELATED REQUIREMENTS

- .1 Concrete Forming, Concrete Reinforcement, Concrete Construction Joints, Cast-in-Place Concrete - Refer to Structural Drawings and Specifications

1.3 REFERENCES

- .1 Applicable Standards: The following standards are referenced herein.
 - .1 American Society for Testing and Materials (ASTM)
 - .2 Army Corps of Engineers (CRD)
 - .3 American Concrete Institute (ACI)
 - .4 American National Standards Institute (ANSI)
 - .5 NSF International

1.4 SYSTEM DESCRIPTION

- .1 Crystalline Waterproofing Additive: Concrete waterproofing and protection system shall be of the crystalline type that chemically controls and permanently fixes a non-soluble crystalline structure within the pores and capillary tracts of the concrete. This crystalline system causes the concrete to become sealed against the penetration of liquids from any direction, and protects the concrete from deterioration due to harsh environmental conditions. The system is used for above or below-grade walls and slabs, including liquid retaining structures and where enhanced chemical resistance is required.

1.5 SUBMITTALS

- .1 Product Data: Submit product data, including manufacturer's specifications, installation instructions, and general recommendations for waterproofing applications.
- .2 Concrete Batch Receipt: Submit copies of concrete batch receipt to Architect for file.

1.6 QUALITY ASSURANCE

- .1 Installer: Ready-mix supplier and/or installer of crystalline waterproofing additive shall be approved by the manufacturer or manufacturer's representative in writing.
- .2 Pre-Installation Conference: Prior to installation of waterproofing system, conduct meeting with Architect/Engineer, owner's representative, concrete supplier, concrete placer and waterproofing manufacturer's representative to verify and review the following:
 - .1 Project requirements for waterproofing as set out in Contract Documents.
 - .2 Manufacturer's product data including mixing and installation instructions.
- .3 Technical Consultation: The waterproofing manufacturer's representative shall provide technical consultation on waterproofing applications and shall provide on-site support as needed.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- .2 Delivery: Deliver packaged waterproofing materials to project site in original undamaged containers, with manufacturer's labels and seals intact.
- .3 Storage: Store waterproofing materials in dry, enclosed location, at a minimum temperature of 45 °F (7 °C).

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Acceptable Manufacturer:

Xypex Chemical Corporation
13731 Mayfield Place, Richmond, B.C., Canada V6V 2G9
Tel: 800 961.4477 or 604 273.5265 Fax: 604 270.0451
E-mail: info@xypex.com Website: www.xypex.com

Note: Acceptable manufacturers include all licensed manufacturing operations of Xypex Chemical Corporation.

- .2 Proprietary Products: Xypex crystalline waterproofing materials as follows:

- .1 Xypex Admix C-500 / C-500NF
- .2 Xypex Admix C-1000 / C1000NF
- .3 Xypex Concentrate
- .4 Xypex Patch'n' Plug

- .3 Source Quality: Obtain all proprietary crystalline waterproofing products from a single manufacturer.

2.2 DOSAGE

- .1 General: Xypex Admix must be added to concrete mix at time of batching.
- .2 Dosage Rate: Under normal conditions, the crystalline waterproofing powder shall be added to the concrete mix at the following rates:
 - .1 Xypex Admix C-500 2% – 3% by weight of cement content
 - .2 Xypex Admix C-1000 2% – 3% by weight of cement content

Note: For enhanced chemical protection or for meeting specific project requirements or where the concrete mix design contains higher than 25% type F fly ash content or includes a portland cement/slag cement/type C fly ash blend, consult with manufacturer or its authorized representative to determine appropriate dosage rates.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

- .1 Crack Control: All reinforcement shall be in accordance with applicable standards. Concrete elements shall be designed and constructed to minimize and control cracking.
- .2 Setting Time and Strength: Some delay of set may occur when using Xypex Admix products. The amount of set delay will depend upon the concrete mix design, the particular Admix product used, dosage rate of the Admix, temperature of

the concrete and climatic conditions. Concrete containing a Xypex Admix product may develop higher ultimate strengths than plain concrete. Conduct trial mixes under project conditions to determine setting time and strength of the concrete. Consult with manufacturer or manufacturer's representative regarding concrete mix design, project conditions and proper dosage rate.

- .3 Weather Conditions: For mixing, transporting and placing concrete under conditions of high temperature or low temperature, follow concrete practices such as those referred to in ACI 305R (Hot Weather Concreting) and ACI 306R (Cold Weather Concreting) or other applicable standards.

3.2 APPLICATION

- .1 General: Xypex Admix is added to the concrete at the time of batching. It is important to obtain a homogeneous mixture of Xypex Admix with the concrete. Do not add dry Admix powder directly to wet mixed concrete as this could cause clumping and thorough dispersion may not occur.
- .2 Concrete Batching & Mixing: Procedures for addition of Xypex Admix will vary according to type of batch plant operation and equipment.
 - .1 Addition to Ready Mixed Truck at Plant: Add Xypex Admix in bulk powder or soluble bag form to the drum of the ready-mix truck immediately prior to driving the truck under the batch plant. Then add the balance of the materials or the premixed concrete in accordance with standard concrete batching practices. Take measures to ensure that soluble bags are dispersed properly. Such measures can include: a) adding the bags as far forward in the drum as possible, b) adding a small amount of batch water along with the bags, and c) spinning the drum prior to adding remaining components. Avoid delays in adding other components and utilize high speed mixing to ensure homogeneity of mix. Where there may be insufficient water for thorough dispersion of the bulk powder, mix the Admix powder with water to form a slurry and add to the truck mixer drum prior to batching. Account for added water in the mix design and slump.

Note 1: While it is preferable to install the Xypex Admix at the batch plant; when necessary, a slurry mixture containing the Admix can be added on site to the ready mix truck. To create a slurry, mix 5 parts Admix powder to 3 parts water by volume (i.e. a water to powder ratio of 0.67 by mass). Following addition to the drum, mix concrete for a minimum of 5 minutes on high speed or until thoroughly dispersed. Account for added water in the mix design and slump.

Note 2: Consult with local Xypex Technical Services Representative concerning additional procedures for addition and mixing.

- .3 Construction and Cold Joints: In addition to specified waterstops apply one coat of Xypex Concentrate slurry at a rate of 2 lb./sq. yd. (1 kg/m²) to joint surfaces between concrete pours. Moisten surfaces prior to slurry application. Apply slurry and keep moist for 12 hours then allow slurry to set or dry. Where joint surfaces are not accessible prior to pouring new concrete, contact Xypex Technical Services Representative for assistance.

Note: Inclusion, type and position of waterstops are at the discretion of the designer. Expanding waterstops may be placed on Xypex after it has dried or before Xypex slurry application. Xypex slurry may only be applied over waterstop if approved by waterstop manufacturer.

- .4 Sealing Strips: Where hydrostatic conditions exist, sealing strips shall also be applied at construction joints by filling grooves that are created along the joints. Dimensions of the grooves shall be 1 inch (25 mm) wide and 1.5 inches (37 mm) deep. If grooves are not been pre-formed then chip grooves to those dimensions. Fill the grooves as follows:
 - .1 Apply slurry coat of Xypex Concentrate to slot in accordance with manufacturer's instructions or recommendations.
 - .2 While slurry coat is still tacky, fill slot with Xypex Concentrate Dry-Pac.
 - .3 Compact tightly using pneumatic packer or hammer and block.

- .4. Wet Dry-Pac surface lightly with water, then apply a slurry coat of Xypex Concentrate at a coverage rate of 1.5 – 2 lb./sq. yd. (0.8 – 1 kg/m²) over sealing strip and extending to 6" (150 mm) on either side.

Note: For further information, see Xypex Schematic Drawings for standard construction joint details.

- .5 *Form Tie Holes:* Form tie holes shall be waterproofed in accordance with manufacturer's technical literature including relevant Method Statements (www.xypex.com/technical/statements). Procedures are generally as follows:
 - .1 Prepare the tie hole to create a straight sided void with a profile of at least ICRI CSP-3. For through element ties holes such as those created by taper ties the prepared void is to be at least 5" (125 mm) deep. For cone ties the void is to be to the bottom of the cone.
 - .2 Clean and profile the area to a 6 inch (150 mm) diameter around the tie hole to an ICRI CSP-3 profile.
 - .3 For through-element tie holes create a solid plug of material at the bottom of the profiled hole using Xypex Patch'n Plug leaving at least 4" (100 mm) of empty tie hole from the top of the plug to the surface of the concrete element.
 - .4 Apply a coat of Xypex Concentrate slurry at a rate of 1.5 lb./sq. yd. (0.8 kg/m²) to the inside of the tie hole and to a 12" (300 mm) diameter area around the hole.
 - .5 Fill and compact the tie hole with Xypex Concentrate Dry-Pac.
 - .6 Wet Dry-Pac surface lightly with water, then apply a slurry coat of Xypex Concentrate at a coverage rate of 1.5 - 2 lb. /sq. yd. (0.8 - 1 kg/m²) over the repaired area to a 12" (300 mm) diameter area around the filled void.
- .6 *Repair of Defects:* Concrete defects shall be repaired in accordance with manufacturer's technical literature including relevant Method Statements (www.xypex.com/technical/statements). Procedures are generally as follows:
 - .1 *Cracks and Faulty Construction Joints:*
 - .1 Chip out cracks, faulty construction joints and other defects to a depth of 1.5 inches (37 mm) and a width of one inch (25 mm). A "V" shaped slot is not acceptable. The slot may be saw cut instead of chipped but ensure that the slot is dovetailed or otherwise shaped such that there will be mechanical interlock of materials placed into the slot at a later stage.
 - .2 Clean slot of debris and dust. Soak area with water and remove excess surface water. Apply a slurry coat of Xypex Concentrate at the rate of 1.5 lb./sq. yd. (0.8 kg/m²) to the slot.
 - .3 While slurry coat is still tacky, fill cavity with Dry-Pac. Compress tightly into cavity using pneumatic packer or block and hammer.
 - .4 Wet Dry-Pac surface lightly with water, then apply a slurry coat of Xypex Concentrate at a coverage rate of 1.5 – 2 lb./sq. yd. (0.8 – 1 kg/m²) over the repaired area to 6" (150 mm) on either side of slot.
 - .2 *Rock Pockets, Honeycombing or other defective concrete:* All areas of poor concrete consolidation (honeycomb or rock pockets) shall be repaired.

Note: Where there is active water-flow see Method Statements or contact Xypex Technical Services Representative for assistance.

3.3 PLACING

- .1 *Concrete Placement:* Concrete placement shall be in accordance with "309R: Guide for Consolidation of Concrete" or other applicable standard. Special attention is to be given to consolidation at joints, penetrations and other potential leakage locations.

3.4 CURING

- .1 General: Concrete containing Xypex Admix shall be moist cured in accordance with ACI 308, "Standard Practice for Curing Concrete" or other applicable standard.
- .2 Curing Compounds: Curing compounds may be used in the event that project requirements or conditions prevent moist curing. Curing compounds shall comply with ASTM C-309 or other applicable standard.

3.5 PROTECTION

- .1 Protection: Protect installed product and finished surfaces from damage during construction.

3.6 FIELD QUALITY CONTROL

- .1 Examination for Defects: Do not conceal Xypex treated concrete before it has been observed by Architect/Engineer, waterproofing manufacturer's representative or other designated entities. Concrete shall be examined for structural defects such as honeycombing, rock pockets, tie holes, faulty construction joints, cold joints and cracks larger than 1/64" (0.4 mm). Such defects to be repaired in accordance with manufacturer's repair procedures as noted above.
- .2 Testing for Tanks and Foundation Works
 - .1 Testing: Fill tanks or, for foundation works, shut off dewatering system as soon as practical so that the structure shall be exposed to it's normal service conditions. Examine for leaks.
 - .2 Monitoring:
 - .1 Actively leaking cracks and joints shall be left to self-heal for as long as practical. Depending on job site and ambient conditions crack healing can be expected to take several days to weeks.
 - .2 Any crack or joints that do not heal in the allowable time frame shall be repaired.
 - .3 Moving cracks shall be repaired using polyurethane injection or other appropriate method.
 - .3 Repair: Use Xypex repair procedures to seal any static crack or joint that does not self-heal. See Method Statements (www.xypex.com/technical/statements) or contact Xypex Technical Services Representative for appropriate repair procedures.

Note: Lower temperatures will extend the times for crystalline development.

3.6 INTERACTION WITH OTHER MATERIALS

- .1 Backfilling: Normal backfilling procedures may be used after concrete has been cured.
- .2 Paint, Epoxy, Grout, Cement Parge Coat, Plaster or Stucco: Xypex Admix treatment of concrete does not adversely affect the bond of subsequently applied materials. Follow surface preparation and other relevant directions of the coating or parge material manufacturer.

3.4 PROTECTION & CLEAN-UP

- .1 Progress Cleaning: Perform cleanup as work progresses. Leave work area clean at the end of each day.
- .2 Final Cleaning: Upon completion, remove surplus materials, rubbish, tools, and equipment.
- .3 Protect installed products and accessories from damage during construction.
- .4 Repair damage to adjacent materials caused by insulation installation.

END OF SECTION 07 16 16

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Application of high-solids, fluid-applied, polyurethane, waterproofing, traffic-bearing, membrane deck coating system.

1.2 RELATED REQUIREMENTS

- .1 Cast-in-Place Concrete – refer to Structural Drawings and Specifications.

1.3 REFERENCES

- .1 ASTM C 957
- .2 CSA S413

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Co-ordinate work of this section with work of other trades for proper time and sequence to avoid construction delays.

1.5 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 31 00.
- .2 Product Data: Submit manufacturer's technical data sheets.
- .3 Quality Control Submittals: Provide protection plan of surrounding areas and non-work surfaces.

1.6 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Manufacturer Qualifications: Company with minimum 15 years of experience in manufacturing of specified products and system.
 - .2 Manufacturer Qualifications: Company shall be ISO 9001:2015 Certified.
 - .3 Applicator Qualifications: Company with minimum of 5 years' experience in application of specified products and system on projects of similar size and scope and is acceptable to product manufacturer.
 - a. Successful completion of a minimum of 5 projects of similar size and complexity to specified work.
- .2 Field Sample:
 - .1 Install field sample at project site or other pre-selected area of building, as directed by architect
 - .2 Provide mock-up of at least 100 square feet (9.3 m²) to include surface profile, sealant joint, crack, flashing and juncture details and allow for evaluation of slip resistance and appearance.
 - .3 Apply material in accordance with manufacturer's written application instructions.
 - .4 Manufacturer's representative or designated representative will review technical aspects; surface preparation, application and workmanship.
 - .5 Field sample will be standard for judging workmanship on remainder of project.
 - .6 Maintain field sample during construction for workmanship comparison.
 - .7 Do not alter, move or destroy field sample until work is completed and approved by architect/engineer.
 - .8 Obtain architect/engineer written approval of field sample before start of material application, including approval of aesthetics, color, texture and appearance.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
- .2 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- .3 Store materials in unopened packaging in clean, dry area protected from sunlight.

1.8 PROJECT CONDITIONS

- .1 Environmental Requirements:
 - .1 Minimum Application Temperature: 40 degrees F (4 degrees C).
 - .2 Do not apply in rain or when rain is expected within 24 hours.
 - .3 Do not apply above 90 degrees F (32 degrees C).

PART 2 PRODUCTS

2.1 MANUFACTURERS

- .1 Specifications and drawings are based on manufacturer's proprietary literature from BASF. Other manufacturers shall comply with minimum levels of material, color selection and detailing indicated in specifications or on drawings. Architect will be sole judge of appropriateness of substitutions.

2.2 MATERIALS

- .1 High-solids, fluid-applied, polyurethane, waterproofing, traffic-bearing, membrane deck coating system.
 - .1 Acceptable Product: MasterSeal Traffic 2500 Deck Coating System (formerly Conipur II Deck Coating System) by BASF.
 - a. Primer: MasterSeal P 255 (formerly Conipur 78 Primer.) two-component, polyurethane-based adhesive primer.
 - b. Base coat: MasterSeal M 265 (formerly Conipur 265-Z Base Coat.) two-component, fast-curing, polyurethane base coat.
 - c. Top Coat: MasterSeal TC 275 (formerly Conipur 275 Top Coat): two-component, fast-curing, aromatic polyurethane top coat.
 - d. Aliphatic Top Coat: MasterSeal TC 295 (formerly Conipur 295 Top Coat): two-component, aliphatic, 100 percent solids, polyurethane, waterproofing top coat.
 - e. Aggregate: MasterSeal 941DR: aggregate free of respirable crystalline silica
 - .2 Performance Requirements: Provide materials complying with the following requirements:
 - .1 Crack Bridging, Base Coat, ASTM C957: Passes.
 - .2 Adhesion Peel, Primer and Base Coat, ASTM C957.
 - a. Plywood: 25 pli.
 - b. Concrete: 14 pli.
 - .3 Tensile Strength, ASTM D412:
 - a. Base Coat: 3,400 psi (23.4 MPa)
 - b. Top Coat: 3,000 psi (20.7 MPa).
 - c. Aliphatic Top Coat: pre-pigmented 3,400 psi (23.4 MPa), tint base 3,000 psi (20.7 MPa).
 - .4 Elongation, ASTM D412:
 - a. Base Coat: 900 percent.
 - b. Top Coat: 30 percent.
 - c. Aliphatic Top Coat: pre-pigmented 340 percent, tint base 390 percent.
 - .5 Hardness, ASTM D2240, Shore A:
 - a. Top Coat: 70.
 - b. Aliphatic Top Coat: pre-pigmented 94, tint base 90.
 - .6 Taber Abrasion Resistance, ASTM D4060, CS-17 Wheel, 1,000 g load, 1,000 cycles:

- a. Primer/Base Coat/Top Coat: 100 mg.
- b. Primer/Base Coat/Intermediate Top Coat/Aliphatic Top Coat: 47 mg.
- .7 Solids Content:
 - a. Primer: 99 percent.
 - b. Base Coat: 99 percent.
 - c. Top Coat: 99 percent.
 - d. Aliphatic Top Coat: 91 percent.
- .8 VOC Content:
 - a. Primer:
 - 1) Part A: 0.08 lbs per gal (10 g/L), less water and exempt solvents.
 - 2) Part B: 0.08 lbs per gal (10 g/L), less water and exempt solvents.
 - b. Base Coat:
 - 1) Part A: 0.03 lbs per gal (4 g/L), less water and exempt solvents.
 - 2) Part B: 0.04 lbs per gal (5 g/L), less water and exempt solvents.
 - c. Top Coat:
 - 1) Part A: 0.59 lbs per gal (71 g/L), less water and exempt solvents.
 - 2) Part B: 0.11 lbs per gal (13 g/L), less water and exempt solvents.
 - d. Aliphatic Top Coat:
 - 1) Part A: 20.1 g/L, less water and exempt solvents
 - 2) Part B: 173.8 g/L, less water and exempt solvents
- .3 Colour:
 - .1 Gray (TBC by Architect w. colour samples)
- .4 Accessories:
 - .1 Aggregate: MasterSeal 941DR.
 - .2 Sealant Primer: MasterSeal P 173 (formerly Sonneborn Primer 733).
 - .3 Sealant: MasterSeal SL 2 or MasterSeal CR 195 (formerly Sonneborn SL-2 or Sonneborn Ultra).
 - .4 Deep Joint Sealant: MasterSeal SL 2 or MasterSeal NP 2 (formerly Sonneborn SL-2 or Sonneborn NP-2).
 - .5 Plywood Joint Sealant: MasterSeal NP 1 or MasterSeal NP 2 (formerly Sonneborn NP-1 or Sonneborn NP-2).
 - .6 Reinforcing Fabric: MasterSeal 995 (formerly Sonoshield Reinforcing Fabric).

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written recommendations.
- .2 Start of insulation installation indicates installer's acceptance of substrate installation conditions.

3.2 SURFACE PREPARATION

- .1 Protection: Protect adjacent work areas and finish surfaces from damage during deck coating system application.
- .2 Prepare surface in accordance with manufacturer's instructions.
- .3 Concrete:
 - .1 Minimum Compressive Strength: 3,000 psi (21 MPa).
 - .2 Cure concrete for a minimum of 28 days.
 - .3 Ensure concrete is structurally sound, clean and dry in accordance with ASTM D4263.
 - .4 Repair voids and delaminated areas.

- .5 Shot blast concrete to remove dirt, dust, grease, oil, coatings, laitance and other surface contamination and to provide profile for proper adhesion.
- .6 Profile: Minimum of ICRI CSP-3 (approximately 80 to 100-grit sandpaper).
- .7 Prestripe and prepare cracks, joints and detail work in accordance with manufacturer's instructions.

3.3 MIXING

- .1 Mix material components in accordance with manufacturer's instructions.
- .2 Precondition material components to a temperature of 70 degrees F (21 degrees C) before mixing.

3.4 APPLICATION - GENERAL

- .1 Apply deck coating system in accordance with manufacturer's instructions.
- .2 Do not apply deck coating system to damp, wet or contaminated surfaces.

3.5 APPLICATION – LIGHT TRAFFIC AND PARKING STALLS

- .1 Primer: Apply 4 wet mils (0.1 mm).
- .2 Base Coat: Apply 25 wet mils (0.5 mm). Allow base coat to cure 3 to 4 hours.
- .3 Top Coat: Apply 20 wet mils (0.5 mm).
- .4 Aggregate: Immediately broadcast aggregate at rate of 10 to 15 lbs per 100 sq ft (0.5 to 0.75 kg/m²) into wet top coat. Backroll to encapsulate.

3.6 APPLICATION – MEDIUM TRAFFIC

- .1 Primer: Apply 4 wet mils (0.1 mm).
- .2 Base Coat: Apply 25 wet mils (0.5 mm). Allow base coat to cure 3 to 4 hours.
- .3 Intermediate Coat: Apply 15 wet mils (0.4 mm). Immediately backroll to level material.
- .4 Aggregate: Immediately broadcast aggregate to refusal into wet intermediate coat. Allow curing time of 3 to 4 hours.
- .5 Top Coat: Apply 12 to 15 wet mils (0.3 to 0.4 mm). Immediately backroll to level material.
- .6 Aggregate: Immediately broadcast aggregate at rate of 3 to 5 lbs per 100 sq ft (0.15 to 0.25 kg/m²) into wet top coat. Lightly backroll to encapsulate.

3.7 APPLICATION – EXTRA-HEAVY TRAFFIC

- .1 Primer: Apply 4 wet mils (0.1 mm).
- .2 Base Coat: Apply 25 wet mils (0.5 mm). Immediately backroll to level material. Allow base coat to cure 3 to 4 hours.
- .3 Intermediate Coat: Apply 20 to 25 wet mils (0.5 to 0.6 mm). Immediately backroll to level material.
- .4 Aggregate: Immediately broadcast aggregate to refusal into wet intermediate coat. Allow curing time of 3 to 4 hours.
- .5 Remove excess aggregate.
- .6 Top Coat: Apply 15 wet mils (0.40 mm). Immediately backroll to level material.
- .7 Additional Slip Resistance: Immediately broadcast aggregate at rate of 3 to 5 lbs per 100 sq ft (0.15 to 0.25 kg/m²). Lightly backroll into top coat.

3.8 PROTECTION & CLEAN-UP

- .1 Pedestrian Traffic: Allow minimum curing time of 4 hours before allowing pedestrian traffic onto deck coating system.
- .2 Vehicular Traffic: Allow minimum curing time of 24 hours before allowing vehicular traffic onto deck coating system.
- .3 Progress Cleaning: Perform cleanup as work progresses. Leave work area clean at the end of each day.
- .4 Protect completed deck coating system from damage and staining during construction.
- .5 Final Cleaning: Upon completion, remove surplus materials, rubbish, tools, and equipment.

END OF SECTION 07 18 16

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Application of penetrating water-repellent treatments for the following vertical and horizontal surfaces:
 - .1 Cast-in-place concrete containing no crystalline waterproofing additive.

1.2 RELATED REQUIREMENTS

- .1 Cast-in-Place Concrete – refer to Structural Drawings and Specifications.

1.3 SUBMITTALS

- .1 Product Data: For each type of product.
 - .1 Include manufacturer's printed statement of VOC content.
 - .2 Include manufacturer's recommended number of coats for each type of substrate and spreading rate for each separate coat.
- .2 Samples: For each type of water repellent and substrate indicated, 300mm x 300 mm in size, with specified water-repellent treatment applied to half of each Sample.

1.4 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Manufacturer Qualifications: Company with minimum 15 years of experience in manufacturing of specified products.
 - .2 Applicator Qualifications: Company with minimum of 5 years experience in application of specified products on projects of similar size and scope, and is acceptable to product manufacturer.
- .2 Mockups:
 - .1 Prepare mockups of each required water repellent on each type of substrate required to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - .2 In addition to verifying performance requirements, use mockups to verify manufacturer's written instructions for application procedure and optimum rates of product application to substrates.
 - .3 Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
- .2 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- .3 Store in unopened containers in clean, dry area between 2 and 43°C.

1.6 PROJECT CONDITIONS

- .1 Environmental Requirements:
 - .1 Minimum Application Temperature: 40 degrees F (4 degrees C).
 - .2 Do not apply in rain or when rain is expected within 12 hours.

- .3 Do not apply sealer when temperatures are expected to fall below 4°C within 4 hours of completed application.

PART 2 PRODUCTS

2.1 PENETRATING WATER REPELLENTS

- .1 Silane/Siloxane-Blend, Penetrating Water-Based Water Repellent: Clear, silane and siloxane blend.
- .1 Basis of Design: INTRAGUARD by W.R Meadows Inc.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of the Work.
 - .1 Verify that surfaces are clean and dry according to water-repellent manufacturer's requirements. Check moisture content in 3 representative locations by method recommended by manufacturer.
 - .2 Verify that there is no efflorescence or other removable residues that would be trapped beneath the application of water repellent.
 - .3 Verify that required repairs are complete, cured, and dry before applying water repellent.
- .2 Test pH level according to water-repellent manufacturer's written instructions to ensure chemical bond to silica-containing or siliceous minerals.
- .3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- .1 New Construction and Repairs: Allow concrete and other cementitious materials to age before application of water repellent, according to repellent manufacturer's written instructions.
- .2 Cleaning: Before application of water repellent, clean substrate of substances that could impair penetration or performance of product according to water-repellent manufacturer's written instructions.
- .3 Protect adjoining work, including mortar and sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live vegetation.
- .4 Coordination with Mortar Joints: Do not apply water repellent until pointing mortar for joints adjacent to surfaces receiving water-repellent treatment has been installed and cured.
- .5 Coordination with Sealant Joints: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.
 - .1 Water-repellent work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those required.

3.3 APPLICATION

- .1 Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of water repellent and to instruct Applicator on the product and application method to be used.
- .2 Apply coating of water repellent on surfaces to be treated using 103 kPa pressure spray with a fan-type spray nozzle, roller or brush to the point of saturation. Apply coating in dual passes of uniform, overlapping strokes. Remove excess

material; do not allow material to puddle beyond saturation. Comply with manufacturer's written instructions for application procedure unless otherwise indicated.

- .3 Apply a second saturation coating, repeating first application. Comply with manufacturer's written instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats. Consult manufacturer's technical representative if written instructions are not applicable to Project conditions.

3.4 FIELD QUALITY CONTROL

- .1 Testing of Water-Repellent Material: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when water repellent is being applied:
 - .1 Owner will engage the services of a qualified testing agency to sample water-repellent material being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
 - .2 Testing agency will perform tests for compliance of water-repellent material with product requirements.
 - .3 Contractor may be directed to stop applying water repellents if test results show material being used does not comply with product requirements. Contractor shall remove noncomplying material from Project site, pay for testing, and correct deficiency of surfaces treated with rejected materials, as approved by Architect.
- .2 Coverage Test: In the presence of Architect, hose down a dry, repellent-treated surface to verify complete and uniform product application. A change in surface color will indicate incomplete application.
 - .1 Notify Architect 2 days in advance of the dates and times when surfaces will be tested.
 - .2 Reapply water repellent until coverage test indicates complete coverage.

3.5 CLEANING

- .1 Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Correct damage to work of other trades caused by water-repellent application, as approved by Architect.
- .2 Comply with manufacturer's written cleaning instructions.
- .3 Progress Cleaning: Perform cleanup as work progresses. Leave work area clean at the end of each day.
- .4 Final Cleaning: Upon completion, remove surplus materials, rubbish, tools, and equipment.

END OF SECTION 07 19 00

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Provide labour, materials, tools and equipment necessary to complete the Work of this Section including, but not limited to:
 - .1 Concrete-Faced Insulation (CFI)

1.2 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 07 42 13 Insulated Metal Wall Panels
- .3 Section 07 92 00 Joint Sealant

1.3 REFERENCES

- .1 ASTM C165, Standard Test Method for Measuring Compressive Properties of Thermal Insulations.
- .2 ASTM C356, Standard Test Method for Linear Shrinkage of Preformed High-Temperature Thermal Insulation Subjected to Soaking Heat.
- .3 ASTM C411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
- .4 ASTM C518, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- .5 ASTM C578-01, Standard Specification for Rigid Cellular Polystyrene Thermal Insulation.
- .6 ASTM D1621, Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
- .7 ASTM D696, Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30° and 30°C with a Vitreous Silica Dilatometer.
- .8 ASTM D2842, Standard Test Method for Water Absorption of Rigid Cellular Plastics.
- .9 ASTM C1338, Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
- .10 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
- .11 ASTM E96/E96M, Standard Test Methods for Water Vapor Transmission of Materials.
- .12 CAN/ULC-S701, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings.
- .13 CAN/ULC S102 - Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies
- .14 CAN/ULC S114 - Standard Method of Test for Determination of Non-Combustibility in Building Materials.
- .15 CAN/ULC S115 - Standard Method of Test of Firestop Systems.
- .16 CSA A23.2-09, Concrete Materials and Methods of Concrete Construction/ Test methods and Standard Practices for Concrete.

1.4 COORDINATION

- .1 Co-operate with adjoining subtrades and promptly proceed with work as soon as site conditions permit.

1.5 SUBMITTALS

- .1 Product Data:
 - .1 Submit product data including manufacturer's literature for insulation materials and accessories, indicating compliance with specified requirements and material characteristics.
 - .2 Include preparation instructions and recommendations, installation methods, and storage and handling requirements,
 - .3 Submit documentation signed by Manufacturer that product meets Quality Assurance Certification requirements of this Section.
- .2 Insulation Installer Qualifications:
 - .2 Submit letter verifying insulation installer's experience with work similar to work of this Section.

- .3 Contract Close-out Submittals (in accordance with Section 01 78 00)
 - .1 List materials used in insulation work.
 - .2 Warranty: submit warranty documents as applicable.

1.6 QUALITY ASSURANCE AND ENVIRONMENTAL MANAGEMENT

- .1 Manufacturers: Insulation systems shall be manufactured and marketed by a firm with a minimum of 20 years experience in the production and sales of insulation materials. Obtain continuous insulation material through one source from a single manufacturer. Manufacturers proposed for use, but not named in these specifications shall submit evidence of ability to meet all requirements specified and include a list of projects of similar design and complexity completed within the past five years.
- .2 Installers: The installation work of this section shall be performed by one entity, an experienced contractor that employs installers and supervisors who are trained and authorized by manufacturer, with a minimum five years' record of successful installations on projects of similar scope.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials and accessories in insulation manufacture's original packaging with identification labels intact and in sizes to suit project.
- .2 Ensure insulation materials are not exposed to moisture during delivery.
- .3 Replace wet or damaged insulation materials.
- .4 Store materials off ground in dry location and protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
- .5 Store in original packaging until installed.

PART 2 PRODUCTS

2.1 CONCRETE-FACED INSULATION (CFI)

- .1 Description
 - .1 Exterior perimeter foundation or low-rise wall insulation panel consisting of Styrofoam brand foam insulation with a factory applied 8mm (nominal) thick latex-modified concrete facing, with a slightly broomed finish. Installed using specially designed galvanized steel mounting clips, included with each shipment.
 - .1 Basis of Design: Concrete Faced Insulated Wall Panels by Tech-Crete Processors Ltd.
2930 – 13th Avenue SW, Salmon Arm, BC V1E 3K1; 250-832-9705; www.tech-crete.com
 - .2 Install in accordance w. manufacturers specifications.
- .2 Performance / Design Criteria:
 - .1 Thermal Resistance per inch (25.4mm), ASTM C518, R-Value (RSI) min. = R 5.0 (0.88 RSI)
 - .2 Foam Compressive Strength – Vertical, ASTM D1621, psi (kPa), min. = 35 psi (241 kPa)
 - .3 Mortar Compressive Strength (at 28 days) CSA A23.09 psi (MPa), min. = 4600 psi (32 MPa)
 - .4 Water Absorption, ASTM D2842, % by volume max. = 0.7%
 - .5 Water Vapour Permeance, ASTM E96, perm, (permSI), max. = 1.0 perm (60 permSI)
 - .6 Maximum Use Temperature, °F (°C) = 165 °F (74°C)
 - .7 Coefficient of Linear Thermal Expansion, ASTM D696, in / in • °F (mm / mm • °C) = 3.5x10⁻⁵ (6.3x10⁻²)
 - .8 Surface Burning Characteristics in accordance w. CAN/ULC-S102-10
 - .1 Flame Spread Classification = 10
 - .2 Smoke Developed Classification = 160
- .3 Materials:
 - .1 Panel Size: 610mm x 1220mm (2' x 4')
 - .2 Foam Thickness / Panel Thickness:
 - .1 50mm (2") = R10 (panel thickness = 2 5/16")

- .2 75mm (3") = R15 (panel thickness = 3 5/16")
- .3 100mm (4") = R20 (panel thickness = 4 5/16")
- .3 Edge Treatment: tongue & groove on 1220mm edge and butt edge on 610mm side.
- .4 Hydrochlorofluorocarbon (HCFC) free with zero ozone depleting potential.

2.2 POLYISOCYANURATE INSULATION + STONE WOOL INSULATION BOARD

- .1 Refer to Section 07 52 16 SBS Modified Bituminous Membrane Roofing for insulation associated with roof assembly.

PART 3 EXECUTION

3.1 INSTALLERS

- .1 Use only installers with [5] years minimum experience with work similar to work of this Section.

3.2 EXAMINATION

- .1 Verification of Conditions: Verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for insulation installation in accordance with manufacturer's written recommendations.
 - .1 Visually inspect substrate in presence of Consultant.
 - .2 Ensure surfaces are free of snow, ice, frost, grease and other deleterious materials.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.
- .2 Start of insulation installation indicates installer's acceptance of substrate installation conditions.

3.3 INSTALLATION

- .1 General:
 - .1 Install insulation in accordance with manufacturer's written recommendations.
 - .2 Install insulation to maintain continuity of thermal protection to building elements and spaces.
 - .3 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
 - .4 Keep insulation minimum 75mm (3 inches) from heat emitting devices such as recessed light fixtures, and minimum 50mm (2 inches) from sidewalls of chimneys and vents.
 - .5 Do not enclose insulation until before inspection and receipt of Consultant's written approval.
 - .6 Offset joints in horizontal insulation in multiple layer applications.
 - .7 Leave insulation board joints unbonded over line of expansion and control joints. Bond a continuous 150 mm wide 0.15 mm approved membrane over expansion and control joints using compatible adhesive and primer before application of insulation.
 - .8 Seal joints as applicable in accordance with Section 07 92 00 Joint Sealant.

3.4 FIELD QUALITY CONTROL

- .1 Field Inspection: Coordinate field inspection in accordance with Section 01 45 00 Quality Control.

3.4 PROTECTION & CLEAN-UP

- .1 Progress Cleaning: Perform cleanup as work progresses in accordance with Section 01 74 21 Construction Waste Management and Disposal. Leave work area clean at end of each day.
- .2 Final Cleaning: Upon completion, remove surplus materials, rubbish, tools, and equipment.
- .3 Waste Management:
 - .1 Co-ordinate recycling of waste materials with 01 74 21 - Construction Waste Management and Disposal.
 - .2 Collect recyclable waste and dispose of or recycle field generated construction waste created during construction or final cleaning related to work of this Section.

- .3 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
- .4 Protection:
 - .1 Protect installed products and accessories from damage during construction.
 - .2 Repair damage to adjacent materials caused by insulation installation.

END OF SECTION 07 21 13

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Provide labour, materials, tools and equipment necessary to complete the Work of this Section including, but not limited to:
 - .1 Provision of fiberglass batt thermal and acoustic insulation for interior wall assemblies.

1.2 RELATED REQUIREMENTS

- .1 Section 09 21 16 Gypsum Board Assemblies
- .2 Section 09 22 16 Non-Structural Metal Framing
- .3 Section 07 92 00 Joint Sealant

1.3 REFERENCES

- .1 Materials shall meet the property requirements of one or more of the following specifications as applicable to the specific product or end use:
 - 1. American Society for Testing of Materials (ASTM):
 - .1 ASTM C423 Test Method for Sound Absorption Coefficient by the Reverberation Room Method.
 - .2 ASTM C518 Test Method for Steady State Thermal Transmission Properties by Means of the Heat Flow Meter.
 - .3 ASTM C1320 Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.
 - .4 ASTM E136 Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C.
 - .5 ASTM E84 Test Method for Surface Burning Characteristics of Building Materials.
 - .6 ASTM E119 Test Methods for Fire Tests of Building Construction and Materials.
 - .7 ASTM C165, Standard Test Method for Measuring Compressive Properties of Thermal Insulations.
 - .8 ASTM C356, Standard Test Method for Linear Shrinkage of Preformed High-Temperature Thermal Insulation Subjected to Soaking Heat.
 - .9 ASTM C411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - .10 ASTM C518, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - .11 ASTM C1338, Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
 - .12 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
 - .13 ASTM E96/E96M, Standard Test Methods for Water Vapor Transmission of Materials.
 - .14 CAN/ULC-S701, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings.
 - .15 CAN/ULC S102 - Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies
 - .16 CAN/ULC S114 - Standard Method of Test for Determination of Non-Combustibility in Building Materials.
 - .17 CAN/ULC S115 - Standard Method of Test of Firestop Systems.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Co-ordinate work of this section with work of other trades for proper time and sequence to avoid construction delays.
- .2 Co-operate with adjoining subtrades and promptly proceed with work as soon as site conditions permit

1.5 SUBMITTALS

- .1 Product Data:
 - .1 Submit product data including manufacturer's literature for insulation materials and accessories, indicating compliance with specified requirements and material characteristics.
 - .2 Include preparation instructions and recommendations, installation methods, and storage and handling requirements,
 - .3 Submit documentation signed by Manufacturer that product meets Quality Assurance Certification requirements of this Section.
- .2 Insulation Installer Qualifications:
 - .2 Submit letter verifying insulation installer's experience with work similar to work of this Section.
- .3 Contract Close-out Submittals (in accordance with Section 01 78 00)
 - .1 List materials used in insulation work.
 - .2 Warranty: submit warranty documents as applicable.

1.6 QUALITY ASSURANCE

- .1 Sustainable Design: Provide products which have received the following certifications:
 - 1. UL Certified Environmental Product Declaration in accordance with ISO 14025. Applies to EcoTouch® Faced and Unfaced insulation.
 - 2. UL Environment EcoLogo CCD-106, applies to EcoTouch® Faced and Unfaced insulation.
 - 3. GREENGUARD Indoor Air Quality Certified® applies to EcoTouch® Unfaced Batts and EcoTouch® Faced Batts and Rolls.
 - 4. GREENGUARD Formaldehyde Free, applies to EcoTouch® Unfaced and EcoTouch® Faced Batts and Rolls.
 - 5. Scientific Certification Systems SCS-MC-01025, SCS Certified minimum 65% recycled glass content (with at least 41% post-consumer recycled and the balance of pre-consumer recycled glass content), applies to EcoTouch® Unfaced Batts and Rolls.
 - 6. Scientific Certification Systems SCS-MC-02676, SCS Certified minimum 58% recycled glass content (with at least 36% post-consumer recycled and the balance of pre-consumer recycled glass content), applies to EcoTouch® Faced Batts and Rolls.
 - 7. USDA Certified Biobased Products: EcoTouch® unfaced – 98 percent; EcoTouch® Kraft-faced – 57 percent; EcoTouch® FSK-faced – 78 percent.
- .2 Manufacturers: Insulation systems shall be manufactured and marketed by a firm with a minimum of 20 years experience in the production and sales of insulation materials. Obtain continuous insulation material through one source from a single manufacturer. Manufacturers proposed for use, but not named in these specifications shall submit evidence of ability to meet all requirements specified and include a list of projects of similar design and complexity completed within the past five years.
- .3 Installers: The installation work of this section shall be performed by one entity, an experienced contractor that employs installers and supervisors who are trained and authorized by manufacturer, with a minimum five years' record of successful installations on projects of similar scope.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials and accessories in insulation manufacturer's original packaging with identification labels intact and in sizes to suit project
- .2 Ensure insulation materials are not exposed to moisture during delivery.
- .3 Do not install insulation that has been damaged or wet. Remove it from jobsite.
- .4 Store and protect products in accordance with manufacturer's instructions. Store in a dry indoors location. Protect insulation materials from moisture and soiling.

- .5 Store in original packaging until installed.

PART 2 PRODUCTS

2.1 FIBREGLASS

- .1 Description:
 - .1 Acceptable Product: EcoTouch® PINK® FIBERGLAS™ Insulation with PureFiber® Technology by Owens-Corning.
- .2 Performance / Design Criteria:
 - .1 Metal Frame Construction, R-Value for Batt Insulation: Per ASTM C518.
 - .1 R-8, 2 ½ inch (64mm) thickness, 16 inch (406mm) or 24 inch (609mm) width, 96 inch (2438mm) length.
 - .2 R-11, 3-1/2 inch (89mm) thickness, 16 inch (406mm) or 24 inch (609mm) width, 48 inch (1219mm) or 96 inch (2438mm) length.
 - .3 R-13, 3-1/2 inch (89mm) thickness, 16 inch (406mm) or 24 inch (609mm) width, 48 inch (1219mm) or 96 inch (2438mm) length.
 - .4 R-15, 3-1/2 inch (89mm) thickness, 16 inch (406mm) or 24 inch (609mm) width, 96 inch (2438mm) length.
 - .5 R-19, 6-1/4 inch (159mm) thickness, 16 inch (406mm) or 24 inch (609mm) width, 48 inch (1219mm) or 96 inch (2438mm) length.
 - .6 R-21, 5-1/2 inch (139mm) thickness, 16 inch (406mm) or 24 inch (609mm) width, 96 inch (2438mm) length.
- .3 Materials:
 - .1 EcoTouch® Unfaced Batt Insulation: ASTM C 665, Type I, preformed formaldehyde free glass fiber batt type, unfaced. Includes Unfaced SonoBatts and Sound Attenuation Batts.
 - .1 Noncombustible per ASTM E 136.
 - .2 Flamespread less than 25, smoke developed less than 50 per ASTM E84.
 - .3 ICC Building Code Construction Classification: All types.
 - .4 Water vapor sorption, Maximum by weight: not more than 5 percent.
- .4 Accessories
 - .1 Provide accessories per insulating system manufacturer's recommendations, including the following as applicable:
 - .1 Tape: Polyethylene self-adhering type for Kraft faced insulation and bright aluminum self-adhering type for foil faced insulation.
 - .2 Insulation Fasteners: Impale clip of galvanized steel; type recommended by insulation manufacturer for particular use intended.
 - .3 Mechanical Insulation Fasteners: FM approved, corrosion resistant, size required to suit application.
 - .4 Wire Mesh: Galvanized steel, hexagonal wire mesh.
 - .5 Spindle Fasteners: Corrosion-resistant wire spindles.
 - .6 Ventilation Baffles: Formed plastic, metal, or cardboard sized to fit full width of rafter spaces.

2.2 SOURCE QUALITY CONTROL

- .1 Ensure insulation components and accessories are supplied or approved in writing by single manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Examine the areas and conditions under which work of this section will be installed. Verify that adjacent materials are dry and ready to receive insulation. Verify mechanical and electrical services within walls have been tested and inspected.

- .2 Start of insulation installation indicates installer's acceptance of substrate installation conditions.

3.2 INSTALLATION

- .1 Comply with manufacturer's installation instructions and ASTM C1320.
- .2 Friction-fit blanket insulation in place, until the interior finish is applied. Install batts to fill entire stud cavity, with no gaps, voids, or areas of compression. If stud cavity is less than 8 feet in height, cut lengths to friction fit against floor and ceiling tracks. Walls with penetrations require that insulation be carefully cut to fit around outlets, junction boxes, and other irregularities.
- .1 Do not install insulation on top of or within 3 inches of recessed light fixtures unless the fixtures are approved for such use.
- .3 Within exterior wall framing, install insulation between pipes and backside of sheathing. Cut or split insulation material as required to fit around wiring and plumbing.
- .4 Where showers and bathtubs are located on exterior walls, install insulation and vapor retarder air barrier between units and exterior.
- .5 If eave ventilation baffles are required, install ventilation baffles at eaves to hold insulation down from roof sheathing and provide positive ventilation from eave to attic space.
- .6 Fluff insulation to full thickness for specified R-value before installation. Do not compress insulation in the cavity during installation, creating gaps or voids that could diminish thermal value.
- .7 Trim insulation neatly to fit spaces. Fill miscellaneous gaps and voids with insulation.
- .8 Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation.
- .9 For unfaced batt insulation, install with friction fit or retain in place with manufacturer's recommended fasteners or mesh.
- .10 For batt insulation with factory-applied facing, install with vapor retarder membrane facing warm in the winter side of building spaces or as specified by local building code. Lap ends and side flanges of membrane over or between framing members. Tape to seal tears, cuts or misalignments in membrane.
- .11 Secure insulation in place using one of the following methods: Friction fit; staple or nail facing flanges in place as needed, tape in place, retain in place with spindle fasteners, retain in place with wire mesh secured to framing members.

3.3 FIELD QUALITY CONTROL

- .1 Coordinate field inspection in accordance with Section 01 00 00 - Quality Requirements

3.4 PROTECTION & CLEAN-UP

- .1 Progress Cleaning: Perform cleanup as work progresses. Leave work area clean at the end of each day.
- .2 Final Cleaning: Upon completion, remove surplus materials, rubbish, tools, and equipment.
- .3 Protect installed insulation from damage due to weather and physical abuse until protected by permanent construction.

END OF SECTION 07 21 16

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Provide labour, materials, tools and equipment necessary to complete the Work of this Section including, but not limited to:
 - .1 Foamed-in-place polyurethane intended to function as an air barrier assembly to and provide thermal protection.
 - .2 Glass fiber insulation spray applied for thermal and acoustic applications.

1.2 RELATED REQUIREMENTS

- .1 Section 06 10 00 Rough Carpentry
- .2 Section 07 26 00 Vapour Retarders
- .2 Section 07 27 00 Air Barriers
- .3 Section 07 46 00 Metal Siding
- .5 Section 07 46 46 Fibre-Cement Siding

1.3 REFERENCES

- .1 ASTM C411-05 - Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
- .2 ASTM C518-10 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- .3 ASTM C1338-08 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
- .4 ASTM D1621-10 - Standard Test Method for Compressive Properties Of Rigid Cellular Plastics.
- .5 ASTM D1622-08 - Standard Test Method for Apparent Density of Rigid Cellular Plastics.
- .6 ASTM D1623-09 - Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics (Type C sample).
- .7 ASTM D2126-09 - Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.
- .8 ASTM D2369-10, Standard Test Method for Volatile Content of Coatings.
- .9 ASTM D2842-06 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.
- .10 ASTM D6226 - Standard Test Method for Open Cell Content of Rigid Cellular Plastics.
- .11 ASTM E96/E96M-10 - Standard Test Methods for Water Vapor Transmission of Materials.
- .12 CAN/ULC S102-10 - Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
- .13 CAN/ULC S127-07 - Standard Corner Wall Method of Test for Flammability Characteristics of Non-Melting Building Materials.
- .14 CAN/ULC S705.1-01, including amendment 1 & 2 - Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Material - Specification, Includes Amendments 1, 2.
- .15 CAN/ULC S705.2-05 - Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Application.
- .16 CAN/ULC S770-09 - Standard Test Method for Determination of Long-term Thermal Resistance of Closed-Cell Thermal Insulating Foams.
- .17 CAN/ULC S774-03 - Standard Laboratory Guide for the Determination of Volatile Organic Compound Emissions from Polyurethane Foam.
- .18 Canadian Construction Materials Centre (CCMC) Evaluation Report CCMC 13530-L.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Coordinate with other work having a direct bearing on work of this section. Coordinate work to ensure timely placement of insulation within construction spaces.

1.5 SUBMITTALS

- .1 Product Data: Provide product description, insulation properties, preparation requirements and overcoat properties.
- .2 Sprayed polyurethane foam (SPF) installer certificate: Submit name of SPF installer with copy of certification card verifying that the SPF installer is licensed by the source manufacturer.
- .3 Manufacturer's Certificate: Certify that Products meet or exceed [specified requirements] as evidenced by a current CCMC Evaluation Report.

1.6 QUALITY ASSURANCE

- .1 Products of this Section:
 - .1 Listed with Canadian Construction Materials Centre (CCMC) certifying the product for use as insulation in accordance with the National Building Code of Canada 2005.
 - .2 EcoLogo™ certified.
 - .3 Eco-efficiency, life cycle analysis approved by NSF or equivalent
- .2 Spray Polyurethane Foam (SPF) Manufacturer Qualifications:
 - .1 Company specializing in manufacturing the products specified in this section with minimum twenty-five (25) years documented experience.
- .3 Spray Polyurethane Foam (SPF) Contractor Qualifications:
 - .1 Contractor performing work must be licensed under Canadian Urethane Foam Contractor's Association (CUFCA) Quality Assurance Program.
 - .2 Applicators performing work under this section must be trained and certified by CUFA/NECA (National Energy Conservation Association).
 - .3 Submit proof of license and certification to the Architect prior to commencement of work.
 - .4 Applicator CUFCA qualification card to contain both a polyurethane foam applicator number and a certified air barrier system applicator number.

1.7 ENVIRONMENTAL REQUIREMENTS

- .1 Do not install insulation when ambient temperature outside is -10°C - +40°C.
- .2 Occupancy: In accordance with CAN/ULC-S774, occupancy is only permitted following delivery of minimum 0.3 air changes per hour for 24 hours following installation.

1.8 COORDINATION

- .1 Coordinate with other work having a direct bearing on work of this section.
- .2 Coordinate work to ensure timely placement of insulation within construction spaces.

PART 2 PRODUCTS

2.1 CLOSED-CELL POLYURETHANE INSULATION

- .1 Description:
 - .1 Acceptable Products: WALLTITE ECO v.2 by BASF Canada Inc.

- .2 Acceptable Alternate: Polarfoam PF-7300-0 by Polyurethane Foam Systems Inc.
- .2 Materials:
 - .1 Spray Polyurethane Foam Insulation: Polyurethane Foam: to CAN/ULC S705.1, including amendment 1&2, closed cell, spray-applied rigid cellular polyurethane foam air barrier and thermal insulation, medium density:
 - .1 Performance Requirements:
 - .1 Water Vapour Permeance ASTM E96: 42 ng/Pa-s-sq m (0.70 perms).
 - .2 Flame Spread Classification CAN/ULC S102: Flame Spread < 500, Smoke Developed <500.
 - .3 Hot Surface Performance ASTM C411: Passed when exposed to 93 deg C for 96 hours.
 - .4 Fungi Resistance ASTM C1338: No fungal growth after 28 day incubation.
 - .5 Long Term Thermal Resistance (LTTR): Conform to the following when tested to CAN/ULC S770.
 - .1 RSI 1.95 @ 50 mm (R11.24 @ 2 inches).
 - .2 RSI 3.00 @ 75 mm (R17.32 @ 3 inches).
 - .3 RSI 4.12 @ 100 mm (R23.73 @ 4 inches).
 - .4 RSI 1.03/25 mm above 100 mm (R5.93/inch above 4 inches).
 - .2 Physical Requirements:
 - .1 Colour: Purple with Indicator Dye Technology.
 - .2 Density ASTM D1622: Minimum 29 kg/cu m (1.8 lb/cu ft).
 - .3 Compressive Strength ASTM D1621: 186 kPa (27.0 psi).
 - .4 Tensile Strength ASTM D1623: 241 kPa (35.0 psi).
 - .5 Open Cell Content ASTM DD2856: 8.0 %.
 - .6 Water Absorption ASTM D2842: 1.2 % by volume.
 - .3 Sustainable Requirements:
 - .1 Zero ozone depleting blowing agents.
 - .2 Minimum Recycled Content: EcoLogo certified; 5% by weight.
 - .3 Eco-efficiency, life cycle analysis approved by NSF or equivalent
- .3 Equipment
 - .1 Comply with CAN/ULC S705.2 and the equipment manufacturer's recommendations for specific type of application.

2.2 MONOGLASS SPRAY THERMAL / ACOUSTIC INSULATION

- .1 Description:
 - .1 Glass fiber insulation spray applied for thermal and acoustic applications
 - .1 Basis of Design: Monoglass Spray-On Insulation www.monoglass.com
- .2 Performance / Design Requirements:
 - .1 Fire Hazard ASTM E84-07: Flame Spread = 0; Smoke Developed = 0
 - .2 Thermal Conductivity ASTM C518: R-Factor = 4.00/inch; K-Factor = 0.25
 - .3 Noise Reduction Coefficient ASTM C423-77: 0.80 – 0.85 NRC @ 1.4 inch ; ISO 354.75 NRC @ 2 inches on solid backing.
 - .4 Dry Density ASTM D1622-83: 2.8 pounds / cubic foot
 - .5 Non-Combustibility ASTM E-136-11: Non-Combustible
 - .6 Air Erosion ASTM 859: No Weight Loss
 - .7 Adhesion / Cohesion ASTM E-736-86: Passed
 - .8 Fungal Bacterial Resistance ASTM G-21 & MIL STD810F: No Growth
- .3 Materials:
 - .1 Monoglass Spray-On is made from a minimum of 25% recycled glass (20% post-consumer), is inorganic, non-toxic, odorless, and white for high light reflectance.
 - .2 Monoglass is a non-combustible product, and contains no cellulose or asbestos

- .3 The polymer adhesive used to apply Monoglass Fiber is water based and non-hazardous.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Examine the areas and conditions under which work of this section will be installed. Verify mechanical and electrical services within walls have been tested and inspected.
- .2 Verify work within construction spaces or crevices is complete prior to insulation application.
- .3 Verify that surfaces are clean, dry and free of matter that may inhibit adhesion.
- .2 Start of insulation installation indicates installer's acceptance of substrate installation conditions.

3.2 PREPARATION

- .1 Mask and protect adjacent surfaces from over spray or dusting.
- .2 Apply primer in accordance with manufacturer's written instructions.
- .3 Prime all metal and non-porous surfaces when required by polyurethane foam manufacturer's written instructions.

3.2 INSTALLATION

- .1 Apply insulation to [CAN/ULC-S705.2] and manufacturer's written instructions.
- .2 Apply insulation by spray method, to a uniform monolithic density without voids, in lifts not exceeding 50 mm thickness in a single pass.
- .3 Apply to a minimum cured thickness to achieve required R-Value.
- .4 Finished surface of foam to be free of voids and imbedded foreign objects.
- .5 Remove masking materials and over spray from adjacent areas immediately after foam surface has hardened.
- .6 Repair damaged areas in accordance with SPF manufacturer's application guidelines for insulation.

3.3 FIELD QUALITY CONTROL

- .1 Coordinate field inspection in accordance with Section 01 00 00 - Quality Requirements
- .2 Conduct daily visual inspection, adhesion testing and density measurements as required by CAN/ULC S705.2 and the manufacturer's application guidelines.

3.4 PROTECTION & CLEAN-UP

- .1 Progress Cleaning: Perform cleanup as work progresses. Leave work area clean at the end of each day.
- .2 Final Cleaning: Upon completion, remove surplus materials, rubbish, tools, and equipment.
- .3 Protect installed insulation from damage due to weather and physical abuse until protected by permanent construction.
- .4 Do not permit subsequent construction work to disturb applied polyurethane foam.

END OF SECTION 07 21 29

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Foamed-insulation-core standing seam metal roof panels, with related metal trim and accessories.

1.2 RELATED REQUIREMENTS

- .1 Section 01 00 00 General Requirements
- .2 Section 07 62 00 Sheet Metal Flashings and Trim
- .3 Section 07 92 00 Joint Sealant
- .4 Structural drawings / specifications
- .5 Pre-Engineered Steel Building drawings / specification

1.3 REFERENCES

- .1 ASTM A 653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 ASTM A 755 - Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
- .3 ASTM A 792 - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- .4 ASTM A 924 - General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
- .5 ASTM C 1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus
- .6 ASTM D 1621 - Compressive Properties of Rigid Cellular Plastics.
- .7 ASTM D 1622 - Apparent Density of Rigid Cellular Plastics.
- .8 ASTM D 6226 - Standard Test Method for Open Cell Content of Rigid Cellular Plastics
- .9 ASTM C 518 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- .10 ASTM D 2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
- .11 ASTM D 4214 - Test Methods for Evaluating Degree of Chalking of Exterior Paint Films.
- .12 ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
- .13 ASTM E 84 - Test Methods for Surface Burning Characteristics of Building Materials.
- .14 ASTM E 1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
- .15 ASTM E 1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.
- .16 ASTM E 1680 - Standard Test Method for Rate of Air Leakage through Exterior Metal Roof Panel Systems.
- .17 ASTM E 1980 - Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.
- .18 CAN/ULC S102 - Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
- .19 CAN/ULC S107 - Method of fire test of roof coverings.
- .20 CAN/ULC S126 - Fire spread under roof-deck assemblies.

1.4 QUALITY ASSURANCE

- .1 Manufacturer/Source: Provide metal panel assemblies and accessories from a single manufacturer approved under an accredited third-party quality control program.
- .2 Manufacturer Qualifications: Approved manufacturer listed in this Section with minimum ten years' experience in the manufacturing of similar products and successful use in similar applications.
 - .1 Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:

- .a Product data, including certified independent test data indicating compliance with requirements.
 - .b Samples of each component.
 - .c Sample submittal from similar project.
 - .d Project references: Minimum of five installations not less than five years old, with Owner and Architect contact information.
 - .e Sample warranty.
 - .f Certificate from an accredited third-party Quality Control Program.
- .2 Substitutions following award of contract are not allowed except as stipulated in Division 01 General Requirements
- .3 Approved manufacturers must meet separate requirements of Submittals Article.
- .3 Installer Qualifications: Experienced Installer certified by metal panel manufacturer with minimum of five years' experience with successfully completed projects of a similar nature and scope.
 - .1 Installer's Field Supervisor: Experienced mechanic certified by metal panel manufacturer supervising work on site whenever work is underway.

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Preinstallation Meeting: Prior to erection of framing, conduct preinstallation meeting at site attended by Owner, Architect, metal panel installer, metal panel manufacturer's technical representative, inspection agency, and related trade contractors.
 - .1 Coordinate building framing in relation to metal panel system.
 - .2 Coordinate openings and penetrations of metal panel system.
 - .3 Coordinate work of Division 07 Sections "Roof Specialties" and "Roof Accessories" and openings and penetrations and manufacturer's accessories with installation of metal panels.

1.6 SUBMITTALS

- .1 Product Data: Manufacturer's data sheets for specified products.
- .2 Shop Drawings: Show layouts of metal panels. Include details of each condition of installation, panel profiles, and attachment to building. Provide details at a minimum scale 1-1/2-inch per foot of edge conditions, joints, fastener and sealant placement, flashings, openings, penetrations, curbs, vents, snow guards, lightning arresting equipment, and special details. Make distinctions between factory and field assembled work.
 - .1 Include data indicating compliance with performance requirements.
 - .2 Indicate points of supporting structure that must coordinate with metal panel system installation.
 - .3 Include structural data indicating compliance with performance requirements and requirements of local authorities having jurisdiction.
- .3 Samples for Initial Selection: For each exposed product specified including sealants. Provide representative color charts of manufacturer's full range of colors.
- .4 Samples for Verification:
 - .1 Provide 305 mm long section of each metal panel profile.
 - .2 Provide color chip verifying color selection.
- .5 Product Test Results: Indicating compliance of products with requirements.
- .6 Qualification Information: For Installer firm and Installer's field supervisor.
- .7 Accreditation Certificate: Indicating that manufacturer is accredited under an accredited third-party quality control program.

.8 **Warranty:**

- .1 Submit manufacturer's written two (2) year limited warranty providing panels to be free from defects in materials and workmanship, beginning from the date of substantial completion excluding coil coatings (paint finishes) that are covered under a separate warranty.
- .2 The installation contractor shall issue a separate warranty against defects in installed materials and workmanship, beginning from the date of substantial completion of the installation.
penetrations and manufacturer's accessories with installation of metal panels.

1.7 CLOSEOUT SUBMITTALS

- .1 Maintenance data.
- .2 Manufacturer's Warranty: Executed copy of manufacturer's warranty.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Protect products of metal panel system during shipping, handling, and storage to prevent staining, denting, deterioration of components, or other damage. Protect panels and trim bundles during shipping. Protect painted surfaces with a protective covering before shipping.
 - .1 Deliver, unload, store, and erect metal panels and accessory items without misshaping panels or exposing panels to surface damage from weather or construction operations.
 - .2 Store in accordance with Manufacturer's written instructions. Provide wood collars for stacking and handling in the field.
 - .3 Shield foam insulated metal panels from direct sunlight until installation.

1.9 WARRANTY

- .1 Special Manufacturer's Warranty: Submit Manufacturer's two (2) year limited warranty providing panels to be free from defects in materials and workmanship, beginning from the date of substantial completion excluding coil coatings (paint finishes) that are covered under a separate warranty.
- .2 The installation contractor shall issue a separate warranty against defects in installed materials and workmanship, beginning from the date of substantial completion of the installation.
- .3 Special Panel Finish Warranty: Submit Manufacturer's limited warranty on the exterior paint finish for adhesion to the metal substrate and limited warranty on the exterior paint finish for chalk and fade.
 - .1 Fluoropolymer Two-Coat System:
 - a. Color fading in excess of [5] or [10] for copper, silver metallic and bright red; Hunter units per ASTM D 2244.
 - b. Chalking in excess of [6] for copper, silver metallic and bright red or [8] rating per ASTM D 4214.
 - c. Failure of adhesion, peeling, checking, or cracking.
 - .2 Modified Silicone-Polyester Two-Coat System:
 - a. Color fading in excess of [5] or [7] for crimson red; Hunter units per ASTM D 2244.
 - b. Chalking in excess of [7] for crimson red or [8] rating per ASTM D 4214.
 - c. Failure of adhesion, peeling, checking, or cracking.
 - .3 Other finish options available; additional information can be found at metlspan.com or contact Metl-Span at 972.221.6656.

PART 2 PRODUCTS

2.1 MANUFACTURER

- .1 Basis of Design Manufacturer: Metl-Span, a Nucor company; Lewisville, Texas Tel: 972.221.6656; Email: info@metlspan.com; Web: metlspan.com
- .1 CFR Insulated Metal Roof Panel.

2.2 PERFORMANCE REQUIREMENTS

- .1 General: Provide metal panel system meeting performance requirements as determined by application of specified tests by a qualified testing facility on manufacturer's standard assemblies.
- .2 Roof Panel Radiative Property Performance:
 - .1 **Energy Star Qualified:** Listed on USDOE ENERGY STAR Roof Products Qualified Product List.
 - .2 **Cool Roof Rating Council:** Listed in CRRC Rated Product Directory, with minimum properties as required by applicable Energy efficiency or High-Performance Green Building standard.
- .3 Structural Performance: Provide metal panel assemblies capable of withstanding the effects of indicated loads and stresses within limits and under conditions indicated, as determined by ASTM E 72 or ASTM E 1592 applied in accordance with ICC AC 04, Section 4, Panel Load Test Option or Section 5, Panel Analysis Option:
 - .1 Wind Loads: Determine loads based on uniform pressure, importance factor, exposure category, and basic wind speed indicated on drawings.
 - .a Roof Panel Wind Uplift Testing: Certify capacity of metal panels by testing of proposed assembly per ASTM E 72 or ASTM E 1592.
 - .b Roof Panel Snow Loads: 25 lbf/sq. ft. / 1197 Pa.
 - .c Deflection Limits: Withstand inward and outward wind-load design pressures in accordance with applicable building code with maximum deflection of 1/180 of the span with no evidence of failure.
- .4 **Roof Panels FM Approvals Listing:** Comply with FM Approvals 4471 as part of a panel roofing system, and that are listed in FM Approvals' "RoofNav" for Class 1 construction.
 - .1 Fire/Windstorm Classification: [Class 1A-60] [Class 1A-75] [Class 1A-90] [Class 1A-105] [Class 1A-120] [Class 1A-135].
 - .2 Hail Resistance Rating: SH.
- .5 Fire Performance Characteristics: Provide metal panel systems with the following fire-test characteristics determined by indicated test standard as applied by UL or other testing and inspection agency acceptable to authorities having jurisdiction.
 - .1 Surface-Burning Characteristics: Provide metal panel systems with the following characteristics when tested per ASTM E 84. The core shall have:
 - .a Flame spread index: 25 or less.
 - .b Smoke developed index: 450 or less.
 - .2 Fire Performance of Insulated Roof: Class 1 roof and wall panel per ANSI/FM 4880.
- .6 Roof Panel Air Infiltration, ASTM E 1680: Maximum 0.023 cfm/sq. ft. (0.115 L/s per sq. m) at static-air-pressure difference of 12 lbf/sq. ft. (575 Pa).
- .7 Roof Panel Water Penetration Static Pressure, ASTM E 1646: No uncontrolled water penetration at a static pressure of 20 lbf/sq. ft. (958 Pa).

- .8 Test procedure for susceptibility to leakage of discontinuous roof systems protocol TAS 114: Water applied to a depth of 6" above the lowest section of roof profile. No water infiltration observed during the seven-day test period.
- .9 Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction. Allow for deflection and design for thermal stresses caused by temperature differences from one side of the panel to the other.
- .10 Thermal Performance: When tested in accordance with ASTM C 518, Measurement of Steady State thermal Transmission, the panels shall provide a k factor of 0.114 btu/sf/hr/deg F at a 35° F (1.67° C) mean temperature.

2.3 INSULATED METAL ROOF PANELS

- .1 Standing Seam, Foamed-Insulation-Core Metal Roof Panels: Structural metal panels consisting of an exterior standing seam with an interior tongue and groove joint, coupled with a vapor seal in the standing seam, and provides superior resistance to air and moisture intrusion. Attached with concealed fasteners to the structure.
 - .1 Basis of Design: Metl-Span, **CFR Insulated Metal Panel**.
 - .2 **G-90 Galvanized Coated Steel:** ASTM A 653 or **Aluminum-Zinc Alloy-Coated Steel:** ASTM A 792/A 792M, structural quality, Grade 50, Coating Class AZ50 (Grade 340, Coating Class AZM150), prepainted by the coil-coating process per ASTM A 755/A 755M.
 - .3 Exterior Face Sheet: 24 gauge coated thickness, with stucco embossed surface.
 - .1 Finish: Fluoropolymer two-coat system
 - .2 Color: As selected by Architect from manufacturer's standard colors.
 - .4 Interior Face Sheet: 24 gauge coated thickness, with stucco embossed surface Mesa profile.
 - .1 Finish: [Polyester two-coat system] [Modified silicone-polyester two-coat system] [Fluoropolymer two-coat system] [Vinyl plastisol two-coat system] [304 Stainless Steel] [316 Stainless Steel].
 - .2 Color: As selected by Architect from manufacturer's standard colors.
 - .5 Endlaps: Provide panels with factory endlaps, notching, swedging and backer plates; where panel lengths permit.
 - .6 Low Eave Treatment: Provide cutback for trim/gutter installation; where panel lengths permit.
 - .7 Panel Width: [30 inches (762 mm)] [36 inches (914 mm)] [42 inches (1067 mm)] [as shown on drawings].
 - .8 Panel Thickness: [2 inch (51 mm)] [2.5 inch (64 mm)] [3 inch (76 mm)] [4 inch (102 mm)] [5 inch (127 mm)] [6 inch (152 mm)] [As required to meet performance requirements] [as shown on drawings].
 - .9 Insulating Core: Polyurethane with zero ozone depletion potential blowing agent
 - .1 Closed Cell Content: 90% or more as determined by ASTM D 6226
 - .2 Compressive Strength: As required to meet structural performance requirements and with a minimum of 22 psi as determined by ASTM D 1621
 - .3 Shear Strength: As required to meet structural performance requirements and with a minimum of 36 psi as determined by ASTM C 273
 - .4 Tensile Strength: As required to meet structural performance requirements and with a minimum of 41 psi ASTM D 1623
 - .5 Minimum Density: 2.0 pcf (32 kg/m3) as determined by ASTM D 1622
 - .6 **Thermal Resistance (R-Value):** [insert corresponding value deg. F * hr * sq. ft./Btu (K * sq. m/W)] as determined by ASTM C 518 at 35 degrees Fahrenheit mean temperature.
 - .7 Heat Transfer Coefficient (U-factor): [insert corresponding value Btu/hr * sq. ft. * deg. F insert corresponding value (W/K * sq. m)] as determined by ASTM C 1363 at 35 degrees Fahrenheit

mean temperature. Tested specimen must include at least two engaged side joints.

2.4 METAL ROOF PANEL ACCESSORIES

- .1 General: Provide complete metal panel assemblies incorporating trim, copings, fasciae, gutters and downspouts, and miscellaneous flashings. Provide required fasteners, closure strips, and sealants as indicated in manufacturer's written instructions.
- .2 Flashing and Trim: Match material, thickness, and finish of metal panel face sheet.
- .3 Panel Fasteners: Self-tapping screws and other acceptable fasteners recommended by metal panel manufacturer. Provide corrosion-resistant fasteners with heads matching color of metal panels by means of factory-applied coating, with weathertight resilient washers.
- .4 Joint Sealers: Provide Tape Mastic Sealants and Concealed Joint Sealants per Section 07 92 00, "Joint Sealants".
- .5 **Roof Accessories:** Approved by metal panel manufacturer. Refer to Section 07 72 00 "Roof Accessories" for requirements for curbs, equipment supports, roof hatches, heat and smoke vents, ventilators, and preformed flashing sleeves.
- .6 **Snow Guards:** Compatible with standing seam roof and approved by metal panel manufacturer. Refer to Section 07 72 53 "Snow Guards" for requirements for snow guards attached to metal roof panels.
- .7 **Roof Curbs:** Compatible with standing seam roof and approved by metal panel manufacture. Refer to Section 07 72 10 "Roof Curbs" for requirements for roof curbs attached to metal roof panels.

2.5 FABRICATION

- .1 General: Provide factory fabricated and finished metal panels, trim, and accessories meeting performance requirements, indicated profiles, and structural requirements.
- .2 Fabricate metal panel joints configured to accept sealant tape providing weathertight seal and preventing metal-to-metal contact and minimizing noise resulting from thermal movement.
- .3 Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's written instructions, approved shop drawings, and project drawings.

2.6 FINISHES

- .1 Finishes, General: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
- .2 Exterior Face Sheet Coil-Coated Finish System
 - .1 Fluoropolymer Two-Coat System: 0.2 – 0.3 mil primer with 0.7 - 0.8 mil 70 percent PVDF fluoropolymer color coat, [meeting solar reflectance index requirements].
 - .a Basis of Design: Metl-Span, Fluoropolymer.
- .3 Interior Face Sheet Coil-Coated Finish System:
 - .1 Polyester Two-Coat System: 0.20 – 0.25 mil primer with 0.7 – 0.8 mil color coat
 - .a Basis of Design: Metl-Span, Igloo White

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Examine metal panel system substrate with Installer present. Inspect for erection tolerances and other conditions that would adversely affect installation of metal panels.
 - .1 Inspect framing that will support insulated metal panels to determine if support components are installed as indicated on approved shop drawings and are within tolerances acceptable to metal panel manufacturer and installer. Confirm presence of acceptable framing members at recommended spacing to match installation requirements of metal panels.
 - .2 Panel Support Tolerances: Confirm that metal panel supports are within tolerances acceptable to metal panel manufacturer but not greater than the following:
 - .a 1/4 inch (6 mm) in 20 foot (6100 mm) in any direction.
 - .b 3/8 inch (9 mm) over any single roof plane.
 - .c At Purlin Spacing 7 feet (2133 mm) or less: 1/8 inches (3 mm), out only.
- .2 Correct out-of-tolerance work and other deficient conditions prior to proceeding with insulated metal panel installation.

3.2 METAL PANEL INSTALLATION

- .1 Standing Seamed, Concealed-Fastener Insulated Metal Panels: Install metal panel system in accordance with manufacturer's written instructions, approved shop drawings, and project drawings. Install metal panels in orientation, sizes, and locations indicated. Anchor panels and other components securely in place. Provide for thermal and structural movement.
- .2 Attach panels to metal framing using clips, fasteners, and sealants recommended for application by metal panel manufacturer.
 - .1 Fasten metal panels to supports with fasteners at each location indicated on approved shop drawings, at spacing and with fasteners recommended by manufacturer.
 - .2 Cut panels in field where required using manufacturer's recommended methods.
 - .3 Provide weatherproof jacks for pipe and conduit penetrating metal panels.
 - .4 Dissimilar Materials: Where elements of metal panel system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by metal panel manufacturer.
- .3 Attach panel flashing trim pieces to supports using recommended fasteners and joint sealers.
- .4 Joint Sealers: Install tape sealers and liquid sealants where indicated and where required for weatherproof performance of metal panel assemblies.
 - .1 Seal panel side and perimeter joints using joint sealers indicated in manufacturer's instructions.
 - .2 Seal roof panel joints utilizing tape sealer and vapor seal bead of non-curing butyl.
 - .3 Prepare joints and apply sealants per requirements of Division 07 92 00 Joint Sealant

3.3 ACCESSORY INSTALLATION

- .1 General: Install metal panel accessories with positive anchorage to building and weathertight mounting; provide for thermal expansion. Coordinate installation with flashings and other components.
 - .1 Install components required for a complete metal panel assembly, including trim, copings, flashings, sealants, closure strips, and similar items.
 - .2 Comply with details of assemblies utilized to establish compliance with performance requirements and manufacturer's written installation instructions.

- .3 Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently weather resistant.

3.4 FIELD QUALITY CONTROL

- .1 Testing Agency: Engage an independent testing and inspecting agency acceptable to Architect to perform field tests and inspections and to prepare test reports.

3.5 PROTECTION & CLEAN-UP

- .1 Remove temporary protective films immediately in accordance with metal panel manufacturer's instructions. Clean finished surfaces as recommended by metal panel manufacturer.
- .2 Replace damaged panels and accessories that cannot be repaired to the satisfaction of the Architect.

END OF SECTION 07 41 13

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Foamed-insulation-core standing seam metal wall panels, with related metal trim and accessories.

1.2 RELATED REQUIREMENTS

- .1 Section 01 00 00 General Requirements
- .2 Section 07 62 00 Sheet Metal Flashings and Trim
- .3 Section 07 92 00 Joint Sealant
- .4 Structural drawings / specifications
- .5 Pre-Engineered Steel Building drawings / specification

1.3 REFERENCES

- .1 ASTM International (ASTM): www.astm.org:
 - .1 ASTM A 653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM A 755 - Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
 - .3 ASTM A 792 - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - .4 ASTM A 240 – Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
 - .5 ASTM C 518 - Standard Test Method for Steady State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - .6 ASTM C 1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus
 - .7 ASTM D 1621 - Compressive Properties of Rigid Cellular Plastics.
 - .8 ASTM D 1622 - Apparent Density of Rigid Cellular Plastics.
 - .9 ASTM D 2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
 - .10 ASTM D 4214 - Test Methods for Evaluating Degree of Chalking of Exterior Paint Films.
 - .11 ASTM D 6226 - Standard Test Method for Open Cell Content of Rigid Cellular Plastics
 - .12 ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
 - .13 ASTM E 84 - Test Methods for Surface Burning Characteristics of Building Materials.
 - .14 ASTM E 283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 - .15 ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
 - .16 ASTM E 1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
 - .17 National Fire Protection Association (NFPA)
 - .18 NFPA 259 – Test Method for Potential Heat of Building Materials.
 - .19 NFPA 285 – Evaluation of Fire Propagation Characteristics of Exterior Non-Load Bearing Wall Assemblies.
 - .20 NFPA 286 – Fire Test of Evaluating Conditions of Wall and Ceiling Finish to Roof Fire Growth.
- .2 FM Global (FM): www.fmglobal.com:
 - .1 FM 4880 American National Standard for Evaluating Insulated Wall and Roof/Ceiling Assemblies
 - .2 FM 4881 Approval Standard for Class 1 Exterior Wall Systems.

- .3 Canadian Standards Association (CSA)
 - .1 CAN/ULC S102 – Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC S101 – Fire Endurance Tests of Building Construction and Materials.
 - .3 CAN/ULC S134 – Fire Test of Exterior Wall Assemblies.
 - .4 CAN/ULC S138 – Fire Growth of Insulated Building Panels in a Full-Scale Room Configuration.
- .4 Green Seal (GS) www.greenseal.org
 - .1 GS-11 – Green Seal Standard for Paints and Coatings, Edition 3.2, October 26, 2015.

1.4 QUALITY ASSURANCE

- .1 Manufacturer/Source: Provide metal panel assemblies and accessories from a single manufacturer approved under an accredited third-party quality control program.
- .2 Manufacturer Qualifications: Approved manufacturer listed in this Section with minimum ten years' experience in the manufacturing of similar products and successful use in similar applications.
 - .1 Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:
 - .a Product data, including certified independent test data indicating compliance with requirements.
 - .b Samples of each component.
 - .c Sample submittal from similar project.
 - .d Project references: Minimum of five installations not less than five years old, with Owner and Architect contact information.
 - .e Sample warranty.
 - .f Certificate from an accredited third-party Quality Control Program.
 - .2 Substitutions following award of contract are not allowed except as stipulated in Division 01 General Requirements
 - .3 Approved manufacturers must meet separate requirements of Submittals Article.
- .3 Installer Qualifications: Experienced Installer certified by metal panel manufacturer with minimum of five years' experience with successfully completed projects of a similar nature and scope.
- .4 Installer's Field Supervisor: Experienced mechanic [certified by metal panel manufacturer] supervising work on site whenever work is underway.

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Preinstallation Meeting: Prior to erection of framing, conduct preinstallation meeting at site attended by Owner, Architect, metal panel installer, metal panel manufacturer's technical representative, inspection agency, and related trade contractors.
 - .1 Coordinate building framing in relation to metal panel system.
 - .2 Coordinate openings and penetrations of metal panel system.

1.6 SUBMITTALS

- .1 Product Data: Manufacturer's data sheets for specified products.
- .2 Shop Drawings: Show layouts of metal panels. Include details of each condition of installation, panel profiles, and attachment to building. Provide details at a minimum scale 1-1/2-inch per foot of edge conditions, joints, fastener and

sealant placement, flashings, openings, penetrations, curbs, vents, snow guards, lightning arresting equipment, and special details. Make distinctions between factory and field assembled work.

- .1 Include data indicating compliance with performance requirements.
- .2 Indicate points of supporting structure that must coordinate with metal panel system installation.
- .3 Include structural data indicating compliance with performance requirements and requirements of local authorities having jurisdiction.
- .3 Samples for Initial Selection: For each exposed product specified including sealants. Provide representative color charts of manufacturer's full range of colors.
- .4 Samples for Verification:
 - .1 Provide 305 mm long section of each metal panel profile.
 - .2 Provide color chip verifying color selection.
- .5 Product Test Results: Indicating compliance of products with requirements.
- .6 Qualification Information: For Installer firm and Installer's field supervisor.
- .7 Accreditation Certificate: Indicating that manufacturer is accredited under an accredited third-party quality control program.
- .8 Warranty:
 - .1 Submit manufacturer's written two (2) year limited warranty providing panels to be free from defects in materials and workmanship, beginning from the date of substantial completion excluding coil coatings (paint finishes) that are covered under a separate warranty.
 - .2 The installation contractor shall issue a separate warranty against defects in installed materials and workmanship, beginning from the date of substantial completion of the installation.

1.7 CLOSEOUT SUBMITTALS

- .1 Maintenance data.
- .2 Manufacturer's Warranty: Executed copy of manufacturer's warranty.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Protect products of metal panel system during shipping, handling, and storage to prevent staining, denting, deterioration of components, or other damage. Protect panels and trim bundles during shipping. Protect painted surfaces with a protective covering before shipping.
 - .1 Deliver, unload, store, and erect metal panels and accessory items without deforming panels or exposing panels to surface damage from weather or construction operations.
 - .2 Store in accordance with Manufacturer's written instructions.
 - .3 Shield foam insulated metal panels from direct sunlight until installation.

1.9 WARRANTY

- .1 Special Manufacturer's Warranty: Submit Manufacturer's two (2) year limited warranty providing panels to be free from defects in materials and workmanship, beginning from the date of substantial completion excluding coil coatings (paint finishes) that are covered under a separate warranty.
- .2 The installation contractor shall issue a separate warranty against defects in installed materials and workmanship, beginning from the date of substantial completion of the installation.
- .3 Special Panel Finish Warranty: Submit Manufacturer's limited warranty on the exterior paint finish for adhesion to the metal substrate and limited warranty on the exterior paint finish for chalk and fade.

- .1 Fluoropolymer Two-Coat System:
 - a. Color fading in excess of [5] or [10] for copper, silver metallic and bright red; Hunter units per ASTM D 2244.
 - b. Chalking in excess of [6] for copper, silver metallic and bright red or [8] rating per ASTM D 4214.
 - c. Failure of adhesion, peeling, checking, or cracking.
- .2 Modified Silicone-Polyester Two-Coat System:
 - a. Color fading in excess of [5] or [7] for crimson red; Hunter units per ASTM D 2244.
 - b. Chalking in excess of [7] for crimson red or [8] rating per ASTM D 4214.
 - c. Failure of adhesion, peeling, checking, or cracking.
- .3 Other finish options available; additional information can be found at metlspan.com or contact Metl-Span at 972.221.6656.

PART 2 PRODUCTS

2.1 MANUFACTURER

- .1 Basis of Design Manufacturer: Metl-Span, a Nucor company; Lewisville, Texas Tel: 972.221.6656; Email: info@metlspan.com; Web: metlspan.com

- .1 CF Mesa, Light Mesa or CF Fluted Insulated Metal Wall Panel.

2.2 PERFORMANCE REQUIREMENTS

- .1 General: Provide metal panel system meeting performance requirements as determined by application of specified tests by a qualified testing facility on manufacturer's standard assemblies.
- .2 Structural Performance: Provide metal panel assemblies capable of withstanding the effects of indicated loads and stresses within limits and under conditions indicated, as determined by ASTM E 72 or ASTM E 1592 applied in accordance with ICC AC 04, Section 4, Panel Load Test Option or Section 5, Panel Analysis Option:
 - .1 Wind Loads: Determine loads based on applicable building code, wind speed, importance factor, exposure category, and internal pressure coefficient indicated on drawings.
 - .1 Wind Negative Pressure: Certify capacity of metal panels by testing of proposed assembly.
 - .2 Deflection Limits: Withstand inward and outward wind-load design pressures in accordance with applicable building code with maximum deflection of [1/120] [1/180] [1/240] of the span with no evidence of failure.
- .3 Fire Performance Characteristics: Provide metal panel systems with the following fire-test characteristics determined by indicated test standard as applied by testing and inspection agency acceptable to authorities having jurisdiction.
 - .1 Surface-Burning Characteristics: The insulating core shall have been tested per ASTM E 84. The core shall have:
 - .a Flame spread index: 25 or less.
 - .b Smoke developed index: 450 or less.
 - .2 Room Test Performance: FM Global 4880: The panel assembly shall not support a self-propagating fire which reaches any limits of the 50' (15.24m) high corner test structure as evidenced by flaming or material damage of the ceiling of the assembly.
 - .3 Fire Propagation: The fire assembly shall meet the requirements of the standard for NFPA 285
 - .4 Fire Growth: The fire assembly shall meet the requirements of the standard for NFPA 286
 - .5 Potential Heat: Determined in accordance with NFPA 259

- .4 Canadian Certifications:
 - .1 Surface Burning Characteristics: The composite panel shall have to be tested per CAN/ULC S102. Meets the National Building Code of Canada requirements.
 - .2 Fire Endurance Tests of Building Construction and Materials: The composite panel shall have to be tested per CAN/ULS S101. Meets 15-minute stay in place requirement.
 - .3 Fire Test of Exterior Wall Assemblies. The composite panel shall have to be tested per CAN/ULS S134. Complies with the fire spread and heat flux limitations required by the National Building Code of Canada.
 - .4 Fire Growth of Insulated Building Panels in a Full-Scale Room Configuration: The composite panel shall have to be tested per CAN/ULS S138 Met the Criteria of the Standard.
 - .5 IBC Chapter 26: Panel Performance under the above test methods, shall meet the requirements of IBC, Chapter on foam plastics.
- .5 Air Infiltration, ASTM E 283:
 - .1 Maximum 0.0002 cfm/sq. ft. (0.001 L/s per sq. m) at static air pressure difference of 1.57 lbf/sq. ft. (75 Pa).
 - .2 Maximum 0.0009 cfm/sq. ft. (0.005 L/s per sq. m) at static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa).
 - .3 Maximum 0.01 cfm/sq. ft. (0.050 L/s per sq. m) at static-air-pressure difference of 20 lbf/sq. ft. (958 Pa).
- .6 Water Penetration Static Pressure:
 - .1 ASTM E 331: No uncontrolled water penetration at a static pressure of 20 lbf/sq. ft. (958 Pa).
 - .2 ASTM E 331 Modified (2-hour duration): No uncontrolled water penetration at a static pressure of 6.24 lbf/sq. ft. (300 Pa).
- .7 Thermal Performance: When tested in accordance with ASTM C 518, Measurement of Steady State thermal Transmission, the panels shall provide a k factor of 0.114 btu/sf/hr/deg F at a 35° F (1.67° C) mean temperature.

2.3 INSULATED METAL WALL PANELS

- .1 Concealed Fastener, Insulated Metal Wall Panels with foam core: Structural metal panels consisting of exterior metal sheet with five major tapered inverted ribs 1 by 1/4 inches (25.4 by 6.4 mm) with a mesa profile between the inverted ribs, and interior metal sheet with a Mesa or Light Mesa profile, with factory foamed-in-place polyurethane core in thermally-separated profile, with tongue-and-groove panel edges, attached to supports using concealed fasteners.
 - .1 Basis of Design: Metl-Span, CF Flute
 - .2 G-90 galvanized coated steel conforming to ASTM A 653 or AZ-50 aluminum-zinc alloy coated steel, conforming to ASTM A 792/A 792M, minimum grade 33, pre-painted by the coil-coating process per ASTM A 755/A 755M.
 - .1 Exterior Face Sheet: [26 gauge] [24 gauge] [22 gauge] thickness, with stucco embossed surface.
 - .1 Finish: [Modified silicone-polyester two-coat system] [Fluoropolymer two-coat system] [Fluoropolymer two-coat metallic and pearlescent color system] [Fluoropolymer two-coat weathered metal color system] [Fluoropolymer two-coat aurora color system].
 - .1 Color: As selected by Architect from manufacturer's Premium SP Exterior Colours.
 - .a Interior Face Sheet: [26 gauge] [24 gauge] [22 gauge] thickness, with stucco embossed surface and Mesa or Light Mesa profile.
 - .3 Panel Width: 42 inches (1067 mm)
 - .4 Panel Thickness: 3 inch (76 mm)
 - .5 Insulating Core: Polyurethane with zero ozone depletion potential blowing agent
 - .1 Closed Cell Content: 90% or more as determined by ASTM D 6226
 - .2 Compressive Strength: As required to meet structural performance requirements and with a minimum of 22 psi as determined by ASTM D 1621
 - .3 Shear Strength: As required to meet structural performance requirements and with a minimum of 36

- psi as determined by ASTM C 273
- .4 Tensile Strength: As required to meet structural performance requirements and with a minimum of 41 psi ASTM D 1623
- .5 Minimum Density: 2.0 pcf (32 kg/m³) as determined by ASTM D 1622
- .6 Thermal Resistance R-Value: [insert corresponding value] deg. F * hr * sq. ft./Btu (K * sq. m/W) per ASTM C 518 at 35 degrees Fahrenheit mean temperature.
- .7 Heat Transfer Coefficient (U-factor): [insert corresponding value] Btu/hr * sq. ft. * deg. F (W/K * sq. m) as determined by ASTM C 1363 at 35 degrees Fahrenheit mean temperature. Tested specimen must include at least two engaged side joints.

2.4 METAL WALL PANEL ACCESSORIES

- .1 General: Provide complete metal panel assemblies incorporating trim, copings, fasciae, gutters and downspouts, and miscellaneous flashings. Provide required fasteners, closure strips, and sealants as indicated in manufacturer's written instructions.
- .2 Flashing and Trim: Match material, thickness, and finish of metal panels.
- .3 Panel Clips: ASTM A 653/A 653M, G90 (Z180) hot-dip galvanized zinc coating, one-piece, configured for concealment in panel joints, and identical to clips utilized in tests demonstrating compliance with performance requirements.
- .4 Panel Fasteners: Self-drilling or Self-tapping screws and other acceptable fasteners recommended by metal panel manufacturer. Where exposed fasteners cannot be avoided, supply corrosion-resistant fasteners with heads matching color of metal panels by means of factory-applied coating, with weathertight resilient washers.
- .5 Joint Sealers:
 - .1 Sealants: Provide Tape Mastic Sealants, Non-skinning sealants, and Urethane Sealants in accordance with manufacturers standards
 - .2 Vertical Joint Gasket: Manufacturers standard EPDM gasket. Color: [Black] [Or custom color].

2.5 FABRICATION

- .1 General: Provide factory fabricated and finished metal panels, trim, and accessories meeting performance requirements, indicated profiles, and structural requirements.
- .2 Fabricate metal panel joints configured to accept sealant tape providing weathertight seal and preventing metal-to-metal contact and minimizing noise resulting from thermal movement.
- .3 Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's written instructions, approved shop drawings, and project drawings.

2.6 FINISHES

- .1 Finishes, General: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
- .2 Exterior Face Sheet Coil-Coated Finish System
 - .1 Fluoropolymer Two-Coat System: 0.2 – 0.3 mil primer with 0.7 - 0.8 mil 70 percent PVDF fluoropolymer color coat, [meeting solar reflectance index requirements].
 - .a Basis of Design: Metl-Span, Fluoropolymer.
- .3 Interior Face Sheet Coil-Coated Finish System:
 - .1 Polyester Two-Coat System: 0.20 – 0.25 mil primer with 0.7 – 0.8 mil color coat
 - .a Basis of Design: Metl-Span, Igloo White

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Examine metal panel system substrate with Installer present. Inspect for erection tolerances and other conditions that would adversely affect installation of metal panels.
 - .1 Inspect framing that will support insulated metal panels to determine if support components are installed as indicated on approved shop drawings and are within tolerances acceptable to metal panel manufacturer and installer. Confirm presence of acceptable framing members at recommended spacing to match installation requirements of metal panels.
 - .2 Panel Support Tolerances: Confirm that metal panel supports are within tolerances acceptable to metal panel manufacturer but not greater than the following:
 - .a 1/4 inch (6 mm) in 20 foot (6100 mm) in any direction.
 - .b 3/8 inch (9 mm) over any single roof plane.
 - .c Girt Spacing 8 feet (2438 mm) or more: 1/4 inch (6 mm) out only.
 - .d Girt Spacing Less Than 8 feet (2438 mm): 1/8 inch (3 mm) out only.
- .2 Correct out-of-tolerance work and other deficient conditions prior to proceeding with insulated metal panel installation.

3.2 METAL PANEL INSTALLATION

- .1 Concealed-Fastener Insulated Metal Panels with foam core: Install metal panel system in accordance with manufacturer's written instructions, approved shop drawings, and project drawings. Install metal panels in orientation, sizes, and locations indicated. Anchor panels and other components securely in place. Provide for thermal and structural movement.
- .2 Attach panels to metal framing using clips, fasteners, and sealants recommended for application by metal panel manufacturer.
 - .1 Fasten metal panels to supports with fasteners at each location indicated on approved shop drawings, at spacing and with fasteners recommended by manufacturer.
 - .2 Cut panels in field where required using manufacturer's recommended methods.
 - .3 Provide weatherproof jacks for pipe and conduit penetrating metal panels.
 - .4 Dissimilar Materials: Where elements of metal panel system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by metal panel manufacturer.
- .3 Attach panel flashing trim pieces to supports using recommended fasteners and joint sealers.
- .4 Joint Sealers: Install tape sealers and liquid sealants where indicated and where required for weatherproof performance of metal panel assemblies.
 - .1 Seal panel base assembly, openings, panel head joints, and perimeter joints using sealants indicated in manufacturer's instructions.
 - .2 Seal wall panel joints; apply continuously without gaps in accordance with manufacturer's written instructions, approved shop drawings, and project drawings.
 - .3 Prepare joints and apply sealants per requirements of Division 07 Section.

3.3 ACCESSORY INSTALLATION

- .1 General: Install metal panel accessories with positive anchorage to building and weathertight mounting; provide for thermal expansion. Coordinate installation with flashings and other components.
 - .1 Install components required for a complete metal panel assembly, including trim, copings, flashings, sealants, closure strips, and similar items.

- .2 Comply with details of assemblies utilized to establish compliance with performance requirements and manufacturer's written installation instructions.
- .3 Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently weather resistant.

3.4 FIELD QUALITY CONTROL

- .1 Testing Agency: Engage an independent testing and inspecting agency acceptable to Architect to perform field tests and inspections and to prepare test reports.
- .2 Water-Spray Test: After completing portion of metal panel assembly including accessories and trim, test 2-bay area selected by Architect for water penetration, according to AAMA 501.2.

3.5 PROTECTION & CLEAN-UP

- .1 Remove temporary protective films immediately in accordance with metal panel manufacturer's instructions. Clean finished surfaces as recommended by metal panel manufacturer.
- .2 Replace damaged panels and accessories that cannot be repaired to the satisfaction of the Architect.

END OF SECTION 07 42 13

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Provide SBS modified bituminous membrane roofing system including but not limited to:
 - .1 Surface Preparation
 - .2 Roof Sheathing
 - .3 Vapour Retarder
 - .4 Roof Insulation
 - .5 Coverboard
 - .6 SBS Modified Bituminous Base and Cap Sheets
 - .7 Roof Accessories – roof drains, scuppers, sheet metal flashing and trim etc.
 - .8 High Compressive Strength Drainage Mat for horizontal applications.

1.2 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 07 62 00 Sheet Metal Flashings and Trim

1.3 REFERENCES

- .1 Membranes must meet or exceed requirements of CGSB 37.56–M (9th Draft), *Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing*
- .2 Membranes must meet or exceed requirements of ASTM D 6162, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fibre Reinforcements.
- .3 Polyisocyanurate thermal insulation boards must meet or exceed requirements of CAN/ULC S704-011, *Thermal Insulation, Polyurethane and Polyisocyanurate, Boards Faced*.
- .4 Roofing system must meet or exceed requirements of CAN/ULC-S107-10, Methods of Fire Tests of Roof Coverings, Class A.
- .5 Roofing Contractors Association of British Columbia (RCABC) Roofing Practices Manual (RPM)

1.4 COMPATIBILITY

- .1 Obtain products from single manufacturer or from sources recommended by manufacturer for use with roofing system and incorporated in manufacturer's warranty.

1.5 COORDINATION

- .1 Co-operate with adjoining subtrades and promptly proceed with work as soon as site conditions permit.
- .2 Ensure items to be incorporated into work of this Section and items required for incorporation by other subtrades are supplied in a timely manner. Proceed with work of this Section after built-in items are installed and roof substrates are completed.

1.6 SUBMITTALS

- .1 Product Data:
 - .1 Submit product data on components of roof system assembly
- .2 Shop Drawings:
 - .2 Submit Shop Drawings as required showing method of installation and layout of each layer, roof edge condition details, roof penetration flashing details, standard roof sections, connection to air barrier in wall, details of insulation, tapered insulation layouts, vapour retarder and sheathing securement details as applicable and other details required for proper roof system installation not specified in, or are different from Specifications and Drawings.
- .3 Field Reports of Roofing Inspector.
- .4 Contract Close-out Submittals (in accordance with Section 01 78 00)
 - .1 Maintenance Manuals
 - .2 Warranty signed by installer and manufacturer

1.7 QUALITY ASSURANCE AND ENVIRONMENTAL MANAGEMENT

- .1 Pre-installation meeting to be held in advance of start of roofing to review installation conditions. Provide a record of meeting and distribute to affected parties.
- .2 Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.8 CONTRACTOR QUALIFICATIONS

- .1 Provide work of this Section executed by competent installers with minimum 10 years experience in application of products, systems and assemblies specified. Roofing contractor and subcontractors must be members of the RCABC and provide evidence in advance of roofing installation.
- .2 Provide a competent project foreman with minimum 5 years experience in supervision of roofing system installation, knowledgeable in roofing type specified herein. Ensure foreman is present at job site during majority of work hours and is accessible to ensure good project coordination. Roofing crew shall be comprised of trade qualified journeyman roofers and registered apprentices only.

1.9 INSPECTION

- .1 As part of RCABC warranty requirements, roofing installation inspection to be done by a qualified roofing inspector and paid for by the Contractor.

1.10 DELIVERY, STORAGE AND HANDLING

- .1 All materials will be delivered and stored in their original packaging, in conformance with the requirements described in the manufacturer's technical documentation.
- .2 At all times, materials will be adequately protected and stored in a dry and properly ventilated area, away from any welding flame or spark, and sheltered from the elements and any harmful substances.
- .3 Materials delivered in rolls will be carefully stored upright; flashings will be stored to avoid wrinkling, buckling, scratches or any other possible damage.
- .4 Avoid gathering construction materials on the roof, which may affect the structural integrity by imposing loads exceeding what is admissible.

1.11 FIRE PROTECTION

- .1 Prior to the start of work, conduct a site inspection to ensure its safety in order to minimize fire risks and hazards.
- .2 Respect safety measures recommended by the related local authorities.
- .3 At the end of each workday, use a heat detector gun to spot any smoldering or concealed fire. Job planning must be organized to ensure workers are still on location at least 1 hour] after welding works. An inspection must be performed by an employee of the roofing contractor who specializes in this kind of job at the end of works and, if necessary, with the help of a member of the fire protection service of the city.
- .4 Never apply the torch directly to flammable materials.
- .5 Throughout roofing installation, maintain a clean site and have a fire hose (when possible) and at least one ULC-approved Class A, B or C fire extinguisher, charged and in perfect operating condition, within 6 m (20 ft) of each torch. Respect all safety measures described in technical data sheets of sealants. Welding torches must never be placed near combustible or flammable products, nor be used where the flame is not visible or cannot be easily controlled.

1.12 WARRANTY

- .1 The membrane manufacturer will issue a written and signed document in the owner's name, certifying that the roofing membranes are free of manufacturing defects for a period of ten (10) years, starting from the date of completion of membrane installation. This warranty will cover the removal and replacement of defective roof membrane products, including workmanship. The warranty must remain full and complete for the duration of the period specified. The warranty certificate must reflect these requirements.
- .2 Roofing Contractor shall provide and pay for all inspections and tests required to provide the Owner with an RCABC Guarantee Corp. (RGC) five year Certificate of Guarantee, starting on the date of approved final inspection.

PART 2 PRODUCTS

2.1 ROOFING SYSTEM

- .1 A 2 ply SBS modified bitumen roof membrane using a heat welded base sheet and heat welded granulated cap sheet over asphaltic coverboard, polyisocyanurate insulation and vapour retarder (on roof board if applicable)
- .2 Design roofing membrane system and base flashings to be watertight, does not permit passage of water through finished roof system, and resists exposure to weather without failure.
- .3 Basis of design product: Soprema "Sopraply" SBS modified bituminous membrane system.

2.2 MEMBRANES SUPPORT PANELS

- .1 Gypsum-Fibre Roof Board:
 - .1 Glass fibre-covered roof board in conformance with ASTM E84 and ASTM C1177.

2.3 INSULATION (HYBRID SYSTEM)

- .1 Tapered Insulation Board:
 - .1 Tapered insulation panel made of polyisocyanurate designed to create positive slope to the roof system.
- .2 Mineral Wool Cover Board:
 - .1 50mm mineral coated HD stone wool cover board insulation to protect the polyisocyanurate from thermal expansion and contraction.

2.4 MEMBRANES (In conformance with CGSB 37.56-M and ASTM D6162)

.1 Base Sheet Membrane for Field Surface:

- .1 Description: Roofing membrane composed of SBS modified bitumen and a composite reinforcement. Both sides are covered with a thermofusible plastic film. The surface must be marked with three (3) chalk lines to ensure proper roll alignment.

.2 Base Sheet Membrane for Flashings and Parapets:

- .1 Description: Membrane composed of SBS modified bitumen and composite heavy duty reinforcement. The surface is covered with a thermofusible plastic film and the underface is covered with a thermofusible plastic film or covered with a release protection film. The surface shall be marked with three (3) chalk lines to ensure proper roll alignment.

.3 Roofing Cap Sheet Membrane for Field Surfaces:

- .1 Description: Roofing membrane composed of SBS modified bitumen and a composite reinforcement. Both sides are covered with a thermofusible plastic film. The surface must be marked with three (3) chalk lines to ensure proper roll alignment.

.4 Roofing Cap Sheet Membrane for Flashings and Parapets:

- .1 Description: Roofing membrane of an SBS modified bitumen membrane with a composite reinforcement and elastomeric bitumen with flame-retarding agent. The surface is protected by coloured granules. The underface is covered with a thermofusible plastic film.

2.5 PRIMER

.1 Primer for Thermofusible Membranes:

- .1 Description: Primer made of bitumen, volatile solvents and adhesive resins. Used as primer to improve the adhesion of thermofusible waterproofing membranes.

2.6 FLAM-STOP MEMBRANE

- .1 Description: Self-adhesive membrane composed of SBS modified bitumen and a glass mat reinforcement, designed to prevent flames from penetrating into voids, cavities and openings before installing heat-welded membranes.

2.7 ACCESSORIES

.1 Drainage Membrane: Rolled Matrix Drainage System

- .1 Basis of Design: MiraDRAIN 9000 for horizontal applications by Carlisle Coatings & Waterproofing.

.2 Gypsum-Fiber Roof Board (on steel deck)

- .1 Basis of Design: Gypsum-Fiber Roof Board by CGC Securock.

PART 3 EXECUTION

3.1 SURFACE INSPECTION AND PREPARATION

- .1 Surface examination and preparation must be completed in conformance with instructions in the membrane manufacturer's technical documentation.
- .2 Before roofing work begins, the owner's representative and roofing foreman will inspect and approve deck conditions (including slopes and wood grounds) as well as flashings at parapets, roof drains, plumbing vents, ventilation outlets and other construction joints. If necessary, a non-conformity notice will be issued to the contractor so that required

corrections can be carried out. The start of roofing work will be considered as acceptance of conditions for work completion.

- .3 Do not begin any portion of work before surfaces are clean, smooth, dry, and free of ice and debris. Use of calcium or salt is forbidden for ice or snow removal.
- .4 Be sure plumbing, carpentry and all other works have been duly completed.
- .5 No materials will be installed during rain or snowfall.

3.2 INSTALLATION

- .1 Roofing system to be installed on clean, dry surfaces in accordance with manufacturer's written installation instructions.
- .2 Install waterproofing membranes at various roofing details in conformance with typical details indicated in technical documentation of the manufacturer.

3.3 INSTALLATION OF METAL FLASHINGS

- .1 Install in accordance with SMACNA specifications.
- .2 Install with clips (no visible fasteners), standing seam joints (caulked), min. 19mm x 19mm drip edge.
- .3 Flashing shall be installed symmetrically, with joints aligned with architectural features where possible. No piece shorter than 915mm +/-.

3.4 FIELD QUALITY CONTROL

- .1 Final Roof Inspection:
 - .1 Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
 - .2 Notify Architect and Owner 48 hours in advance of date and time of inspection.
- .2 Repair or remove and replace components of roofing work where test results or inspections indicate that they do not comply with specified requirements.
 - .1 Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.4 PROTECTION & CLEAN-UP

- .1 Protect roofing system from damage and wear during remainder of construction period.
- .2 Correct deficiencies in or remove roofing system that does not comply with requirements; repair substrates; and repair or reinstall roofing system to a condition free of damage and deterioration at time of acceptance by Owner.

END OF SECTION 07 52 16

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Provide all labor, equipment, and materials to fabricate and install including, but not limited to, the following:
 - .1 Edge strip and flashings.
 - .2 Fascia, edge metal, scuppers, and trim.
 - .3 Coping cap at parapets.
 - .4 Gutters and RWL's

1.2 RELATED REQUIREMENTS

- .1 Section 01 00 00 General Conditions
- .2 Section 07 52 16 SBS Modified Bituminous Membrane Roofing
- .3 Section 07 92 00 Joint Sealant
- .4 Section 08 11 00 Metal Doors and Frames
- .5 Section 08 41 13 Aluminum-Framed Entrances and Storefronts / Windows

1.3 REFERENCES

- .1 The Aluminum Association (AA)
Aluminum Sheet Metal Work in Building Construction
AA DAF45, Designation System for Aluminum Finishes
- .2 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .3 ASTM A792/A792M, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- .4 ASTM D523, Standard Test Method for Specular Gloss.
- .5 CAN/CGSB-37.5, Cutback Asphaltic Plastic Cement
- .6 Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)
- .7 Roofing Contractors Association of British Columbia (RCABC) Roofing Practices Manual (RPM)

1.4 SUBMITTALS

- .1 Shop Drawings:
 - .1 Identify typical flashing conditions. Indicate material profile, jointing pattern, jointing details, fastening methods, flashing, terminations, and installation details.
 - .2 Indicate type, gauge and finish of metal.
- .2 Samples: Submit duplicate 50 x 50 mm samples of each type of sheet metal material, colour and finish.
- .3 Submittals to be made in accordance with Section 01 33 00 Submittal Procedures.

1.5 MOCK-UP

- .1 Provide a mock-up, including all components of the system (joints, connection hardware, typical tie-ins to adjacent systems) of each condition on the project site for Consultant review and acceptance. Mock-up may be part of finished work. Allow 24 hours for review of mock-up by Consultant before proceeding with the work.
- .2 Modifications to mock-up required to meet design and performance requirements at no cost to contract.

PART 2 PRODUCTS

2.1 SHEET METAL

- .1 Minimum gauge of steel or thickness of Aluminum to be specified in accordance with Architectural Sheet Metal Manual, SMACNA, recommendations.
- .2 Pre-Finished Aluminum Sheet: ASTM B209, 3003 alloy, alloy and temper as required for application and finish; 0.032 inch thick (20 gauge); finish shop pre-coated with silicone polyester baked enamel top coat.
- .3 Colour as selected by Consultant from manufacturer's standard colour chart to match adjoining material.

2.2 ACCESSORIES

- .1 Isolation coating: alkali resistant bituminous paint.
- .2 Plastic Cement: CAN/CGSB-37.5
- .3 Sealant: As specified in Section 07 92 00.
- .4 Underlayment: SBS Modified Bituminous Membrane Roofing as specified in Section 07 52 16
- .5 Cleats: of same material and gauge as sheet metal being secured.
- .6 Fasteners: Corrosion resistant screw fastener to ASTM F1667 / CSA O86-09.
- .7 Washers: of same material as sheet metal, 1mm thick with rubber packings.
- .8 Touch-up Paint: as recommended by prefinished material manufacturer.

2.3 FABRICATION

- .1 Fabricate metal flashings and other sheet metal work in accordance with applicable RCABC series details.
- .2 Form pieces in 2400 mm maximum lengths. Make allowance for expansion at joints.
- .3 Hem exposed edges on underside 12 mm. Mitre and seal corners with sealant.
- .4 Flashing joint on cap flashings and inside corners of cant strip flashings to be with standing seams and concealed anchor clips.
- .5 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .6 Isolate metal products from dissimilar metals, masonry or concrete with bituminous paint, tape, or slip sheet. Use gasketed fasteners where required to prevent corrosive reactions.
- .4 Scuppers: size and profile to RCABC standards as required; copper; installed with compatible fasteners to prevent galvanic corrosion.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Verify that curbs are solidly set and nailing strips located.
- .2 Perform field measurements prior to fabrication.
- .3 Coordinate work with work of other trades.
- .4 Verify that substrate is dry, clean and free of foreign matter.
- .5 Commencement of installation shall be considered acceptance of existing conditions.

3.2 INSTALLATION

- .1 Install sheet metal work, including suppers, in accordance with applicable RCABC series details and as detailed.
- .2 All accessories or other items essential to the completeness of sheet metal installation, whether specifically indicated or not, shall be provided and of the same material as item to which applied.
- .3 Allow sufficient clearances for expansion and contraction of linear metal components.
- .4 Secure using concealed fasteners except where approved before installation. Unapproved exposed face fastening will be rejected.
- .5 Provide underlay under sheet metal. Secure in place and lap joints 100 mm.
- .6 Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- .7 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs. Flash joints using standing seam forming tight fit over hook strips, as detailed.
- .8 Lock and seal metal joints watertight.

3.3 TOUCH-UP AND CLEAN-UP

- .1 Clean installed work in accordance with the manufacturer's instructions.
- .2 Replace damaged work than cannot be restored by normal cleaning methods.
- .3 Remove and properly dispose of waste products generated. Comply with requirements of authorities having jurisdiction

3.4 INSPECTION

- .1 At completion of installation and associated work, arrange for inspection of flashing of roof penetrations, walls, curbs and other equipment by testing agency appointed by Owner.

END OF SECTION 07 62 00

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 All labour, materials, tools and other equipment, services and supervision required to complete all work as specified herein to locations and to details indicated on drawings and schedules
 - .1 HydraPressed + Aristocrat Slabs
 - .2 Pedestals as required to suit required installation.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Abbotsford Concrete Products: HydraPressed Slabs
 - .1 Finish: Texada or Cortez Series
 - .2 Colour: Charcoal or Granite
 - .3 Size: 610mm x 610mm x 50mm (24" x 24" x 2"0)
- .1 Abbotsford Concrete Products: Aristocrat Series
 - .1 Finish: 'Anti-Slip'
 - .2 Colour: Dover Grey
 - .3 Size: 600mm x 600mm x 20mm (24" x 24" x 2"0)
- .2 Pedestals: To suit paver, installed in accordance w. manufacturer's written instructions.
 - .1 BlackJack OneStep System or PAVE-EL: Model 6X Paver Stone Pedestal
 - .2 BlackJack ScrewJack Pedestal

PART 3 EXECUTION

3.1 CONDITIONS

- .1 Examine all conditions on which the successful work of this section depends.
- .2 Report to the Consultant (Architect) in writing defects of work prepared by other trades and unsatisfactory site conditions. Starting of the work shall imply acceptance of surfaces.

3.2 INSTALLATION

- .1 Install as specified by manufacturer.
- .2 Trim pavers as required to fit specified area.
- .3 Finished work shall be level, and free from distortion and defects, detrimental to appearance or performance.

3.3 PROTECTION AND CLEAN UP

- .1 Protect during installation any adjacent surfaces from damage due to the work of this section.
- .2 Protect items installed under this section from damage resulting from the work of other sections.
- .3 Promptly as the work proceeds and on completion, remove all crating, surplus materials, and equipment.

END OF SECTION 07 76 16

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 All labour, materials, tools and other equipment, services and supervision required to complete all fire stopping work required by latest BC building and fire code requirements.
- .2 Provide firestop systems consisting of a material, or combination of materials installed to retain the integrity the fire-resistance rated construction by maintaining an effective barrier against the spread of flame, or smoke, and/or hot gases through penetrations, blank openings, construction joints, or at the gap that is created at the building perimeter of the horizontal fire resistance rated assembly and non-fire-resistance rated exterior wall and in or adjacent to either fire-resistance or non-fire-resistance rated barriers in accordance with the requirements of the Building Code for this project.
- .3 Firestop systems shall be used in locations including, but not limited to, the following:
 - .1 Penetrations through fire-resistance-rated floor and roof assemblies requiring protected openings including both empty openings and openings that contain penetrations.
 - .2 Penetrations through fire-resistance-rated wall assemblies including both empty openings and openings that contain penetrations.
 - .3 Membrane penetrations in fire-resistance-rated wall assemblies where items penetrate one side of the barrier.
 - .4 Joints in fire-resistance-rated assemblies that to allow independent movement.
 - .5 Perimeter of the horizontal fire-resistance rated assembly and exterior wall between a rated floor/roof and an exterior wall assembly that is not fire-resistance rated.
 - .6 Joints, through penetrations and membrane penetrations in Smoke Barriers and Smoke Partitions.

1.2 RELATED REQUIREMENTS

- .1 Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that relate directly to Work of this Section include, but are not limited to:
 - .1 Division 3 – Concrete
 - .2 Division 6 – Wood and Plastics
 - .3 Division 7 – Thermal and Moisture Protection
 - .4 Division 8 – Openings
 - .5 Division 9 – Finishes
 - .6 Structural – Refer to Drawings and Specifications
 - .7 Mechanical – Refer to Drawings and Specifications
 - .8 Fire Suppression - Refer to Drawings and Specifications
 - .9 Electrical – Refer to Drawings and Specifications

1.3 REFERENCES

- .1 Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirement shall govern.
 - .1 American Society for Testing and Materials (ASTM).
 - .1 E 2174 Standard Practice for On-Site Inspection of Installed Fire Stops
 - .2 E 2393 Standard Practice for On-Site Inspection of Installed Fire Stop Joint Systems

- .3 E 2307 Standard Test Method for Determining the Fire Endurance of Perimeter Fire Barrier Systems Using the Intermediate-Scale, Multi Story Test Apparatus (ISMA)
- .4 E 2837 Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies
- .2 Factory Mutual (FM) Approvals:
 - .1 FM Approval Standard of Firestop Contractors – Class 4991
 - .2 FM Firestop Exam
 - .3 FM Approvals Standard for Firestops – Class 4990
- .3 Firestop Contractors International Association (FCIA):
 - .1 MOP – FCIA Firestop Manual of Practice
 - .2 FCIA Recommended Professional Practice RPP-L-2018-1, for the Identification of Fire-Resistance Rated and Smoke Resistant Penetration and Joint Firestopping
- .4 International Firestop Council (IFC):
 - .1 Ref. 1 Recommended IFC Guidelines for Evaluating Firestop Engineering Judgments (April 2001)
 - .2 Ref. 2 Inspectors Field Pocket Guide
 - .3 Ref. 3 IFC Recommended Guidelines for Performing Destructive Testing for Installed Penetration Firestop Systems, Fire Resistive Joint Systems, or Perimeter Fire Barrier Systems
- .5 International Accreditation Services
 - .1 IAS Accreditation Criteria for Special Inspection Agencies AC-291
- .6 National Fire Protection Association (NFPA):
 - .1 NFPA 1 – The Fire Code
 - .2 NFPA 70 - National Electric Code
 - .3 NFPA 101 - Life Safety Code
 - .4 NFPA 221 - Fire Walls and Fire Barriers (preliminary to be released)
 - .5 NFPA 251 - Fire Tests of Building Construction and Materials
- .7 Underwriters Laboratories, Inc – UL, LLC. (UL/ULC):
 - .1 ULC Qualified Firestop Contractor Program
 - .2 UL Firestop Exam
 - .3 CAN/ULC-S115 Fire Tests of Firestop Systems
 - .4 CAN/ULC-S102 Surface Burning Characteristics of Building Materials and Assemblies
 - .5 CAN/ULC-S101 Fire Endurance Tests of Building Construction and Materials

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- .1 Penetrations: Provide and install firestopping products that once installed to the tested and listed system or engineering judgment (EJ) / equivalent fire-resistance rated assembly (EFRRA) to become firestop systems or EJ/EFRRA's that are produced to resist the spread of fire, and/or the passage of smoke through breaches, gaps, openings, in fire-resistance-rated and smoke resistant assemblies according to requirements indicated, including but not limited to the following:
 - .1 Firestop all breaches made for penetrations passing through fire resistance rated wall and floor assemblies and other locations as indicated on the drawings.
 - .2 Provide and install complete penetration firestopping systems that have been tested and approved by a nationally recognized third-party testing agency to the listing and the manufacturers installation instructions.
 - .3 F - Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated, as determined through testing in accordance with CAN/ULC-S115, but not less than one hour or the fire-resistance rating of the construction assembly being penetrated.

- .4 FT - Rated Through-Penetration Firestop Systems: Provide firestop systems with T (temperature) ratings, in addition to F ratings, as determined through testing in accordance with CAN/ULC-S115, where indicated, and required by the applicable Building Code.
- .5 FTH – Rated Through-Penetration Firestop Systems: Provide firestop systems with FTH (Hose Stream Test) ratings, in addition to F and T ratings, as determined through testing in accordance with CAN/ULC-S115, where indicated, and required by the applicable Building Code
- .6 L – Rated Through-Penetration Firestop Systems: Provide firestop systems with Air Leakage (L) ratings, in addition to F and T ratings, as determined in accordance with CAN/LC-S-115, where indicated.
- .2 Perimeter Fire Containment Systems: Provide interior perimeter joint systems with fire-resistance ratings indicated, as determined per ASTM E 2307 or CAN/ULC-S-115, but not less than the fire-resistance rating of the floor / horizontal assembly construction.
- .3 Fire-Resistive Joints: Provide fire resistive joint systems with fire-resistance ratings indicated, as determined by tests performed to ULC-S115 but not less than the fire-resistance rating of the assembly in which the breach or joint occurs. For where fire resistance rated walls do not meet and create a breach between a non-fire resistant horizontal assembly, provide fire resistive joint systems with fire-resistance ratings as determined by tests performed in accordance with ASTM E 2837.
- .4 For firestopping breaches, gaps or joints exposed to view, traffic, moisture, and physical damage, provide firestop systems for these conditions that meet conditions expected as communicated through construction documents.
- .5 Where there is no specific third party tested and listed, classified firestop system available for a particular firestop configuration, the firestopping contractor shall obtain from the firestop manufacturer, an Engineering Judgment (EJ) or Equivalent Fire Resistance Rated Assembly (EFRRA) for submittal. All EJ's or EFRRA's to state the manufacturer EJ/EFRRA will pass the fire tests referenced in this specification section for the application, if tested.

1.5 SUBMITTALS

- .1 Submit Manufacturers Product Data Sheets for each type of product selected. Certify that Firestop Material shall be asbestos free and complies with local regulations.
- .1 Certification by firestopping manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOC's) and are nontoxic to building occupants.
- .2 Submit system design listings, including illustrations from a qualified testing and inspection agency that is applicable to each firestop configuration.
 - .1 Systems shall be submitted and reference system numbers in the UL Fire Resistance Directory or Online Certification Directory, under product categories XHEZ, XHDG or XHBN. As an alternative, system numbers from other approved agencies shall be submitted. An example of selected numbering, but not the complete numbering system is:
 - .1 Breaches in Concrete Assemblies with
 - .1 Metal Penetrating Items – C-AJ-1XXX.
 - .2 Plastic Penetrating Items – C-AJ-2XXX
 - .3 Cables – C-AJ-3XXX
 - .4 Cable Trays – C-AJ-4XXX
 - .5 Insulated Penetrating Items – C-AJ-5XXX
 - .6 Multiple Penetrating – C-AJ-8XXX
 - NOTE: There may be some systems available in other alpha numeric categories.
 - .2 Breaches in Gypsum Wallboard Assemblies with
 - .1 Metal Penetrating Items – W-L-1XXX.
 - .2 Plastic Penetrating Items – W-L-2XXX

- .3 Cables – W-L-3XXX
 - .4 Cable Trays – W-L4XXX
 - .5 Insulated Penetrating Items – W-L-5XXX
 - .6 Multiple Penetrating – W-L-8XXX
 - NOTE: There may be some systems available in other alpha numeric categories.
 - .3 Breaches between Walls and floors
 - .1 Concrete to Concrete Wall to Floor – HW-S or HW-D-XXXX
 - .2 Framed Wall to Concrete Wall – WW-S or WW-D-XXXX
 - NOTE: There may be some systems available in other alpha numeric categories.
 - .4 Breaches between curtain walls and horizontal Assemblies –
 - .1 CW-S-XXXX or CW-D-XXXX
 - NOTE: There may be some systems available in other alpha numeric categories.
 - .2 Where there is no specific third party tested and classified Firestop System available for particular firestop configuration from any manufacturer, the firestopping contractor shall obtain from the firestop manufacturer an Engineering Judgment (EJ) or Equivalent Fire Resistance Rated Assembly (EFRRA) for submittal The EJ or EFRRA shall state that the assembly is expected to pass the appropriate fire test and is equivalent to a tested and listed firestop system.
 - .3 Submit contractor qualifications as noted in “Quality Assurance” article.
- 1.6 QUALITY ASSURANCE**
- .1 Fire-Test-Response Characteristics: Provide firestopping System Design Listing by a nationally recognized testing agency in accordance with the appropriate ULC Standard(s) per article 1.04 or another agency performing testing and follow-up inspection services for firestop materials that is acceptable to the authority having jurisdiction.
 - .2 Contractor Qualifications: Acceptable firestop installation contractor (installer) firms shall be:
 - .1 FM Approved in accordance with FM Standard 4991 – Approval of Firestop Contractors, or.
 - .2 UL/ULC Qualified Firestop Contractor, AND;
 - .3 Firestop Contractors International Association Contractor Member in good standing. Submit written proof of current membership in good standing.
 - .4 Licensed by the Province, Territory, or local authority, where applicable.
 - .5 Shown to have successfully completed not less than 5 comparable scale projects.
 - .3 Special Inspection Agency Qualifications: Special Inspection agencies shall be:
 - .1 IAS AC 291 Accredited for Firestop Systems.
 - .4 Special Inspectors Credentials: Special Inspectors shall have experience in the same type and complexity of work inspected. In addition, both the competence and experience shall be acceptable to the authority having jurisdiction, where inspection is code mandated Special inspectors shall prove competency by passing at 80%, either:
 - .1 FM Firestop Exam,
 - Or
 - .2 UL/ULC Firestop Exam
 - AND
 - .3 IFC Firestop Exam
 - .5 Single Source Responsibility: Obtain firestop systems for each kind of penetration and construction condition indicated from a single primary firestop systems manufacturer.
 - .1 Materials of different manufacture than allowed by the tested and listed system shall not be intermixed in the same firestop system or opening.
 - .2 Tested and listed, classified firestop systems are to be used. If another manufacturer has a tested and listed system, then that system shall be used prior to an Engineering Judgment (EJ) or Equivalent Fire Resistance Rated Assembly (EFRRA).
 - .6 Field Constructed Mockup: Prior to installing firestopping, erect mockups for each different firestop system indicated to verify selections made and to demonstrate qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final installations.

- .1 Locate mockups on site in locations indicated or, if not indicated, as directed by Architect. Include mockup for each type of system.
- .2 Notify Architect in advance of the dates and times when mockups will be installed.
- .3 Obtain Architect and AHJ's acceptance of mockups before start of Work.
- .4 Retain and maintain mockups during construction in an undisturbed condition as a standard for judging completed unit of Work. Accepted mockups in an undisturbed condition at time of Substantial Completion may become part of completed unit of Work.

1.7 MATERIAL STORAGE AND HANDLING

- .1 Deliver firestopping products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer.
- .2 Store and handle firestopping materials in accordance with manufacturers written instructions.

1.8 ENVIRONMENTAL CONDITIONS

- .1 Environmental Conditions: Install firestopping in accordance with manufacturers written instructions and the system design listings.
- .2 Ventilation: Ventilate per firestopping manufacturers' instructions or Safety Data Sheet (SDS)

1.9 SEQUENCE AND SCHEDULING

- .1 Project coordination is essential to inform and educate all the parties involved with the firestopping process of their role and how they can affect firestopping on the project. A pre-construction meeting shall be scheduled and required for all parties involved prior to the start of construction. Firestop Systems tested and listed systems from laboratory directories, engineering judgements/equivalent fire resistance rated assembly documentation shall be used to prepare breaches in fire-resistance rated and smoke resistant assemblies.

1.10 ENVIRONMENTAL REGULATIONS

- .1 All materials shall be asbestos free and comply with local VOC Regulations.
- .2 If required, hazardous disposal of firestop materials shall be strictly observed as noted on the individual MSDS.

PART 2 PRODUCTS

2.1 GENERAL

- .1 Systems listed by approved testing agencies, as identified in part 1 above, may be used, providing they conform to the construction type, penetrant type, annular space requirements and fire rating involved in each separate instance.
- .2 Manufacturer of firestop products shall have been successfully producing and supplying these products for a period of not less than 3 years, and be able to show evidence of at least 10 projects where similar products have been installed and accepted.
- .3 Firestop products produced by FCIA Manufacturer Members in good standing.
 - .1 3M Fire Protection Products
 - .2 BALCO, Inc.
 - .3 Construction Specialties, Inc.
 - .4 EMSEAL Joint Systems, Ltd.
 - .5 Fireline 520, an Inpro Company
 - .6 HILTI, Inc.
 - .7 International Carbine Technology Co., Ltd.
 - .8 NUCO, Inc.
 - .9 Rectorseal/CSW Industrials
 - .10 ROCKWOOL
 - .11 Specified Technologies, Inc.
 - .12 Thermafiber, Inc. (An Owens Corning Company)

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION OF SURFACES

- .1 Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping. Notify the responsible party or parties of any unsatisfactory conditions. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- .1 Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping. Notify the responsible party or parties of any unsatisfactory conditions. Do not proceed with installation until unsatisfactory conditions have been corrected.
- .2 Verify that system components are clean, dry, and ready for installation.
- .3 Verify that field dimensions are as shown on the Drawings, tested and listed, classified systems, Engineering Judgments, EFRRA's and as recommended by the manufacturer

3.3 INSTALLING PENETRATION FIRESTOPS

- .1 General: Comply with the "System Performance Requirements" article in Part 1 and the through-penetration firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.
 - .1 Coordinate with other trades to assure that all pipes, conduit, cable, and other items, which penetrate fire rated construction, have been permanently installed prior to installation of firestop assemblies.
 - .2 Schedule the work to assure that partitions and all other construction that conceals penetrations are not erected prior to the installation of firestop and smoke seals.
- .2 Install packing/backing/forming materials and other accessories in accordance with manufacturers written instructions, tested and listed, classified systems.
- .3 Install fill, void and cavity materials for through-penetration firestop systems by proven techniques as recommended by the manufacturer, tested and listed, classified system and tooled to produce the following results:
 - .1 Clean surfaces as recommended by manufacturers' written instructions and the system design listing.
 - .2 Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items, in accordance with the system design listing.
 - .3 Install materials so they contact and adhere to substrates formed by openings and penetrating items.
 - .4 Finish to produce smooth, uniform surfaces as recommended by manufacturer's installation instructions and tested and listed, classified system requirements.

3.4 INSTALLING FIRESTOP JOINT SYSTEMS

- .1 General: Comply with the "System Performance Requirements" article in Part 1 and with the firestop manufacturer's installation instructions, system design listings and drawings pertaining to products and applications indicated.
 - .1 Install joint forming materials to provide support of firestop materials during application and at the position required to produce the cross-sectional shapes and depths of installed firestop material relative to joint widths that allow optimum sealant movement capability and develop fire-resistance rating required.
- .2 Install tested and listed, classified systems and non-tested engineering judgments, EFRRA's that result in firestop materials:
 - .1 Directly contacting and fully wetting joint substrates.
 - .2 Completely filling recesses provided for each joint configuration in accordance with the system design listing,
 - .3 Providing uniform, cross-sectional shapes and depths relative to joint width that optimize movement capability and meet tested and listed system requirements.
- .3 Tool or smooth non-sag firestop sealant materials immediately after their application and prior to the time skinning or begins. Form smooth, uniform beads of configuration indicated or required to:
 - .1 Produce fire-resistance rating

- .2 Eliminate air pockets
- .3 Ensure contact and adhesion with sides of joint.

3.5 **INSTALLING PERIMETER BARRIER SYSTEMS**

- .1 General: Comply with "System Performance Requirements" article in Part 1 and with the firestop manufacture's installation, systems design listings and drawings pertaining to products and applications indicated.
- .2 Install metal framing, curtain wall insulation, mechanical attachments, safing materials and other firestop system components as applicable within the system design.

3.6 **FIELD QUALITY CONTROL**

- .1 Provide either of the following:
 - .1 **CERTIFICATE OF CONFORMANCE** – Firestopping shall be installed by an FM 4991 Approved Firestop Contractor and/or UL/ULC Qualified Firestop Contractor. The installer shall issue to AHJ or Owner a Certificate of Conformance confirming that the work has been carried out in accordance with specifications.

...AND/OR...
 - .2 **INSPECTION** – Independent inspection agency employed and paid by owner, will examine penetration firestopping in accordance with ASTM E – 2174, "Standard Practice for On-Site Inspection of Installed Fire Stops and ASTM E-2393, "Standard Practice for On-Site Inspection of Installed Fire Stop Joint Systems.
 - .3 The type of firestop is defined as by system design listing by firestop installation contractor.

1.7 **CLEANING**

- .1 Clean off excess fill materials and sealants adjacent to openings and joints as work progresses. Use methods and cleaning materials approved by manufacturers of firestopping products and or assemblies in which openings and joints occur.
- .2 Protect firestopping during and after curing period from contact with contaminating substances. If damage caused by others, owner and general contractor to instruct firestop contractor to make appropriate repairs and charge to appropriate trades.

1.8 **DOCUMENTATION**

- .1 Provide **documentation** of penetrations, joints and perimeter fire containment listings and designs with areas noted on life safety drawings to building owner and manager.
- .2 **Documentation:** Provide details of installations, with Listed Systems and/or EJ/EFRA's and locations on Life Safety Drawings for restoring the fire resistance rating or smoke resistant properties where a breach in an assembly occurs for a fire-resistance rated joint, penetration and/or safing slot, perimeter fire containment system. Such documentation shall be delivered as a binder, electronic or software application/program to the building owner or manager at the end of construction. This information shall be part of the closeout documents. Documentation shall be composed in a concise and comprehensible manner by so that the Authority Having Jurisdiction (AHJ) can understand and verify installations.
- .3 **On Site Firestop Identification Systems:** (Optional) Wall and floor identification system, shall be permanent, affixed, labels made that self-destruct upon removal, consisting of paper, metal or ceramic fiber materials, or hanging tags in accordance with FCIA Recommended Professional Practice RPP-L-2018-1, for the Identification of Fire-Resistance Rated and Smoke Resistant

Penetration and Joint Firestopping: The firestop system identification device shall be located within 6" of the firestop system edge, each side of the wall, accessible side of horizontal assemblies, in or out of view. Firestop identification systems shall be installed as each firestop system is completed. Firestop Identification system shall have the following minimum information:

- .1 The words – “Warning - Firestop System – Do Not Remove or Tamper”
 - .2 UL or other laboratory tested and listed system number.
 - .3 Date of Installation.
 - .4 Installing Contractor Company name, contact information.
 - .5 Manufacturer Company Name
 - .6 Installing Individual Identifier
- .4 Fire Separation Markings:
- .1 Provide identification for all vertical fire separations.
 - .2 Identification markings: Adhesive tamper evident stickers, stencil painted with lettering at least 75 mm (3") in height with a minimum 10 mm (3/8") stroke in contrasting color.
 - .3 Marking to incorporate the assembly's fire-resistance rating and the type of assembly that the words: "FIRE SEPARATION AND/OR SMOKE BARRIER – PROTECT ALL OPENINGS".
 - .4 For occupied areas with exposed ceilings: use 50 mm red dot adhesive stickers, stencil painted red dots, without horizontal painted lines.

END OF SECTION 07 84 00

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Provide sealants not specified in other sections.

1.2 RELATED REQUIREMENTS

- .1 Section 01 00 00 General Requirements
- .2 Section 07 62 00 Sheet Metal Flashings and Trim
- .3 Section 08 11 00 Metal Doors and Frames
- .4 Section 08 44 00 Curtain Wall and Glazed Assemblies

1.3 REFERENCES

- .1 CGSB 19-GP-5-M Sealing Compound, One Component, Acrylic Base, Solvent Curing (Incorporating Amendment No. 1).
- .2 CAN/CGSB 19.17-M One Component, Acrylic Emulsion Base, Sealing Compound.
- .3 CAN/CGSB 19.13-M Sealing Compound, One-Component, Elastomeric, Chemical Curing Canadian General Standards Board.
- .4 CGSB 19-GP-14-M Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing.
- .5 CAN/CGSB-19.24-M Multi-component, Chemical Curing, Sealing Compound.

1.4 QUALITY ASSURANCE

- .1 A recognized specialized applicator with minimum 5 years experience shall carry out installation of sealing and caulking work.

1.5 SUBMITTALS

- .1 Product Data: Submit manufacturer's information indicating chemical characteristics, performance criteria and limitations for all proposed caulking and sealant products to be supplied as well as sealant colour charts and colour availability for each sealant type specified for Consultant review, selection and pre-approval prior to installation.
- .2 Samples: Submit duplicate samples of each type of material and colour.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials to site in original, unopened containers with manufacturer's labels intact.
- .2 Handle and store materials in accordance with manufacturer's recommendations.

1.7 ENVIRONMENTAL CONDITIONS

- .1 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants, including special conditions governing use.
- .2 Record conditions and temperatures of application of caulking and sealant.

PART 2 PRODUCTS

2.1 SEALANTS GENERAL

- .1 Use sealant with Low VOC content where available and suitable.
- .2 Compatibility: Provide joint sealants and accessory materials that are compatible with one another, and with adjacent materials, as demonstrated by sealant manufacturer using ASTM C 1087 testing and related experience.
- .3 Where exposed to view, colour to match adjacent surface. Colour as selected by Consultant from manufacturer's standard colours.

2.2 POLYURETHANE SEALANT

- .1 Provide Sealants that meet the following specifications: (non-traffic)
 - .1 Single-component, Nonsag, Moisture-cure, Polyurethane Hybrid Joint Sealant: ASTM C 920, Type S, Grade NS, Class 35, Use: NT; Greenguard certified.
 - .2 Basis of Design Product: **Tremco, Inc., Dymonic FC.**
 - .1 Extrusion Rate ASTM C1183: 93.1 mL/min
 - .2 Weight Loss ASTM C1246: Pass
 - .3 Tack Free Time ASTM C679: 3 to 4 hr
 - .4 Volatile Organic Compound (VOC) Content: 10 g/L maximum.
 - .5 Volatile Organic Emissions (VOE): Not greater than Greenguard Children & Schools Certification emissions levels.
 - .6 Color: As selected by Architect from manufacturer's standard line of not less than 15 colors.
- .2 Provide Sealants that meet the following specifications: (traffic)
 - .1 Immersible, Single-Component, Pourable, Traffic Grade Polyurethane Joint Sealant: ASTM C 920, Type S, Grade P, Class 50, Use T and I.
 - .2 Basis of Design Product: **Tremco, Inc., Vulkem 445SSL.**
 - .1 Tensile Strength, ASTM D 412: 250 psi (1.7 MPa), at 100 percent elongation.
 - .2 Tear Strength, ASTM D 412: 35 pli (6.1 kN/m).
 - .3 Adhesion to Concrete, After Water, ASTM C 794: 28 pli (4.4 kN/m)
 - .4 Hardness, ASTM C 661: 40 durometer Shore A, minimum.
 - .5 Accelerated Weathering, ASTM C 793: Pass.
 - .6 Volatile Organic Compound (VOC) Content: 106 g/L maximum.
 - .7 Color: As selected by Architect from manufacturer's standard line of 70 colors

2.3 ACOUSTICAL SEALANT

- .1 Basis of Design: MONO Acoustical Sealant by DAP Canada or Excel Acoustical Sealant by GH International.

2.4 JOINT SEALANT ACCESSORIES

- .1 Joint Cleaner: xylol, methyl ethyl ketone or non-corrosive type recommended by sealant manufacturer and compatible with joint forming materials.
- .2 Joint Primers: Non-corrosive and non-staining type, as recommended by sealant manufacturer, for joint surface conditions encountered.

- .3 Bond Breaker Tape: Polyethylene tape/plastic tape recommended by sealant manufacturer, applied to sealant contact surfaces where bond to substrate or backer rod must be avoided for proper performance of sealant. Provide self-adhesive tape where applicable.
- .4 Solvents, Cleaners and Primers: non-staining, non-corrosive types as recommended by sealant manufacturer for each particular substrate and compatible with joint forming materials.
- .5 Backer Rod: Non-adherent type, open or closed cell, to suit application requirements flexible rod, conforming to ASTM D1056 and D1565 compatible with primers and sealants used, of type as recommended by sealant manufacturer.
 - .1 Compatible with primers and sealants, outsized 30 to 50%.
 - .2 Polyethylene, urethane, neoprene or vinyl: extruded closed cell foam, Shore A hardness 20, tensile strength 140 to 200kPa.
 - .3 Neoprene or butyl rubber: round solid rod, Shore A hardness 70.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Examine joint profiles and surfaces to determine if work is ready to receive joint sealants. Verify joint dimensions are adequate for development of sealant movement capability. Verify joint surfaces are clean, dry, and adequately cured. Proceed with joint sealant work once conditions meet sealant manufacturer's written recommendations.
- .2 Unsatisfactory surfaces and / or conditions to be communicated to Consultant. Start of joint sealant work will be considered as acceptance of conditions for work completion.

3.2 PREPARATION

- .1 Joint Surface Cleaning: Clean joints prior to installing joint sealants using materials and methods recommended by sealant manufacturer. Comply with ASTM C 1193.
 - .1 Remove curing compounds, laitance, form-release agents, dust, and other contaminants.
 - .2 Clean nonporous and porous surfaces utilizing chemical cleaners acceptable to sealant manufacturer.
 - .3 Protect elements surrounding the Work of this section from damage or disfiguration. Apply masking tape to adjacent surfaces when required to prevent damage to finishes from sealant installation.

3.3 SEALANT APPLICATION

- .1 Sealant and Primer Installation Standard: Comply with ASTM C 1193 and manufacturer's written instructions.
- .2 Joint Backing: Select joint backing materials recommended by sealant manufacturer as compatible with sealant and adjacent materials. Install backing material at depth required to produce profile of joint sealant allowing optimal sealant movement.
 - .1 Install joint backing to maintain the following joint ratios:
 - .1 Joints up to 1/2 inch (13 mm) wide: 1:1 width to depth ratio.
 - .2 Joints greater than 1/2 inch (13 mm) wide: 2:1 width to depth ratio; maximum 1/2 inch (13 mm) joint depth.
 - .2 Install bond breaker tape over substrates when sealant backings are not used.
- .3 Masking: Mask adjacent surfaces to prevent staining or damage by contact with sealant or primer.
- .4 Joint Priming: Prime joint substrates when recommended by sealant manufacturer or when indicated by preconstruction testing or experience. Apply recommended primer using sealant manufacturer's recommended application techniques.
- .5 Liquid Sealant Application: Install sealants using methods recommended by sealant manufacturer, in depths recommended for application. Apply in continuous operation from bottom to top of joint vertically and horizontally in a single direction. Apply using adequate pressure to fill and seal joint width.

- .1 Tool sealants immediately with appropriately shaped tool to force sealants against joint backing and joint substrates, eliminating voids and ensuring full contact.
- .2 Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- .3 Tool exposed joint surface concave using tooling agents approved by sealant manufacturer for application.
- .6 Cleaning: Remove excess sealant using materials and methods approved by sealant manufacturer that will not damage joint substrate materials.
 - .1 Remove masking tape immediately after tooling joint without disturbing seal.
 - .2 Remove excess sealant from surfaces while still uncured.

3.4 PROTECTION & CLEAN-UP

- .1 Ensure sealants do not overflow or spill onto adjacent surfaces. Ensure sealants do not migrate into voids of adjacent surfaces.
- .2 Protect sealant from contamination and damage by other materials.
- .3 Upon completion, remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 74 00 Cleaning and Waste Management.

END OF SECTION 07 92 00

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 This section includes hollow metal doors and pressed steel frames for doors as scheduled.

1.2 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 07 92 00 Joint Sealant
- .3 Section 09 90 00 Painting and Coating

1.3 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CSA W59, Welded Steel Construction (Metal Arc Welding).
- .2 Canadian Steel Door Manufacturers' Association, (CSDMA).
 - .1 CSDMA, Specifications for Commercial Steel Doors and Frames.

1.4 SUBMITTALS

- .1 Shop Drawings
 - .1 Prior to fabrication, submit shop drawings which include door + frame schedule, typical details, including hardware requirements.

1.5 QUALITY ASSURANCE

- .1 Conform to requirements of ANSI A117.1
- .2 Company specializing in manufacturing products specified with a minimum of five (5) years documented experience.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store, handle and protect doors and frames in accordance with Section 01 60 00 Product Requirements.
- .2 Deliver, handle and store doors and frames at the job site in such a manner as to prevent damage
- .3 Store doors and frames under cover with doors stored in a vertical position on blocking, clear of floor and with blocking between doors to permit air circulation.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Hot dipped galvanized steel sheet: to ASTM A653/A653M, ZF75, minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts.
- .2 Reinforcement channel: to CSA G40.20/G40.21, Type 44W, coating designation to ASTM A653/A653M, ZF75.

2.2 DOOR FRAMES

- .1 Fabricate frames in accordance with CSDMA specifications.
- .2 Fabricate frames to profiles and maximum face sizes as indicated.
- .3 Exterior frames: 1.2 mm welded, thermally broken type construction.
- .4 Protect mortised cut-outs with steel guard boxes.
- .5 Conceal fastenings except where exposed fastenings are indicated.
- .6 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.
- .7 Provide thermally broken frames at all exterior locations.
- .8 Provide rated, labeled frames as indicated in contract documents.

2.3 HOLLOW METAL DOORS (FLUSH TYPE)

- .1 Stiffened: face sheets welded insulated core
 - .1 Expanded polystyrene: CAN/ULC-S701, density 16 to 32 kg/m³.
 - .2 Polyurethane: to CAN/ULC-S704 rigid, modified polyisocyanurate, closed cell board. Density 32 kg/m³.
- .2 Temperature rise rated (TRR): core composition to limit temperature rise on unexposed side of door to 250°C at 60 minutes. Core to be tested as part of a complete door assembly, in accordance with CAN4-S104, ASTM E152 or NFPA 252, covering Standard Method of Tests of Door Assemblies and listed by nationally recognized testing agency having factory inspection service.
- .3 Thermal Insulation materials must:
 - .1 Not require being labelled as poisonous, corrosive, flammable or explosive under the Consumer Chemical and Container Regulations of the Hazardous Products Act.
 - .2 Be manufactured using a process that uses chemical compounds with the minimum zone depletion potential (ODP) available.
- .4 Provide rated, labeled doors as indicated in contract documents.

2.4 ANCHORS

- .1 Shim and anchor new doors in accordance with CAN/CSA A440.4.
- .2 Provide appropriate anchorage to floor and wall construction.
- .3 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.
- .4 Provide 2 anchors for rebate opening heights up to 1520 mm and 1 additional anchor for each additional 760 mm of height or fraction thereof.
- .5 Locate anchors for frames in existing openings not more than 150 mm from top and bottom of each jambs and intermediate at 660 mm o.c. maximum.

2.5 FABRICATION OF FRAMES

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

2.6 FABRICATION OF METAL DOORS

- .1 Doors: swing type, flush.
- .2 Exterior doors: insulated, hollow steel construction.
- .3 Fabricate doors with longitudinal edges locked seam. Seams: grind welded joints to a flat plane, fill with metallic paste filler and sand to a uniform smooth finish.
- .4 Doors: manufacturers' proprietary construction, tested and/or engineered as part of a fully operable assembly, including door, frame, gasketing and hardware in accordance with ASTM E330.
- .5 Reinforce doors where required, for surface mounted hardware. Provide flush steel top caps to exterior doors. Provide inverted, recessed, spot welded channels to top and bottom of interior doors.
- .6 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.

2.7 HARDWARE PREPARATION

- .1 Blank, reinforce, drill and tap frames for mortised, template hardware using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.
- .2 Blank, reinforce, drill doors and tap for mortised, templated hardware.

2.8 HARDWARE

- .1 Hardware to provide:
 - .1 Closer
 - .2 Lever
 - .3 Lockset (as per schedule)
 - .4 Weather stripping as applicable
 - .5 Coordinate w. Interior Design + Client

2.9 FINISHING

- .1 Touch up with primer finishes damaged during installation.
- .2 Fill exposed frame anchors and surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

PART 3 EXECUTION

3.1 INSPECTION

- .1 Inspect the work and notify the Architect of any conditions that would affect the installation or performance of the work.
- .2 Start of door and frame installation indicates installer's acceptance of substrate installation conditions.

3.2 INSTALLATION

- .1 Install doors and frames to CSDMA Installation Guide.

3.3 FRAME INSTALLATION

- .1 Set frames plumb, square, level and at correct elevation.
- .2 Secure anchorages and connections to adjacent construction.
- .3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.
- .4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.
- .5 Caulk perimeter of frames between frame and adjacent material.

- .6 Maintain continuity of weather barrier and vapour retarder as applicable.

3.4 DOOR INSTALLATION

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

3.4 ADJUST AND CLEAN-UP

- .1 Check and readjust operating finish hardware items in hollow metal work in advance of final inspection. Leave work in complete, fully properly functioning condition. Remove and replace defective work, including doors and / or frames which are warped, bowed or otherwise damaged.

END OF SECTION 08 11 00

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 All labour, materials, tools and other equipment, services and supervision required to complete all work as specified herein to locations and to details indicated on drawings and schedules.
- .2 Work under this Contract shall also include, but not necessarily be limited to the supply and/or installation of the following:
 - .1 Wood doors, non-rated, fire-rated.
 - .1 Flush.
 - .2 Moulded Panel.
 - .3 Factory Glazing.
 - .4 Louvers

1.2 RELATED REQUIREMENTS

- .1 Section 06 20 00 - Finish Carpentry.
- .2 Section 06 41 00 - Architectural Wood Casework
- .3 Section 08 11 00 - Metal Doors and Frames.
- .4 Section 09 21 16 – Gypsum Board Assemblies
- .5 Section 09 90 00 – Painting and Coating

1.3 REFERENCES

- .1 The latest edition (at time of Bidding) of the following 'Reference Standards' shall govern all work:
 - .1 Architectural Woodwork Standards 2nd Edition, published jointly by the Architectural Woodwork Institute (AWI), the Architectural Woodwork Manufacturer Association of Canada (AWMAC), and the Woodwork Institute (WI).
 - .2 ANSI/WDMA I.S. 1A-13 Industry Standard for Architectural Wood Flush Doors
 - .3 CAN/ULC S-104-10 Standard Method for Fire Tests of Door Assemblies
 - .4 NFPA 80-13 Standard for Fire Doors and Other Opening Protectives
 - .5 NFPA 252-12 Standard Method of Fire Tests of Door Assemblies
 - .6 ITS/Warnock Hersey Mark for Fire Door Test Certification
 - .7 ASTM E90-09 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
 - .8 ASTM E413 - 10 Classification for Rating Sound Insulation.

1.4 SUBMITTALS

- .1 Submit under provisions of Section 01 33 00 – Submittal Procedures.
- .2 Submit shop drawings in conformance to the requirements of the Architectural Woodwork Standards 2nd Edition.
- .3 Illustrate door opening information such as location, size types, construction, swings, undercuts, special bevelling, hardware location and preparation requirements, blocking for hardware in mineral core doors, fire ratings, lite cut-outs, factory finish, glass, and other pertinent data.
- .4 Product Data: Indicate door core materials, thickness, construction, veneer species
 - .1 Indicate manufacturer's full lifetime warranty.
 - .2 Indicate glass size, type and thickness for factory glazed doors.
- .5 Samples:

- .1 Provide door construction samples with door faces, edges, and core representative of the specified door type(s).
- .2 Where applicable, provide pre-finished veneer sample to illustrate the color of the specified door face materials.

1.5 QUALITY ASSURANCE

- .1 Perform work to Custom Grade in accordance with the Grade requirements specified in the Architectural Woodwork Manufacturer's Association of Canada quality standards manual. (North American Architectural Woodwork Standards (NAAWS) - current edition at date of tender)
- .2 Manufacturer specializing in products herein specified with a minimum of five years documented experience.
- .3 Manufacturer must be a member in good standing of the Architectural Woodwork Manufacturer Association of Canada (AWMAC).
- .4 Provide fire-rated wood doors in compliance with NFPA 80.
- .5 Provide fire-rated wood doors with ULC or ITS/Warnock Hersey label

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store, protect and handle products in compliance with the Architectural Woodwork Standards; Section 2 Care & Storage, and manufacturer's care and handling instructions.
- .2 Deliver materials only when the project is ready for installation and the general contractor has provided a clean storage area.
- .3 Accept doors on site in manufacturer's standard packaging. Inspect for damage.
- .4 Protect all doors from exposure to natural and artificial light after delivery.

1.7 ENVIRONMENTAL CONDITIONS

- .1 Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.
- .2 Store upright in a dry, well ventilated building or shelter at a constant temperature. Do not store in damp, freshly plastered, drywall or concrete areas until materials have completely dried. Doors should be stored at least 10' away from any heat source to help prevent uneven drying. Doors must be sealed with an oil-based sealer or primer if stored for long periods.

1.8 WARRANTIES

- .1 Provide manufacturer's standard lifetime warranty for "Full Life of Original Installation", including hanging and finishing if door(s) do not comply with warranty tolerance standards.
- .2 Include coverage for delamination, warping, bow, cup and telegraphing of core construction beyond warranty tolerances.

PART 2 PRODUCTS

2.1 GENERAL

- .1 Basis of Design: Lynden Door – Commercial (CD) Series

2.2 COMPONENTS

- .1 Manufacture doors to ANSI/WDMA I.S. 1A-13 Heavy Duty performance level.

- .2 Flush Wood Doors
 - .1 Plain Sliced White Maple
- .3 Door Frame:
 - 1. Anodized Aluminum Storefront jambs shall be fabricated as a at jamb with doorstop applied or 2-piece split jamb. Hinge jamb preparations for 35 mm thick doors to be machined for standard weight radius mortise 90 mm hinges and 45 mm thick doors to be machined to accepts 102 mm hinges. Strike jamb preparations are to be machined for full lip cylindrical strike plate. Double door units shall include preparations for ball catch located at the top of door on both door panels designed to strike into the head jamb.
- .4 Hinges:
 - 1. (3) standard weight radius mortise hinges are required on doors 7'0" height or smaller & (4) on doors greater than 7'0".
- .5 Identify doors in pairs and sets on door schedule by door numbers, including doors separated by a mullion.
- .6 Doors with transoms - Continuous Match.
- .7 Adhesives: AWS Type I.
- .8 Non-Rated Wood Doors
 - .1 Core for non-rated doors: UF Free Particleboard
 - .2 Stiles for non-rated doors: structural composite lumber laminated to hardwood.
 - .3 Top and bottom rails for non-rated doors: structural composite lumber.
- .9 Fire-rated Wood Doors
 - .1 Core for 20-minute fire-rated doors: UF Free Particleboard.
 - .2 Core for 45 minute fire-rated doors: Structural Composite Lumber Core.
- .10 Stiles and rails for fire-rated wood doors: manufacturer's standard, conforming to the requirements of the manufacturer's labelling agency.

2.3 ACCESSORIES

- .1 Louvers
 - .1 Coordinate with mechanical for door grilles as required.
- .2 Glazing Stops
 - .1 Non-rated glazing stops: Wood species same as door face.
 - .2 Fire-rated glazing stops: Metal Vision Frames.
- .3 Glass and glazing in wood doors.
 - .1 Glass and glazing for non-rated and fire-rated doors to be provided by and installed by manufacturer.
- .4 Meeting edges for fire-rated door pairs.
 - .1 Metal Edge and Astragal.

2.4 FABRICATION

- .1 Flush Doors:
 - .1 Doors shall meet the requirements of ANSI/WDMA I.S. 1A-13 Heavy Duty performance level.
 - .2 Doors shall be 5 ply construction.
 - .3 Fully bond stiles and rails to core and abrasive plane assembled unit prior to lamination of faces.
 - .4 Assemble doors using AWS Type 1 adhesive that does not contain added urea-formaldehyde resins.
 - .5 Edges for veneered doors: AWS Type A constructed with 1" (25mm) of structural lumber laminated to 7/16" (11mm) of hardwood of the same species as face veneer. AWS Type B, wood veneer edges are not permitted. Impact-resistant door edge protector: Edgefender.
 - .6 Rails for doors minimum 1-7/6 (36mm) of structural composite lumber.
 - .7 Edges for veneered doors minimum 1" (25mm) structural composite lumber laminated to 7/16" (11mm) of hardwood of the same species as face veneer. Wood veneer edges are not permitted.
 - .8 Edges for doors for Opaque finish: AWS Type A, constructed with 1" (25mm) of structural composite lumber laminated to 7/16" (11mm) of wood of a species compatible with face veneer.
 - .9 Edges for doors with Plastic Laminate faces: AWS Type A mill option wood to be painted on-site to match face laminate.
- .2 Construct fire-rated doors to the requirements of all applicable labelling agencies.
- .3 Provide blocking on all non-rated and fire-rated doors, as required for hardware to prevent the need for through-bolting.
- .4 Factory drill pilot holes for hinges.
- .5 Bevel lock and hinge stile to Architectural Woodwork Standard 2nd Edition, 3 degree bevel.
- .6 Factory install non-rated and fire rated glass and glazing.

2.5 FINISHES

- .1 Factory applied transparent urethane finish. Provide Touch-up Kit for field touch-ups.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Verify that opening sizes and tolerances are acceptable and ready to receive this work.
- .2 Do not install doors in frame openings that are not plumb or are out of tolerance for size or alignment.
- .3 Commencing construction activities of this section indicates installer's acceptance of conditions.

3.2 INSTALLATION

- .1 Remove protective packaging just prior to installation. Installer shall be experienced in performing work required and shall be specialized in the installation of work similar to that required for this project. Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product packaging instructions for installation.
- .2 Install non-rated and fire-rated doors in accordance with NFPA 80, manufacturer's instructions and to ITS/Warnock Hersey requirements.
 - .1 Install factory finished doors just prior to substantial completion.
 - .2 Allow a fitting clearance of 3mm (1/8").
 - .3 Trim non-rated door widths as required by cutting equally on both edges. Reseal and

- refinish all cut or planed surfaces immediately to match factory finish.
- .4 Trim door height by cutting bottom edges to a maximum 19mm (3/4").
- .5 Trim fire door heights at bottom edge only in accordance with fire rating requirements.
- .6 Do not trim fire rated door widths.
- .7 Factory drill pilot holes.
- .8 Coordinate installation of doors with installation of frames and hardware.
- .9 Install door louvers and light kits plumb and level.
- .10 Adjust doors for smooth and balanced door movement and operation.

3.3 TOLERANCES

- .1 Conform to the Architectural Woodwork Manufacturer's Association of Canada quality standards manual. (North American Architectural Woodwork Standards (NAAWS) - current edition at date of tender) standards and testing methods for warp, cup, bow, and telegraphing.

END OF SECTION 08 14 00

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Extreme Series High Performance Door System.
 - .1 Aluminum Full View Sectional Overhead Door.
 - .2 Electric door operator and controls
 - .3 Operating hardware tracks and support

1.2 RELATED SECTIONS

- .1 Section 05500 - Metal Fabrications: Steel frame and supports.
- .2 Section 06114 - Wood Blocking and Curbing: Rough wood framing and blocking for door opening.
- .3 Section 07900 - Joint Seals: Perimeter sealant and backup materials.
- .4 Section 08710 - Door Hardware: Cylinder locks.
- .5 Section 09900 - Paints and Coatings: Field painting.
- .6 Section 16130 - Raceway and Boxes: Empty conduit from control station to door operator.
- .7 Section 16150 - Wiring Connections: Electrical service to door operator.

1.3 REFERENCES

- .1 ASCE 7 American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures
- .2 ANSI / DASMA 102; American National Standard specifications for sectional overhead type doors.

1.4 SUBMITTALS

- .1 Submit under provisions of Section 01300.
- .2 Manufacturer's data sheets on each product to be used, including:
 - .1 Preparation instructions and recommendations.
 - .2 Installation methods.
 - .3 Operation and maintenance data.
 - .4 Nameplate data and ratings for motors.
- .3 Shop Drawings: Include opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.
- .4 Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

- .1 Manufacturer Qualifications: Company specializing in manufacturing the types of doors specified in this section, with not less than ten years of documented experience.
- .2 Installer Qualifications: Company specializing in installing the types of products specified in this section, with minimum of five years of documented experience, and approved by the door manufacturer.

1.6 WARRANTY

- .1 Finish Limited Warranty:
 - .1 Standard Paint – 5 Years
 - .2 Custom Color Option (Color Blast® Finish) – 5 years
 - .3 Custom Color Option (RAL Powder Coat Finish) – 5 years
- .2 Parts and Hardware Limited Warranty
 - .1 Parts and Hardware: 1 Year
 - .2 Springs: 2 Years or 50,000 cycles.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- .1 Manufacturers: Clopay Corporation
- .2 Clopay Corporation
 - .1 Cookson
 - .2 Cornell

2.2 SECTIONAL OVERHEAD DOORS, EX900 SERIES

- .1 EX3728: Flush Insulated Steel Full View Doors, Thermally-Broken, Polystyrene Insulated
 - .1 Panels: Sandwich construction of exterior and interior steel skins pressure bonded to an expanded core, with skins separated by a continuous silicone filling forming a thermal break.
 - .2 Panel Thickness: 2 inches
 - .3 Steel Skin Thickness: Minimum 27 gauge 0.016 inch exterior; minimum 27 gauge 0.016 inch interior
 - .4 Stiles: Galvanized double end stiles, minimum 0.061 inch thick
 - .5 Astragal: U-shaped flexible PVC in retainer of full-length 0.055 inch rigid PVC
 - .6 Thermal Resistance (R-value): 18.4 deg F hr sq ft/Btu; calculated door section R-value in accordance with

DASMA TDS-163 Insulation: CFC-free and HCFC-free polyurethane, fully encapsulated

- .7 IECC: ASTM E283-12 and ANSI/DASMA 105-2012
 - .1 U-Factor: 0.16
 - .2 Air Infiltration: 0.41cfm/ft2
- .8 Finish: Interior stucco embossed texture with shallow U ribbed pattern, white interior color. Exterior stucco embossed with light ribbed pattern, exterior as follows:
 - .1 Color Blast® (Sherwin Williams® Color Code – High quality durable two-part Polane® paint system) – colour to match red cladding.
- .9 Windows: PVC windows measuring 42 inches by 16 inches
 - .1 Glazing: 3/4 inch insulated tempered
- .10 Weather-stripping: Provide complete perimeter seals. Provide flexible top seal, flexible jamb seal and U-shaped bottom seal
- .11 Track: Vertical tracks minimum 0.0961 inch galvanized steel tapered and mounted for wedge type closing. Horizontal tracks minimum 0.096 inch galvanized steel, reinforced with minimum 0.0897 inch galvanized steel angles as required
 - .1 Track Width: 3 inches
 - .2 Provide standard lift track as indicated
 - .3 Rollers: Long-stem tandem rollers.
- .12 Spring Counterbalance:
 - .1 Specialized torsion spring counterbalance mechanism sized to weight of the door. Spring to be helically wound, oil tempered, treated with secondary process to increase cycle life and reliability. Spring to be mounted on a solid steel shaft with center coupling
 - .2 Cable drum of die cast aluminum with high strength galvanized aircraft cable with minimum 7 to 1 safety factor. Cable to be at minimum 7-19 stranded 3/16 diameter with thimble loop.
 - .3 Cable Safety Device: Snubbers to help maintain cable tension.
 - .4 Spring cycles:
 - .1 Maximum cycles on a single shaft

2.3 DOOR OPERATOR

- .1 Manufacturer: LiftMaster
 - .1 Motor design: 1.25 HP
 - .1 3-phase, 460/575V available with supplementary step-down transformer provided by manufacturer

- .2 Operation: Variable speed direct drive
- .3 Operator Speed: Travels an average of 24" in the up direction and between 12"-18" in the down direction, depending on door type and drum size. Includes soft start/stop ramps
- .4 Motor: Listed by Underwriters Laboratories. Meet UL 325
- .5 Wall controller: Provide separation of low and high voltage wiring and include functionality of 3-button station; set door profile and programming limits, and performs diagnostics.
 - .1 Floor-level programming: Set limits, door profile, operating modes, and select photo entrapment devices via wall controller from standing height
 - .2 Display: Absolute cycle count, service cycle count, diagnostic messages, and door and operator status via 2 line, text LED display
 - .3 Cycle counter: Resettable via wall controller or MyQ technology
 - .4 Limit setting: Electronic pushbutton via wall controller
 - .5 Service cycle count, lifetime cycle count, and remote diagnostics via wall controller or myQ technology
- .6 Manual Hoist: Manual hoist with integral manual operation protection circuit
- .7 Cable Tension Monitor: Mitigates door operation when cable slackening occurs
- .8 Internet connectivity:
 - .1 Built-in Wi-Fi with myQ technology
 - .2 Over-the-air updates
- .9 Primary monitored entrapment protection:
 - .1 Curtain UL 325 approved (standard)

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Examine wall and overhead areas, including opening framing and blocking, with installer present, for compliance with requirements for installation tolerances, clearances, and other conditions affecting performance of Work in this Section.
- .2 Proceed with installation only after unsatisfactory conditions have been corrected.
- .3 If substrate preparation is the responsibility of another entity, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- .1 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- .1 Install overhead doors and track in accordance with approved shop drawings and the manufacturer's printed instructions.

3.4 PROTECTION

- .1 Protect installed products until completion of project.
- .2 Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 08 36 13

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 This section includes Architectural Aluminum Storefront Systems, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of storefront units.

1.2 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 07 42 13 Insulated Metal Wall Panels
- .3 Section 07 92 00 Joint Sealant

1.3 REFERENCES

- .1 ASTM E283, Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- .2 CAN/CSA-A440.4:19 Window, Door and Skylight Installation.
- .3 ASTM E331, Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- .4 AAMA 501.1, Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure.
- .5 ASTM E330 / E330M, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- .6 AAMA 501.4, Recommended Static Test Method for Evaluating Window Wall, Curtain Wall and Storefront Systems Subjected to Seismic and Wind-Induced Inter-Storey Drift
- .7 AAMA 501.5, Test Method for Thermal Cycling of Exterior Walls
- .8 AAMA Specification 1503, Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
- .9 AAMA Specification 1801, Voluntary Specification for the Acoustical Rating of Exterior Windows, Doors, Skylights and Glazed Wall Sections.
- .10 ASTM E1245, Standard Practice for Determining the Acoustical Performance of Windows, Doors, Skylight and Glazed Wall Systems.
- .11 ASTM E90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

1.4 PERFORMANCE REQUIREMENTS

- .1 Storefront System Performance Requirements:
 - .1 Wind loads: Provide storefront system; include anchorage, capable of withstanding estimated wind load design pressures of 28 lbs./sq. ft. factored inward and 25 lbs./sq. ft. factored outward. The design pressures shall be calculated by glazing supplier's engineer. Numbers provided are for estimating purposes only. Storefront glazing to be engineered by specialty engineer registered in the province of British Columbia. Schedule SB and SC shall be submitted to the coordinating registered professional.
 - .2 Air Leakage: The test specimen shall be tested in accordance with ASTM E 283. Air Leakage rate shall not exceed 0.06 cfm/ft² (0.3 l/s · m²) at a static air pressure differential of 6.2 psf (300 Pa) with interior seal, or, rate shall not exceed 0.06 cfm/ft² (0.3 l/s · m²) at a static air pressure differential of 1.6 psf (75 Pa) without interior seal. CSA A440 Fixed Rating.

- .3 Water Resistance: The test specimen shall be tested in accordance with ASTM E 331. There shall be no leakage at a minimum static air pressure differential of 8 psf (383 Pa) as defined in AAMA 501.
- .4 Uniform Load: A static air design load of 35 psf (1680 Pa) shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of L/175 of the span of any framing member. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.
- .5 Seismic: When tested to AAMA 501.4, system must meet design displacement of 0.010 x the story height and ultimate displacement of 1.5 x the design displacement.
- .6 Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures:
 - a. Temperature Change (Range): 0 deg F (-18 deg C); 180 deg F (82 deg C).
 - b. Test Interior Ambient-Air Temperature: [75 deg F (24 deg C)] .
 - c. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5 for a minimum 3 cycles.
- .7 Energy Efficiency:
 - a. Thermal Transmittance (U-factor): When tested to AAMA Specification 1503, the thermal transmittance (U-factor) shall not be more than:
 1. Glass to Exterior – 0.38 (low-e).
- .8 Condensation Resistance (CRF): When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than:
 1. Glass to Exterior – 70_{frame} and 69_{glass} (low-e).
- .9 Sound Transmission Class (STC) and Outdoor-Indoor Transmission Class (OITC): When tested to AAMA Specification 1801 and in accordance with ASTM E1425 and ASTM E90, the STC and OITC Rating shall not be less than:
 1. Glass to Exterior – 38 (STC) and 31 (OITC).

1.5 SUBMITTALS

- .1 Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, hardware, finishes, and installation instructions for each type of aluminum-framed storefront system indicated.
- .2 Shop Drawings: Include plans, elevations, sections, details, hardware, and attachments to other work, operational clearances and installation details. Shop Drawings to be prepared, sealed and signed by a Professional Structural Engineer licensed in the province of British Columbia. This includes field review in order to provide Schedules to Consultant at project completion.
- .3 Samples for Initial Selection: For units with factory-applied color finishes including samples of hardware and accessories involving color selection.
- .4 Samples for Verification: For aluminum-framed storefront system and components required.
- .5 Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for each type of aluminum-framed storefront.

1.6 QUALITY ASSURANCE

- .1 Installer Qualifications: An installer which has had successful experience with installation of the same or similar units required for the project and other projects of similar size and scope.
- .2 Manufacturer Qualifications: A manufacturer capable of providing aluminum-framed storefront system that meet or exceed performance requirements indicated and of documenting this performance by inclusion of test reports, and calculations.
- .3 Source Limitations: Obtain aluminum-framed storefront system through one source from a single manufacturer.

- .4 Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum-framed storefront system and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements". Do not modify size and dimensional requirements.
 - .1 Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- .5 Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - .1 Build mockup for type of storefront elevations as agreed to with Architect.
- .6 Pre-installation Conference: Conduct conference at Project site with relevant consultants.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- .2 Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle storefront material and components to avoid damage. Protect storefront material against damage from elements, construction activities, and other hazards before, during and after storefront installation.

1.8 PROJECT CONDITIONS

- .1 Field Measurements: Verify actual dimensions of aluminum-framed storefront openings by field measurements before fabrication and indicate field measurements on Shop Drawings.

1.9 WARRANTY

- .1 Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment by manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- .1 Basis-of-Design Product:
 - .1 Kawneer Company Inc.
 - .2 Trifab™ 451T (Thermal) Framing System
 - .3 System Dimensions: 2" x 4-1/2" (50.8 mm x 114.3 mm)
 - .4 Glass: Exterior
- .2 Acceptable Alternate: Thermally broken, double glazed storefront system by Metro Aluminum

2.2 MATERIALS

- .1 Aluminum Extrusions: Alloy and temper recommended by aluminum storefront manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.070" (1.8 mm) wall thickness at any location for the main frame and complying with ASTM B 221: 6063-T6 alloy and temper.
 - .1 Recycled Content: Shall have a minimum of 50% mixed pre- and post-consumer recycled content.
- .2 Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum framing members, trim hardware, anchors, and other components.
- .3 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 or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.
- .4 Reinforcing Members: Aluminum, 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 or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

- .5 Sealant: For sealants required within fabricated storefront system, provide permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.
- .6 Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of storefront members are nominal and in compliance with AA Aluminum Standards and Data.

2.3 STOREFRONT FRAMING SYSTEM

- .1 Thermal Barrier (Trifab™ VG 451T):
 - .1 Kawneer IsoLock™ Thermal Break with a 1/4" (6.4 mm) separation consisting of a two-part chemically curing, high-density polyurethane, which is mechanically and adhesively joined to aluminum storefront sections.
 - a. Thermal Break shall be designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 505.
 - .2 Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
 - .3 Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Where exposed shall be stainless steel.
 - .4 Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action
 - .5 Windows: GLASSvent UT windows for storefront framing.

2.4 GLAZING SYSTEMS

- .1 Glazing: Solarban 60, Argon filled.
- .2 Glazing Gaskets: Manufacturer's standard compression types; replaceable, extruded EPDM rubber.
- .3 Spacers and Setting Blocks: Manufacturer's standard elastomeric type.
- .4 Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.
- .5 Glazing Sealants: For structural-sealant-glazed systems, as recommended by manufacturer for joint type, and as follows:
 - .1 Structural Sealant: ASTM C 1184, single-component neutral-curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by a structural-sealant manufacturer for use in aluminum-framed systems indicated.
 - a. Color: Black
 - .2 Weatherseal Sealant: ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; single-component neutral-curing formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and aluminum-framed-system manufacturers for this use.
 - a. Color: Matching structural sealant.

2.5 ENTRANCE DOOR SYSTEMS

- .1 Entrance Doors: Insulclad 260.
- .2 Entrance Door Hardware:
 - .1 Lock: Von Duprin concealed vertical rod exit device.

- .2 Closer: LCN 1461 slim line, adjustable closer.
- .3 Automatic Door Operator: Horton 4000 series.
- .3 Electrical:
 - .1 Coordinate w. electrical for controlled access / interconnection, automatic door operator as applicable.

2.6 ACCESSORY MATERIALS

- .1 Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Section 07 92 00 Joint Sealants.
- .2 Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30 mil (0.762 mm) thickness per coat.

2.7 FABRICATION

- .1 Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
 - .1 Profiles that are sharp, straight, and free of defects or deformations.
 - .2 Accurately fit joints; make joints flush, hairline and weatherproof.
 - .3 Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
 - .4 Physical and thermal isolation of glazing from framing members.
 - .5 Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - .6 Provisions for field replacement of glazing.
 - .7 Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- .2 Storefront Framing: Fabricate components for assembly using manufacturer's standard installation instructions.
- .3 After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

- .1 Finish designations prefixed by AA comply with the system established by the Aluminum Association for Designating aluminum finishes.
- .2 Factory Finishing: To be confirmed by Consultant based on below:
 - .1 Kawneer Permanodic™ AA-M10C21A41 / AA-M45C22A41, AAMA 611, Architectural Class I Clear Anodic Coating (Color #14 Clear) (Optional).
 - .2 Kawneer Permafluor™ AAMA 2605, Architectural Coating (Color selected from Kawneer #22 stock coatings).

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Inspect the work and notify the Architect of any conditions that would affect the installation or performance of the work.
- .2 Start of installation indicates installer's acceptance of substrate installation conditions.
- .3 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, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weather tight framed aluminum storefront system 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 3 inches (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 aluminum-framed storefront system, accessories, and other components.
- .2 Install aluminum-framed storefront system 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 Install aluminum-framed storefront system and components to drain condensation, water penetrating joints, and moisture migrating within aluminum-framed storefront to the exterior.
- .5 Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 FIELD QUALITY CONTROL

- .1 Field Tests: Architect shall select storefront units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. Conduct tests for air infiltration and water penetration with manufacturer's representative present. Tests not meeting specified performance requirements and units having deficiencies shall be corrected as part of the contract amount.
 - .1 Testing: Testing shall be performed by a qualified independent testing agency. Refer to Testing Section for payment of testing and testing requirements. Testing Standard per AAMA 503, including reference to ASTM E 783 for Air Infiltration Test and ASTM E 1105 Water Infiltration Test.
 - .a Air Infiltration Tests: Conduct tests in accordance with ASTM E 783. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft², whichever is greater.
 - .b Water Infiltration Tests: Conduct tests in accordance with ASTM E 1105. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 6.2 psf (300 Pa).
- .2 Manufacturer's Field Services: Upon Owner's written request, provide periodic site visit by manufacturer's field service representative.

3.4 ADJUSTING, CLEANING AND PROTECTION

- .1 Clean aluminum surfaces immediately after installing aluminum-framed storefronts. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
- .2 Clean glass immediately after installation. Comply with glass manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.
- .3 Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- .4 Adjust as required to ensure full and proper functionality.

END OF SECTION 08 41 13

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 All labour, materials, tools and other equipment, services and supervision required to complete all work as specified herein to locations and to details indicated on drawings and schedules.
- .2 Hardware Schedule to be prepared by a specialty Hardware Consultant and to include but not be limited to the following:
 - .1 Hinges
 - .2 Locksets
 - .3 Closers
 - .4 Exit Devices
 - .5 Flush Bolts
 - .6 Coordinators
 - .7 Weatherstripping
 - .8 Astragals
 - .9 Mechanical Stops and Holders
 - .10 Electromagnetic Door Releases
 - .11 Thresholds
 - .12 Kick Plates
 - .13 Combination Latchsets
 - .14 Electric Strikes
 - .15 Electric Power Transfers
 - .16 Door Position Switch
 - .17 Electric Door Operators

1.2 SUBMITTALS

- .1 Submit under provisions of Section 01 00 00 General Requirements.
- .2 Schedule: Identify each piece of hardware with opening number and manufacturer's name and catalog number.
- .3 Product Data: Along with schedule, submit catalog cuts and item description for each item of hardware. Submit copies separately bound and referenced to hardware schedule.
- .4 Shop Drawings: Indicate hardware locations and mounting heights.
- .5 Certifications: Certification(s) by hardware supplier(s) that all hardware furnished for this Project is made of new material by the approved manufacturer, and that no remanufactured or retrofitted items are supplied.
- .6 Samples: Submit samples of hardware for approval of function, design and finish. Samples will be returned to Subcontractor if requested.
- .7 Closeout Submittals: Manufacturer's parts list and maintenance instructions for each type of hardware supplied and tools necessary for proper maintenance of hardware.

1.3 QUALITY ASSURANCE

- .1 Regulatory Requirements:
 - .1 Fire Rated Doors: Comply with requirements of NFPA 80 and applicable codes for fire rated door hardware; provide hardware bearing Underwriters Laboratory of Canada (ULC) labels.
 - .2 Access for Persons with Physical Disabilities: Comply with BCBC 2018 Requirements
- .2 Hardware Supplier: Recognized builders' hardware supplier with minimum five years successful experience in scheduling and furnishing hardware. Coordinate w. hardware consultant as req'd to generate hardware schedule.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Arrange work and secure delivery of hardware so that Work will progress without delay or interruption.
- .2 Delivery: Deliver hardware in manufacturer's original packages, marked for intended opening and with hardware schedule item number.
- .3 Pack complete with necessary screws, bolts, keys, instructions, and installation templates if necessary for spotting mortise tools.
- .4 Upon delivery, furnish complete list of hardware for checking, clearly marked to correspond with each package and hardware schedule item number. Review list for completeness and accuracy.
- .5 Template Hardware: Supply templates to door and frame manufacturers for proper and accurate sizing and locations of hardware cutouts.

PART 2 PRODUCTS

2.1 GENERAL

- .1 Furnish hardware made of new material by approved manufacturers, including electrical components. Remanufactured or retrofitted hardware is not permitted and, if submitted, supplied or installed, will be rejected and replaced with no delay in schedule and at no additional cost to Client.
- .2 Review Drawings for hardware group locations and door types. In preparing Hardware Schedule, comply with the following general requirements. Inform Project Manager where conflicts occur.
- .3 Provide hardware items with accessories complete to function as intended.
- .4 Make provisions and coordinate requirements for electrical and mechanical devices as applicable in connection with hardware.
- .5 Templates: Furnish templates or physical hardware items to manufacturers concerned sufficiently in advance to avoid delay in Work.
- .6 Hardware Finish: self-coloured stainless steel, satin finish. Fasteners to match hardware finish.
- .7 Reinforcing Units: Furnished by door manufacturer, coordinated by hardware manufacturer.
- .8 Concealed Hardware: Furnish items which must be concealed within metal work to metal door and frame manufacturer.
- .9 Fasteners: Furnish as recommended by manufacturer and as required to securely install hardware.
 - .1 Furnish hardware fastened to concrete or masonry with expansion sleeve anchors
 - .2 Through bolts are not permitted on wood or metal doors.
 - .3 Furnish fasteners for items applied to gypsum board sufficiently long to provide solid connection to framing or backing.

2.2 MANUFACTURERS

- .1 Acceptable Manufacturers:
 - .1 AHI Hardware (available through McGregor Thompson)
 - .2 Canaropa (available through McGregor Thompson)

2.3 MATERIALS

- .1 Lever: FSB 1147 self-coloured stainless steel, satin finish
- .2 Heavy Duty Lever Latch: ANSI Code F13
- .3 Hinge: BB 1079 Series (5 knuckle ball bearing hinge) – vandal-proof as applicable

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Inspect doors, frames and other surfaces to receive items of finish hardware and report any defects, which might adversely affect the installation and function of the hardware.
- .2 Verify that power supply is available to power operated devices.
- .3 Commencing work implies acceptance of surfaces as satisfactory.

3.2 COORDINATION

- .1 Coordinate fabrication of work or material to receive hardware including doors and frames, internal reinforcement for door hardware, and conduit, wiring and electrical work required for electrically operated hardware items. No extra cost will be allowed because of changes or corrections necessary to facilitate the proper installation of hardware.

3.3 INSTALLATION

- .1 Install hardware specified under this Section.
- .2 Install hardware in accordance with manufacturers' instructions and recommendations.
- .3 Fit hardware prior to painting, then remove prior to painting doors and frames; reinstall after painting is complete.
- .4 Accessibility: Comply with CBC for positioning requirements for accessibility.
- .5 Mounting Heights Above Finished Floor:
 - .1 Hinges:
 - .a Top: Frame manufacturer's standard, but not greater than 10 inches (250 mm) from head of frame to center line of hinge.
 - .b Bottom: Frame manufacturer's standard, but not greater than 12-1/2 inches (318 mm) from floor to center line of hinge.
 - .c Intermediate: Equally spaced between top and bottom hinges and from each other.
 - .2 Locks and Latches: 38 inches (966 mm) to center line of lever.
 - .3 Exit Devices: Manufacturer's standard for device specified, subject to approval by Architect.
 - .4 Door pulls, Push-Pull Bars, Push Plates: 42 inches (1067 mm) to center of pull, bar or plate.
 - .5 Comply with recommendations of BHMA for heights of items not indicated, subject to approval by Architect.

3.4 ADJUSTMENT

- .1 After air system has been balanced, qualified hardware suppliers or manufacturers' representatives shall inspect installation and make adjustments.
- .2 Adjust closers, locks, and critical operation hardware.

3.5 HARDWARE SCHEDULE

- .1 Examine Drawings and Specifications and provide proper hardware for door openings, whether listed or not. Bring omissions to attention of Architect.

.2 Hardware Groups:

- .1 Group # XX - Each [door] [pair of doors] to have:
- | | | |
|-----------------------------|--------|----------------------------|
| Hinges | H# | # Pairs |
| Locksets | L# | # |
| Closers | C# | # |
| Panic Exit Devices | P# | # |
| Flush Bolts | FB# | 1 Set |
| Coordinators | COR1 | 1 |
| Weatherstripping | W1 | At head and jambs |
| Astragals | A# | 1 Set |
| Stops/Holders | S# | # |
| Electric Holders | EH1 | # |
| Thresholds | T# | 1 |
| Kickplates | Yes/No | # |
| Combination Latchsets | CL# | # |
| Electric Strikes | E1 | # |
| Electric Power Transfers | EPT# | # |
| Door Position Switches | DP1 | # |
| Electric Door Operators | D# | # |
| Security/Card Access System | Yes/No | Coordinate with Electrical |
| Fire Alarm System | Yes/No | Coordinate with Electrical |

- .1 Protect during installation any adjacent surfaces from damage due to the work of this section.
- .2 Protect items installed under this section from damage resulting from the work of other sections.
- .3 Promptly as the work proceeds and on completion, remove all crating, surplus materials, and equipment.

END OF SECTION 08 71 00

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Provide labour, materials, tools and equipment necessary to complete the Work of this Section including, but not limited to:
 - .1 Gypsum board wall and ceiling systems.
- .2 Trim accessories, joint compound, control joints, fasteners, reveal moldings and sealants.

1.2 RELATED REQUIREMENTS

- .1 Division 01 General Requirements
- .2 Section 09 22 16 Non-Structural Metal Framing

1.3 REFERENCES

- .1 American Society for Testing and Materials, (ASTM)
 - .1 ASTM C475, Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - .2 ASTM C514, Specification for Nails for the Application of Gypsum Board.
 - .3 ASTM C840, Specification for Application and Finishing of Gypsum Board.
 - .4 ASTM C954, Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
 - .5 ASTM C1002, Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - .6 ASTM C1047, Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
 - .7 ASTM C1280, Standard Specification for Application of Gypsum Sheathing.
 - .8 ASTM C1177/C1177M, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 - .9 ASTM C1178/C1178M, Standard Specification for Glass Mat Water-Resistant Gypsum Backing Board.
 - .10 ASTM C1396/C1396M, Standard Specification for Gypsum Wallboard.
- .2 Association of the Wall and Ceilings Industries International (AWCI)
 - .1 AWCI Levels of Gypsum Board Finish.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.34, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .4 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.

1.4 SUBMITTALS

- .1 Product Data: Manufacturer's published descriptive literature for gypsum board types, trim accessories, and control joints pertinent to this Section.

1.5 DELIVERY, STORAGE AND HANDLING

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

1.6 SITE ENVIRONMENTAL REQUIREMENTS

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

1.7 QUALIFICATIONS

- .1 Installer Qualifications: Minimum 5 years documented experience in quality work of comparable scope.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Standard board: to ASTM C1396/C1396M regular and Type X, thicknesses as indicated on drawings, 1200 mm wide x maximum practical length, ends square cut, edges bevelled.
 - .1 Acceptable Product: Certainteed - Regular and Type X Gypsum Board or equivalent.
- .2 Moisture and mold resistant board: to ASTM C1396/C1396M regular and Type X, thicknesses as indicated on drawings, 1200 mm wide x maximum practical length, ends square cut, edges bevelled.
 - .1 Acceptable Product: Certainteed – M2Tech or equivalent.
- .3 Glass mat water-resistant gypsum board (Tile Backer): to ASTM C1178/C1178M with glass mat facings, both sides, regular and Type X, thicknesses as indicated on drawings, 1200 mm wide x maximum practical length, ends square cut, long edges tapered.
 - .1 Acceptable Product: Certainteed - Diamondback Tile Backer or equivalent.
- .4 Gypsum Shaftwall Board: to ASTM C1396 - Fire-resistant shaftwall board.
 - .1 Typical Thickness: 3/4 inch and 1 inch as applicable.
 - .2 Steel Framing for Shaftwall: to ASTM C645.
- .5 Glass mat exterior gypsum board sheathing: to ASTM C1177/C1177M regular and Type X, thicknesses as indicated on drawings, 1200 mm wide x maximum practical length, ends and long edges square cut.
- .6 Metal furring runners, hangers, tie wires, inserts, anchors: to CSA A82.30 galvanized.
- .7 Drywall furring channels: 0.5 mm core thickness galvanized steel channels for screw attachment of gypsum board.
- .8 Resilient drywall furring: 0.5 mm base steel thickness galvanized steel for resilient attachment of gypsum board.
- .9 Nails: to ASTM C514.
- .10 Steel drill screws: to ASTM C1002.
- .11 Stud adhesive: to CAN/CGSB-71.25.
- .12 Laminating compound: as recommended by manufacturer, asbestos-free.
- .13 Casing beads, corner beads, control joints and edge trim: to ASTM C1047, metal, zinc-coated by hot-dip process 0.5 mm base thickness, perforated flanges, one piece length per location.
- .14 Sealants: in accordance with Section 07 92 00 - Joint Sealing.
- .15 Acoustic sealant: to CGSB 19-GP-21M.
- .16 Polyethylene: to CAN/CGSB-51.34, Type 2.
- .17 Insulating strip: rubberized, moisture resistant, 3 mm thick cork strip, 12 mm wide, with self sticking permanent adhesive on one face, lengths as required.

- .18 Joint compound: to ASTM C475, asbestos-free.

2.2 FINISHES

- .1 Texture finish: asbestos-free standard white texture coating and primer-sealer, recommended by gypsum board manufacturer.

PART 3 EXECUTION

3.1 ERECTION

- .1 Do application and finishing of gypsum board in accordance with ASTM C840 except where specified otherwise.
- .2 Do application of gypsum sheathing to ASTM C1280.
- .3 Erect hangers and runner channels for suspended gypsum board ceilings in accordance with ASTM C840 except where specified otherwise.
- .4 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
- .5 Install work level to tolerance of 1:1200.
- .6 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles, and other protrusions.
- .7 Install 19 x 64 mm furring channels parallel to, and at exact locations of steel stud partition header track.
- .8 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.
- .9 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.
- .10 Install wall furring for gypsum board wall finishes in accordance with ASTM C840, except where specified otherwise.
- .11 Furr openings and around built-in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.
- .12 Furr duct shafts, beams, columns, pipes and exposed services where indicated.

3.2 APPLICATION

- .1 Do not apply gypsum board until bucks, anchors, blocking, sound attenuation, electrical and mechanical work are approved.
- .2 Apply single layer gypsum board to wood or metal furring or framing using screw fasteners. Maximum spacing of screws 300 mm oc.
 - .1 Apply gypsum board on ceilings prior to application of walls in accordance with ASTM C840.
 - .2 Apply gypsum board vertically or horizontally, providing sheet lengths that will minimize end joints.
- .3 Apply single layer gypsum board to concrete or concrete block surfaces, where indicated, using laminating adhesive.
 - .1 Comply with gypsum board manufacturer's recommendations.
 - .2 Brace or fasten gypsum board until fastening adhesive has set.
 - .3 Mechanically fasten gypsum board at top and bottom of each sheet.
- .4 Apply moisture and mold resistant gypsum board to washrooms. Apply tile backer where wall tiles are to be applied. Apply water-resistant sealant to edges, ends, cut-outs which expose gypsum core and to fastener heads. Do not apply joint treatment on areas to receive tile finish.
- .5 Apply 12 mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, ducts, in partitions where perimeter sealed with acoustic sealant.
- .6 Install ceiling boards in direction that will minimize number of end-butt joints. Stagger end joints at least 250 mm.

- .7 Install gypsum board on walls vertically to avoid end-butt joints. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs, except where local codes or fire-rated assemblies require vertical application.
- .8 Install gypsum board with face side out.
- .9 Do not install damaged or damp boards.
- .10 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

3.3

INSTALLATION

- .1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm oc using contact adhesive for full length.
- .2 Install casing beads around perimeter of suspended ceilings.
- .3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.
- .4 Install insulating strips continuously at edges of gypsum board and casing beads abutting metal window and exterior door frames, to provide thermal break.
- .5 Construct control joints of two back-to-back casing beads set in gypsum board facing and supported independently on both sides of joint.
- .6 Provide continuous polyethylene dust barrier behind and across control joints.
- .7 Locate control joints at changes in substrate construction.
- .8 Install control joints straight and true.
- .9 Construct expansion joints as detailed, at building expansion and construction joints. Provide continuous dust barrier.
- .10 Install expansion joint straight and true.
- .11 Install access doors to electrical and mechanical fixtures specified in respective sections.
 - .1 Rigidly secure frames to furring or framing systems.
- .12 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.
- .13 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with Association of the Wall and Ceiling Industries (AWCI) International Recommended Specification on Levels of Gypsum Board Finish:
 - .1 Levels of finish:
 - Level 4**

All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with a joint knife or trowel, leaving a thin coating of joint compound over all joints and interior angles. In addition, two separate coats of joint compound shall be applied over all flat joints and one separate coat of joint compound applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. All joint compounds shall be smooth and free of tool marks and ridges. The prepared surface shall be covered with a drywall primer prior to the application of the final decoration.
- .14 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.
- .15 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.
- .16 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.
- .17 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.

- .18 Apply one coat of white primer sealer over surface to be textured. When dry apply textured finish in accordance with manufacturer's instructions.
- .19 Mix joint compound slightly thinner than for joint taping.
- .20 Apply thin coat to entire surface using trowel or drywall broadknife to fill surface texture differences, variations or tool marks.
- .21 Allow skim coat to dry completely.
- .22 Remove ridges by light sanding or wiping with damp cloth.
- .23 Provide protection that ensures gypsum drywall work will remain without damage or deterioration at time of substantial completion.

3.4 SCHEDULES

- .1 Construct fire rated assemblies where indicated and seal penetrations with applicable, approved fire stopping systems.
- .2 Install moisture and mold resistant gypsum board on walls and ceilings in washrooms.
- .3 Install tile backer in locations that are scheduled to receive tile. To be confirmed by Owner.

3.5 CLEANING

- .1 Clean beads, screeds, base, trim, mechanical and electrical items, and other work.
- .2 Wipe clean, leaving work ready for finish specified under other sections.
- .3 As work is completed in each space, clean all rubbish, utensils, and surplus materials from the space. Leave floors broom-clean.

END OF SECTION 09 21 16

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Furnishing of all labour, material, services and equipment necessary for supply and installation of steel studs, stud tracks, bridging, angle clips, tension straps & accessories.

1.2 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 07 92 00 Joint Sealants
- .3 Section 09 21 16 Gypsum Board Assemblies

1.3 REFERENCES

- .1 All materials and execution of work shall conform to the latest edition of the following standards or as otherwise specified:
 - .a ASTM C645, Specification for Nonstructural Steel Framing Members.
 - .b ASTM C754, Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
 - .c Canadian Sheet Steel Building Institute CSSBI 58-2011 Lightweight Steel Framing Manual.

1.4 SHOP DRAWINGS

- .1 Shop Drawings for dropped ceiling framing to be prepared, sealed and signed by a Professional Structural Engineer licensed in the province of British Columbia. This includes field review in order to provide Schedules to Consultant at project completion.

PART 2 PRODUCTS

2.1 METAL FRAMING

- .1 Steel studs: to CAN/CSA S-136, fabricated from zinc coated steel, depth as indicated. Minimum steel thickness, flange width, and section properties complying with SSMA standard sections
- .2 Stud tracks: fabricated from same material and finish as steel studs, depth to suit.
 - .a Bottom track: single piece.
 - .b Top track: single piece track or double track or slotted single top track. (double track or slotted single top track to accommodate deflection).
 - .c Separator: neoprene, sized to suit.
- .3 Insulating strip: rubberized, moisture resistant 3 mm thick cork foam strip, 12 mm wide, with self sticking adhesive on one face, lengths as required.

PART 3 EXECUTION

3.1 GENERAL

- .1 Do work in accordance with CSSBI 58.

3.2 ERECTION

- .1 Erect components to requirements of reviewed shop drawings.

- .2 Anchor tracks securely to structure at 600 mm oc maximum, unless lesser spacing prescribed on shop drawings.
- .3 Place studs vertically at 400 mm o.c and not more than 50 mm from abutting walls, and at each side of openings and corners. Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.
- .4 Attach studs to bottom and ceiling track using screws.
- .5 Co-ordinate erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.
- .6 Co-ordinate erection of studs with installation of door/window frames and special supports or anchorage for work specified in other Sections.
- .7 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified. Secure studs together, 50 mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.
- .8 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs. Secure track to studs at each end, in accordance with manufacturer's instructions. Install intermediate studs above and below openings in same manner and spacing as wall studs.
- .9 Frame openings and around built-in equipment, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.
- .10 Provide 40 mm stud or furring channel secured between studs for attachment of fixtures behind lavatory basins, toilet and bathroom accessories, and other fixtures including grab bars and towel rails, attached to steel stud partitions.
- .11 Install steel studs or furring channel between studs for attaching electrical and other boxes.
- .12 Extend partitions to ceiling height except where noted otherwise on drawings.
- .13 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs.
- .14 Install continuous insulating strips to isolate studs from uninsulated surfaces, where applicable.

3.3 ERECTION TOLERANCES

- .1 Plumb: not to exceed 1/500th of member length.
- .2 Camber: not to exceed 1/1000th of member length.
- .3 Spacing: not more than 3.0 mm from design spacing.
- .4 Gap between end of stud and track web: not more than 4.0 mm.

3.4 CLEANING

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

END OF SECTION 09 22 16

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Provide labour, materials, tools and equipment necessary to complete the Work of this Section including, but not limited to:
 - .1 Acoustical ceiling panels
 - .2 Exposed grid suspension system
 - .3 Wire hangers, fasteners, main runners, cross tees, and wall angle moldings
 - .4 Perimeter Trim

1.2 RELATED REQUIREMENTS

- .1 Division 01 General Requirements
- .2 Section 09 21 16 Gypsum Board Assemblies
- .3 Section 23 00 00 HVAC
- .4 Section 26 00 00 Electrical

1.3 REFERENCES

- .1 American Society for Testing and Materials, (ASTM)
 - .1 ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
 - .2 ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
 - .3 ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
 - .4 ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
 - .5 ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
 - .6 ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
 - .7 ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
 - .8 ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
 - .9 ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material
 - .1 Armstrong Fire Guard Products
 - .10 ASTM E 580 Installation of Metal Suspension Systems in Areas Requiring Moderate Seismic Restraint
 - .11 ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems
 - .12 ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum
 - .13 ASTM E 1264 Classification for Acoustical Ceiling Products
- .2 National Building Code of Canada, current edition
- .3 ASHRAE Standard 62.1-2004, Ventilation for Acceptable Indoor Air Quality
- .4 Canadian Electrical Code, current edition
- .5 ASCE 7 American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures

- .6 International Code Council-Evaluation Services - AC 156 Acceptance Criteria for Seismic Qualification Testing of Non-structural Components
- .7 International Code Council-Evaluation Services Report - Seismic Engineer Report
 - .1 ESR 1308 - Armstrong Suspension Systems
- .8 International Association of Plumbing and Mechanical Officials - Seismic Engineer Report
 - .1 0244 - Armstrong Single Span Suspension System

1.4 SYSTEM DESCRIPTION

- .1 Continuous / Wall-to-Wall

1.5 SUBMITTALS

- .1 Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.
- .2 Samples: Minimum 6 inch x 6 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.
- .3 Shop Drawings: Layout and details of acoustical ceilings show locations of items that are to be coordinated with, or supported by the ceilings. Shop Drawings to be prepared, sealed and signed by a Professional Structural Engineer licensed in the province of British Columbia. This includes field review in order to provide Schedules to Consultant at project completion.
- .4 Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.
- .5 If the material supplied by the acoustical subcontractor does not have an Underwriter's Laboratory classification of acoustical performance on every carton, subcontractor shall be required to send material from every production run appearing on the job to an independent or NVLAP approved laboratory for testing, at the architect's or owner's discretion. All products not conforming to manufacturer's current published values must be removed, disposed of and replaced with complying product at the expense of the Contractor performing the work.

1.6 QUALITY ASSURANCE

- .1 Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.
- .2 Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
 - .1 Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 Classification.
 - .2 Fire Resistance: As follows tested per ASTM E119 and listed in the appropriate floor or roof design in the Underwriters Laboratories Fire Resistance Directory
- .3 Acoustical Panels: As with other architectural features located at the ceiling, may obstruct or skew the planned fire sprinkler water distribution pattern through possibly delay or accelerate the activation of the sprinkler or fire detection systems by channeling heat from a fire either toward or away from the device. Designers and installers are advised to consult a fire protection engineer, NFPA 13, or their local codes for guidance where automatic fire detection and suppression systems are present.

- .4 Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- .2 Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.
- .3 Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.8 PROJECT CONDITIONS

- .1 Space Enclosure:
 - .1 Do not install interior ceilings until space is enclosed and weatherproof; wet work in place is completed and nominally dry; work above ceilings is complete; and ambient conditions of temperature and humidity are continuously maintained at values near those intended for final occupancy. Building areas to receive ceilings shall be free of construction dust and debris.

1.9 ALTERNATE CONSTRUCTION WASTE DISPOSAL

- .1 Ceiling material being reclaimed must be kept dry and free from debris
- .2 Contact the Armstrong Recycle Center a consultant will verify the condition of the material and that it meets the Armstrong requirements for recycling. The Armstrong consultant will provide assistance to facilitate the recycling of the ceiling.

1.10 WARRANTY

- .1 Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following:
 - .1 Acoustical Panels: Sagging and warping
 - .2 Grid System: Rusting and manufacturer's defects
- .2 Warranty Period:
 - .1 Acoustical panels: One (1) year from date of substantial completion
 - .2 Cirrus: Ten (10) years from date of substantial completion
 - .3 Grid: Ten years from date of substantial completion
- .3 The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.11 MAINTENANCE

- .1 Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
 - .1 Acoustical Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.
 - .2 Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- .1 Ceiling Panels:
 - .1 Armstrong World Industries, Inc.
- .2 Suspension Systems:
 - .1 Armstrong World Industries, Inc.
- .3 Perimeter Systems
 - .1 Armstrong World Industries, Inc.

2.2 ACOUSTICAL CEILING UNITS

- .1 Acoustical Panels: Basis of Design = Optima PB Concealed panels with Prelude XL HD 15/16" suspension system.
 - .1 Surface Texture: Fine
 - .2 Composition: Fibreglass
 - .3 Color: Blizzard White
 - .4 Size: 24IN x 24IN
 - .5 Edge Profile:
 - .6 Noise Reduction Coefficient(NRC): ASTM C 423; Classified with UL label on product carton 0.90.
 - .7 Ceiling Attenuation Class (CAC) : ASTM C 1414; Classified with UL label on product carton 33.
 - .8 Articulation Class (AC): ASTM E 1111; Classified with UL label on product carton 190.
 - .9 Flame Spread: ASTM E 1264; Class A (UL)
 - .10 Light Reflectance White Panel: ASTM E 1477;
 - .11 Recycle Content: 50%

2.3 METAL SUSPENSION SYSTEMS

- .1 Main beams and cross tees, base metal and end detail, fabricated from commercial quality hot dipped galvanized steel complying with ASTM A 653. Main beams and cross tees are double-web steel construction with exposed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.
 - .1 Structural Classification: ASTM C 635 normal duty
 - .2 Color: Blizzard White and match the actual color of the selected ceiling tile, unless noted otherwise.
 - .3 Acceptable Product: 65 as manufactured by Armstrong World Industries

Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
- .2 Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft annealed, with a yield stress load of at least three design load, but not less than 12 gauge.
- .3 Edge Moldings and Trim:
 - .1 7875 - 10ft Shadow Molding
- .4 Accessories
 - .1 ALBERC2 - aluminum systems - 2" Aluminum Beam End Retaining Clip
 - .2 BERC2 - steel - 2" Beam End Retaining Clip
 - .3 BERC - Beam End Retaining Clip
 - .4 SJMR15 - Seismic Joint Clip - Main Beam - 15/16" Suspensions
 - .5 SJMR09 - Seismic Joint Clip - Main Beam - 9/16" Suspensions
 - .6 SJCG - PeakForm Suspension - Seismic Joint Clips CT
 - .7 SJCSI - Square Bulb Suspension - Seismic Joint Clip CT

- .8 ES4 - for 15/16" Prelude Expansion Sleeves
- .9 ES49 - for 9/16" Suprafine
- .10 ES76004 for 1/4" Silhouette Suspension
- .11 ES76008 - for 1/8" Silhouette Suspension
- .12 STAC - Single Tee Adapter Clip
- .13 7445 - 48" Stabilizer bar - not required when using the BERC2
- .14 7425 - 24" Stabilizer bar - not required when using the BERC2

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations.

3.2 PREPARATION

- .1 A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

3.3 INSTALLATION

- .1 Follow manufacturer installation instructions.
- .2 Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.
- .3 Suspend main beam from overhead construction with hanger wires spaced 4'-0" on center along the length of the main runner. Install hanger wires plumb and straight.
- .4 Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.
- .5 For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.
- .6 Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.4 ADJUSTING AND CLEANING

- .1 Replace damaged and broken panels.
- .2 Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove any ceiling products that cannot be successfully cleaned and or repaired. Replace with attic stock or new product to eliminate evidence of damage.
- .3 Before disposing of ceilings, contact the Armstrong Recycling Center at 877-276-7876, select option #1 then #8 to review with a consultant the condition and location of building where the ceilings will be removed. The consultant will verify the condition of the material and that it meets the Armstrong requirements for recycling. The Armstrong consultant will provide assistance to facilitate the recycle of the ceiling.

END OF SECTION 09 51 23

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Furnishing of all labor, materials, services and equipment necessary for surface preparation and supply and installation of resilient flooring.

1.2 RELATED REQUIREMENTS

- .1 Division 1 – General Requirements
- .2 Section 09 65 66 – Resilient Athletic Flooring

1.3 REFERENCES

- .1 ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.
- .2 ASTM D3389 - Standard Test Method for Coated Fabrics Abrasion Resistance (Rotary Platform Abrader).
- .3 ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- .4 ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
- .5 ASTM E662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
- .6 ASTM F137 - Standard Test Method for Flexibility of Resilient Flooring Materials with Cylindrical Mandrel Apparatus.
- .7 ASTM F970 - Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading.
- .8 ASTM F925 - Standard Test Method for Resistance to Chemicals of Resilient Flooring.
- .9 ASTM F1514 - Standard Test Method for Measuring Heat Stability of Resilient Flooring by Color Change.
- .10 ASTM F1515 - Standard Test Method for Measuring Light Stability of Resilient Flooring by Color Change.
- .11 ASTM F1914 - Standard Test Methods for Short-Term Indentation and Residual Indentation of Resilient Floor Covering.
- .12 ASTM F2055 - Standard Test Method for Size and Squareness of Resilient Floor Tile by Dial Gage Method.
- .13 ASTM F2199 - Standard Test Method for Determining Dimensional Stability of Resilient Floor Tile after Exposure to Heat.
- .14 ASTM F2421 - Standard Test Method for Measurement of Resilient Floor Plank by Dial Gage.
- .15 CAN/ULC-S102-07, Surface Burning Characteristics of Building Materials and Assemblies.
- .16 CAN/ULC-S102.2-07, Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials and Assemblies.

1.4 SUBMITTALS

- .1 Product Data: Manufacturer's data sheets on each product to be used, including:
 - .1 Preparation instructions and recommendations.
 - .2 Storage and handling requirements and recommendations.
 - .3 Installation methods.
- .2 Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- .3 Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square representing actual product, color, and patterns.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra Stock Materials:
 - .1 Deliver 5% of factory width plank, tile and sheet flooring of each colour and pattern for future maintenance.
 - .2 Maintenance materials shall be same product run as installed products.

- .3 Clearly identify each box / roll. Store where directed by Owner.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.
- .2 Handle materials to avoid damage.

1.7 SITE CONDITIONS

- .1 Ambient Conditions:
.1 Maintain materials and areas of work at temperatures between 20°C and 32°C for not less than 48 hours before, during and 48 hours after installation. Maintain a minimum temperature of 15°C thereafter.

1.8 EXTRA MATERIAL

- .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Provide minimum 5% of each type and colour of tile required for project for maintenance use. Store where directed.
- .3 Maintenance material to be of same production run as installed material.

1.9 QUALITY ASSURANCE

- .1 Manufacturer Qualifications: Minimum 5 year experience manufacturing similar products.
- .2 Installer Qualifications: Trained journeymen with a minimum of three years successful experience in the installation of resilient flooring.

1.10 WARRANTY

- .1 Vinyl Sheet Flooring: Manufacturer's 20-year commercial warranty.
- .2 Linoleum Sheet Flooring: Manufacturer's 30-year warranty.

PART 2 PRODUCTS

2.2 RESILIENT FLOORING

- .1 Linoleum Sheet Flooring Performance: to ASTM F 2034
.1 Basis of Design: Forbo Marmoleum
- .2 Vinyl Sheet Flooring Performance: to ASTM F1913
.1 Basis of Design: Tarkett Optima or Granit

2.3 RESILIENT BASE

- .1 Resilient Base Performance: to ASTM F1861
.1 Basis of Design: rubber to suit resilient flooring
.2 Style: Tight Lock Wall Base
.3 Height: 100mm
.4 End Stops and External Corners: premoulded

2.4 ACCESSORY COMPONENTS

- .1 Stair Nosing: square nose, 5 mm thick, profiled to accept resilient flooring, 50 mm vertical face, 50 mm minimum horizontal face ribbed, vinyl, one-piece length for stair nosing. Colour as selected by Interior Design.

- .2 Stair Treads: vinyl, 48 mm vertical face, square nose, full tread deep, 5 mm thick, smooth surface, solid pattern, standard colour with tactile contrasting as selected by Interior Design.
- .3 Stair Risers: vinyl 152 mm vertical face, solid pattern, standard colour as selected by Interior Design.
- .4 Stair Stringers: vinyl, 254 mm vertical face, colour to match adjacent resilient base.
- .5 Edge Strips: aluminum extruded, smooth, anodized with lip to extend under floor finish, shoulder flush with top of adjacent floor finish.

2.5 ACCESSORY MATERIALS

- .1 Sub-Floor Filler: white premix latex requiring water only to produce cementitious paste.
- .2 Primers: VOC-free as recommended by flooring manufacturer for specific material on applicable substrate, above, on or below grade.
- .3 Adhesives: VOC-free as recommended by flooring manufacturer for each flooring material on applicable substrate, above, on or below grade.
- .4 Welding Rod: designed to weld seams of sheet flooring, as recommended by flooring manufacturer, colour to match flooring.
- .5 Sealer and Wax: as recommended by flooring manufacturer for flooring type and location.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Do not begin installation until substrates have been properly prepared. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- .1 Clean surfaces thoroughly prior to installation.
- .2 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- .1 Install in accordance with manufacturer's instructions, approved submittals, and in proper relationship with adjacent materials.

3.5 PROTECTION & CLEAN-UP

- .1 Separate waste materials for reuse and / or recycling where possible. Protect installed products until completion of project.
- .3 Progress Cleaning: Perform cleanup as work progresses. Leave work area clean at the end of each day.
- .4 Touch-up, repair or replace damaged products before Substantial Completion.
- .5 Final Cleaning: Upon completion, remove surplus materials, rubbish, tools, and equipment.

END OF SECTION 09 65 00

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Furnishing of all labor, materials, services and equipment necessary for surface preparation and supply and installation of resilient flooring, including recycled rubber flooring.
 - .1 AktivPro Recycled Rubber Molded Tiles
 - .2 Adhesives

1.2 RELATED REQUIREMENTS

- .1 Division 1 – General Requirements
- .2 Section 09 65 00 – Resilient Flooring

1.3 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers – Tension
 - .2 ASTM F137 Standard Test Method for Flexibility of Resilient Flooring Materials with Cylindrical Mandrel Apparatus
 - .3 ASTM F970 Standard Test Method for Static Load Limit
 - .4 ASTM D2047 Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as measured by the James Machine
 - .5 ASTM F925 Standard Test Method for Resistance to Chemicals of Resilient Flooring
 - .6 ASTM C423 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
 - .7 ASTM C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
 - .8 ASTM E492 Standard Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine
 - .9 ASTM E413 Classification for Rating Sound Insulation
 - .10 ASTM E2129 Standard Practice for Data Collection for Sustainability Assessment of Building Products
 - .11 ASTM D5116 Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products
 - .12 ASTM F150 Standard Test Method for Electrical Resistance of Conductive and Static Dissipative Resilient Flooring
 - .13 ASTM D297 Standard Practice for Rubber Products – Chemical Analysis
 - .14 ASTM D3676 Standard Specification for Rubber Cellular Cushion used for Carpet or Rug Underlay
 - .15 ASTM D395 Standard Test Methods for Rubber Property – Compression Set
 - .16 ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
 - .17 ASTM F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

1.4 SYSTEM DESCRIPTION

- .1 Performance Requirements: Provide recycled rubber resilient flooring, which has been manufactured and installed to maintain performance criteria stated by manufacturer without defects, damage, or failure.

1.5 SUBMITTALS

- .1 Quality Assurance Submittals: Submit the following:
 - .1 Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.

- .2 Certificates: Produce certificates signed by manufacturer certifying materials comply with specified performance characteristics criteria, and physical requirements.
- .3 Manufacturer's Instructions: Manufacturer's installation instructions.
- .2 Closeout Submittals: Submit the following:
 - .1 Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operational Data) Section. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.
 - .2 Warranty: Warranty documents specified herein.

1.6 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
 - .1 Certificate: When requested, submit certificate, indicating qualification.
 - .2 Manufacturer's Qualifications: Manufacturer capable of providing field service representation during construction and approving application method.
 - .3 Mock-Ups: Install at project site a job mock-up using acceptable products and manufacturer approved installation methods. Obtain Owner and Architect's acceptance of finish color, texture and pattern and workmanship standard. Comply with Division 1 Quality Control (Mock-up Requirements) Section.
 - .1 Mock-Up Size: 1220mm x 1220mm
 - .2 Maintenance: Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.
 - .3 Incorporation: Mock-up may be incorporated into final construction upon Architect's approval.
 - .4 Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's instructions, and manufacturer's warranty requirements. Comply with Division 1 Project Management and Coordination (Project Meetings) Section.
 - .5 Pre-installation Testing: Conduct pre-installation testing as follows: (Specify substrate testing; consult with flooring manufacturer.)

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- .2 Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- .3 Storage and Protection: Store materials at temperature and humidity conditions recommended by manufacturer and protect from exposure to harmful weather conditions.

1.8 PROJECT CONDITIONS

- .1 Temperature Requirements: Maintain air temperature in spaces where products will be installed for time period before, during, and after installation as recommended by manufacturer.

- .2 Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.8 WARRANTY

- .1 Project Warranty: Refer to Conditions of the Contract for project warranty provisions.
- .2 Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to and not a limitation of, other rights Owner may have under Contract Documents.

1.9 MAINTENANCE

- .1 Extra Materials: Deliver to Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Division 1 Closeout
- .2 Provide minimum 5% of each type and colour of tile required for project for maintenance use. Store where directed.
- .3 Maintenance material to be of same production run as installed material.
- .4 Comply with Owner's requirements for delivery, storage and protection of extra materials.

PART 2 PRODUCTS

2.1 MANUFACTURER

- .1 Manufacturer: Regupol America, available through Centaur Products, 3145 Thunderbird Crescent, Burnaby BC V5A 3G1 Tel: 604-43-3088 Email: info@centaurproducts.com
 - .1 Basis of Design: Regupol AktivPro Tiles and Adhesives manufactured by Regupol America for indoor commercial applications.
 - .1 Regupol AktivPro Tiles Recycled Rubber Molded Tiles
 - .2 Regupol PU350 one-component polyurethane adhesive

2.2 REGUPOL AKTIVPRO TILES: RECYCLED RUBBER MOLDED TILES

- .1 Product Name: The factory molded modular surfacing system furnished under this specification shall be REGUPOL AMERICA's AktivPro 1" x 24" x 24" Recycled Rubber Molded Tiles.
- .2 Physical: Regupol AktivPro Tiles configurations consist of a high density, wear surface, cylindrical support feet that allow underside cable routing, resiliency, and water drainage, as well as twelve molded perimeter dowel holes that accept specially designed barbed dowel pins to promote ease of installation.
- .3 Material: Made from 100% recycled SBR (Styrene-Butadiene Rubber) tire rubber and polyurethane binders.
- .4 Component: Regupol AktivPro Tiles is a factory-molded surface composed of high quality rubber granules bound with a wear and weather resistant polyurethane.
- .5 Tile Dimension: Regupol AktivPro Tiles tile products shall be 24" x24" and an overall thickness of 1". F. Tile Weight: 4.0 lb/ft² (19.5 kg/m²)
- .6 Tile Standard Tolerances: Width: ± 2 mm; Thickness: ± 3 mm
- .7 Colors: Specify color from manufacturer's standard colors, custom colors, or special logo/graphic inlays.
- .8 Wear Surface Density: 65.0 lbs/cu. ft. min.
- .9 Water Permeation Rate: 0.045 cm./sec.
- .10 Tear Resistance: 70pli min.,(ASTM D624, Die C)
- .11 Tensile Strength: (ASTM D412) >200 lb/in² min.
- .12 Static Load Limit: (ASTM F970) 400 lb/in² < 0.005 in.
- .13 Coefficient of Friction: > 0.9 (ASTM D2047)
- .14 Chemical Resistance:
 - .1 5% Acetic Acid, no change
 - .2 (ASTM F925) 70% Isopropyl Alcohol: no change

- .3 5% Sodium Hydroxide: no change
- .4 5% Hydrochloric Acid: no change
- .5 5% Ammonia: no change
- .6 Bleach: no change
- .7 5% Phenol: no change
- .8 Sulfuric Acid: no change
- .15 Impact Insulation Class: (ASTM E492) >50

2.3 REGUPOL PU350 ONE-COMPONENT PU ADHESIVE

- .1 Product Name: The one-part urethane adhesive under this specification shall be REGUPOL AMERICA's PU350 one component polyurethane adhesive.
- .2 Material: PU350 is a one-component polyurethane moisture cured, non- sag, permanently elastic adhesive that has excellent adhesion to elastomers, concrete, and wood and is engineered for indoor and outdoor applications.
- .3 Adhesive Type: one-component polyurethane
- .4 Adhesive Cure System: moisture cured
- .5 Weight: 5 gal pail - 56 lbs, 2.5 gal pail - 28lbs
- .6 Color: Light Tan
- .7 VOC Content: <60 g/ltr.
- .8 Freeze/Thaw: stable
- .9 Application Temperature: 40° F - 100° F
- .10 Calcium Chloride Test: Maximum 5.5 lbs per 1,000 sq. ft. in 24 hrs. (ASTM F1869)
- .11 Flashpoint: > 500° F
- .12 Shelf Life: 12 months
- .13 Working Time: 30-40 minutes
- .14 Trowel: 1/16" square notched trowel (1)
- .15 Coverage Rate: 95 ft² per gallon (1/16" square notched trowel)

2.4 RESILIENT BASE

- .1 Resilient Base Performance: to ASTM F1861
 - .1 Basis of Design: rubber to suit resilient flooring
 - .2 Style: Tight Lock Wall Base
 - .3 Height: 100mm
 - .4 End Stops and External Corners: premoulded

2.5 SOURCE QUALITY

- .1 Source Quality: Obtain recycled rubber resilient flooring materials from a single manufacturer.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions, and product carton instructions for installation.

3.2 EXAMINATION

- .1 Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

3.3 PREPARATION

- .1 Clean surfaces thoroughly prior to installation.

- 2 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.4 INSTALLATION

- .1 Recycled Rubber Flooring Installation: Comply with AktivPro Installation Instructions for procedures and techniques for AktivPro tile installation.
- .2 Finish Color/Textures/Patterns: Coordinate w.finishes specified in Part 2 Products.
- .3 Related Products Installation: Refer to other sections listed in Related Sections paragraph herein for related products installation.

3.5 FIELD QUALITY REQUIREMENTS

- .1 Manufacturer's Field Services: Upon Owner's request, provide manufacturer's field service consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
- .2 Site Visits: as required to ensure quality control.

3.6 CLEANING

- .1 Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project site and legally dispose of debris.

3.7 PROTECTION & CLEAN-UP

- .1 Separate waste materials for reuse and / or recycling where possible. Protect installed products until completion of project.
- .3 Progress Cleaning: Perform cleanup as work progresses. Leave work area clean at the end of each day.
- .4 Touch-up, repair or replace damaged products before Substantial Completion.
- .5 Final Cleaning: Upon completion, remove surplus materials, rubbish, tools, and equipment.

END OF SECTION 09 65 66

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 This section includes requirements for the supply and install of carpet tile with all necessary trims and accessories required for a complete installation.
- .2 Coordinate with Interior Design + Client.

1.2 RELATED REQUIREMENTS

- .1 Section 03 54 00 – Cast Underlayment
- .2 Section 09 60 13 – Acoustic Underlayment
- .3 Section 09 65 00 – Resilient Flooring

1.3 REFERENCES

- .1 B.C. Building Code (2018).
- .2 Canadian General Standards Board (CGSB):
 - .1 CAN/CGSB-4.129-93: Carpet for Commercial Use
 - .2 CAN/CGSB-4-GP-156: Direct Glue-Down Carpet, Guide to Selection and Installation.
- .3 American Society for Testing and Materials (ASTM):
 - .1 ASTM E648 Class 1 (glue down) – Standard test method for critical radiant flux of floor-covering systems using a radiant heat Energy Source;
 - .2 ASTM E-662 Less than 450 – Standard test method for Specific optical density of smoke generated by solid materials;
 - .3 ASTM D5252 – Standard practice for the operation of the Hexapod Tumble Drum Tester;
 - .4 ASTM F710-03, Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring;
 - .5 ASTM F1869-03, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride;
 - .6 ASTM- F2170, Situ Probe rH Test Method
- .4 Carpet and Rug Institute (CRI):
 - .1 CRI 104-2002, Standard for Installation of Commercial Carpet;
 - .2 CRI Indoor Air Quality Carpet Testing Program.
- .5 American Association of Textile Chemists and Colorists (AATCC):
 - .1 Color Fastness to Lightfastness ASTCC 16-E
 - .2 Electrostatic Propensity of Carpet, AATCC -134 under 3.5KV;
- .6 Underwriters' Laboratories of Canada (ULC):
 - .1 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies;

1.4 SUBMITTALS

- .1 Submit two sets of tile layout drawings, complete with carpet tile schedule and room designation consistent with construction drawings.
- .2 Submit two complete sets of carpet tile manufacturer's running line range. Ensure each set is labeled with the following:
 - .1 Manufacturer's name
 - .2 Pattern (Collection Series)

- .3 Color
- .4 Fiber
- .5 Dye method
- .6 Oz. weight
- .7 Manufacturers Installation Options

- .3 Upon selection of colour and pattern, submit two full size carpet tile samples in selected color and pattern.
- .4 Submit maintenance data in accordance with Division 01, Section 01 78 00 Closeout Submittals.
- .5 Submit verification to demonstrate compliance with CAN/ULCS102 and CAN/ULCS102.2.
- .6 Submit proof that carpet has been tested and passed the Indoor Air Quality (IAQ) Carpet Testing Program requirements of the Carpet and Rug Institute.
- .7 Submit report verifying that tuft bind meets requirements of CAN/CGSB-4.129 when tested to CAN/CGSB-4.2 No.77.1.

1.5 MAINTENANCE MATERIALS

- .1 Prior to installation, provide extra materials as described below. Extra materials to be packaged with protective covering for storage. Identify extra materials with labels describing contents.
- .2 Extra Stock: Provide full size units equal to 10 percent of each type, colour and pattern required. Store on site as directed.
- .3 Maintenance materials to be from the same product run as installation materials.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver carpet tile and other accessories in original cartons or packaging clearly marked with the manufacturer's name, material description, colour, pattern, size, type, dye lot and quantity.
- .2 Store under cover and away from moisture. Keep dry at all times.

1.7 ENVIRONMENTAL CONDITIONS

- .1 Maintain minimum temperature of 18°C in installation areas for a minimum of 48 hours prior to, during and 48 hours after installation.
- .2 Operate ventilation fans of appropriate size, at maximum capacity during carpet tile and adhesive removal and during and for at least 72 hours after glue-down installation.

1.8 PROJECT CONDITIONS

- .1 Do not install carpet tiles until wet work in spaces is complete and dry and that ambient temperature and humidity conditions are maintained at the levels when space will be occupied for its intended use.
- .2 Do not install carpet tile over concrete subfloor until slabs have cured and are sufficiently dry to bond with adhesive and concrete subfloor have pH range recommended by carpet manufacturer.
- .3 Moisture content not to exceed 75% rh test method as per ASTM F-2170.
- .4 Pre-installation moisture and alkalinity test as per ASTM test standards.

1.9 WARRANTIES

- .1 Provide one year warranty against defects in material and workmanship from the date of Substantial Completion.

PART 2 PRODUCTS

2.1 GENERAL

- .1 Basis of Design / Acceptable Manufacturer: Shaw Contract:

- .1 As selected by Interior Design.

2.2 PERFORMANCE REQUIREMENTS

- .1 Carpet tile construction must meet or exceed the following:
- .1 Fibre Content: 100% nylon, bulk continuous filament, and permanently conductive fibres to control electrostatic propensity.
 - .2 Dye Method: 100% Solution Dyed. Accepted is minimum 90% Solution Dyed, 10% Space Dyed.
 - .3 Pile Characteristics: Multi-level loop, textured level loop, or level loop.
 - .4 Tufted Weight: 18 oz. minimum.
 - .5 Gauge: 1/10" minimum.
 - .6 Stitches per inch: 8.00" minimum.
 - .7 Pile Density: 6000oz./cy minimum.
 - .8 Tile size: 18" x 18" (457mm x 457mm) to 24" x 24" (610mm x 610mm).
 - .9 Backing System:
 - .1 Manufacturers standard vinyl or thermoplastic hard backed or cushion thermoplastic backing system.
 - .2 Recyclable content.
 - .3 Maintaining a 100% true moisture barrier between the secondary backing and the substrate below.
 - .4 A pre-adhered backing system may be used as an alternate to an applied releasable adhesive to the surface substrate
 - .10 Color and Pattern: Province to select from manufacturers standard color range.
 - .11 Carpet tiles to be a either non-direction, quarter turn, random, monolithic, ashlar, brick pattern as selected by Consultant.
 - .12 Inherent Static Control less than 3.0 Kilovolts at 21°C and 20% relative humidity.
 - .13 Delimitation to ASTM D3936 to min 2.5 Lbs/in.
 - .14 Soil/Stain protection.

2.3 ACCESSORIES

- .1 Cementitious Underlayment: self-leveling and trowel grade.
- .1 For gypsum based toppings, seal top surface with liquid latex applied by roller, or other method approved by carpet manufacturer.
 - .2 Minimum compressive strength 10 MPa at 24 hours and 20 Mpa at 7 days. Suitable for floor covering installation not more than 12 or 4 hours after application.
- .2 Releasable pressure sensitive type adhesive: adhesive must allow for removal of carpet tile at any time without damage to carpet, must contain antimicrobial preservative and have "zero" calculated Volatile Organic Compounds (VOCs).
- .3 Carpet tile Edge Guard: as follows:
- .1 Type: non-metallic, extruded or molded heavy-duty rubber "T" shaped cap insert and minimum 50 mm wide extruded aluminum anchorage flange, profiled to accept cap.
 - .2 Colour: selected by the Consultant from manufacturer's standard range. A different colour will be selected for each different colour of carpet tile.
- .4 Carpet Stair Nosings: rubber, double butt, square nose, 10 mm thick, 8 mm butting gauge, 25 mm vertical face and 25 mm vertical lip, 40 mm horizontal face and 45 mm horizontal lip, standard will be selected by Consultant.

2.4 RESILIENT BASE

- .1 Resilient Base: to ASTM F1861-00 and as follows:
 - .1 Type: TP, rubber, thermoplastic.
 - .2 Group: 1, solid.
 - .3 Style: cove.
 - .4 Thickness: 3.2 mm.
 - .5 Height: 101.6mm.
 - .6 End Stops and External Corners: pre-moulded.
 - .7 Colour: colour will be selected by Consultant. A different colour may be selected for each type of carpet specified.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION OF SURFACES

- .1 Examine substrates, areas, and conditions, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerance and other conditions that may affect the performance of the carpet tile.
- .2 Commencing construction activities of this section indicates installer's acceptance of conditions.

3.2 PREPARATION

- .1 Comply with CRI 104, Site conditions: Floor Preparation and Carpet Manufacturers written installation instructions for preparing substrates indicated to receive carpet installation.
- .2 Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions and protrusions in the substrate. Fill or level cracks, holes and depressions 3mm wide or wider and protrusions more than 0.8mm, unless more stringent requirements are identified in the carpet tile manufacturer's written instructions.
- .3 Trowel and float to produce a smooth, flat surface. Allow to cure properly.
- .4 Remove coatings, including curing compounds and other substances from concrete or gypcrete subfloor that are not compatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents using mechanical methods recommended in writing by the carpet tile manufacturer.
- .5 Broom and vacuum clean substrate to remove dust and other small particles. Cover prior to installing carpet tile.
- .6 Substrate to have acceptable level of absorbency as per manufacturer's written instructions. After cleaning, examine substrates for acceptable levels of moisture, alkaline salts, carbonation, or dust before proceeding with installation.
- .7 When underlayment has cured, clean substrate surface and allow to dry. Seal as required.
- .8 To ensure requirements are achieved test cementitious substrate for porosity, moisture content and alkalinity.

3.3 INSTALLATION

- .1 Install carpet tile using a minimum number of pieces of carpet tile.
- .2 Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.
- .3 Comply with CRI 104, Section 8, direct Glue-Down Installation or as per carpet tile manufacturer written instructions; install every carpet tile with full spread, releasable, pressure sensitive adhesive as per manufacturers written instructions.
- .4 Ensure product and substrate temperature is 18 degrees Celsius minimum for direct glue-down installation. Adhesives to be applied in accordance with manufacturers written instructions.
- .5 Install carpet tile pattern parallel to walls and borders and as indicated in Finish Schedule.
- .6 Install carpet tile smooth and free of bubbles, puckers and defect. Confirm carpet tile type, color and pattern prior to installation. Maintain dye lot integrity. Do not mix dye lots in same area.
- .7 Carpet tile cuts to be a "clean cut". Fit carpet tile tight to intersection with vertical surfaces without gaps.
- .8 All edge transition strips to be installed completely, conceal all exposed edges.
- .9 Do not bridge building expansion joints with carpet tile.

- .10 Install seams in accordance with carpet tile manufacturer's written instructions for seam locations and direction of carpet tile.
- .11 Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.
- .12 Bind or seal cut edges as per carpet tile manufacturer written instructions.
- .13 Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- .14 Maintain all reference markers, openings and holes that are in place or marked for future cutting.
- .15 Roll carpet tile for complete contact of carpet tile with adhesive and substrate.

3.4 INSTALLATION OF RUBBER BASE

- .1 Install rubber base in accordance with manufacturer's installation instructions.
- .2 Fit joints tight and vertical.
- .3 Mitre internal corners. Use pre-moulded sections for external corners and exposed ends.
- .4 Install base on solid backing. Adhere tightly to wall and floor surfaces.
- .5 Scribe and fit to door, frames and other obstructions.
- .6 Install straight and level to variation of plus or minus 3 mm over 3 m straight edge.

3.5 CLEANING AND PROTECTION

- .1 Use protection and cleaning procedures and / or methods as per manufacturers written instructions.
- .2 After installing carpet tile:
 - .1 Remove excess adhesive, seam sealer and other surface blemishes using cleaner recommended by carpet tile manufacturer and as per manufacturers written instructions.
 - .2 Remove yarns that protrude from carpet tile surface.
 - .3 Vacuum carpet tile.
- .3 Protect installed carpet tile from damage and soiling from construction operations and placement of equipment and fixtures during the remainder of the construction period
- .4 Progress Cleaning: Perform cleanup as work progresses. Leave work area clean at the end of each day.
- .5 Final Cleaning: Upon completion, remove surplus materials, rubbish, tools, and equipment.

3.5 TRAINING

- .1 Provide qualified representative from carpet tile manufacturer to instruct building maintenance staff in proper methods for installing, maintaining carpet tile, including environmental friendly cleaning and stain removal products and procedures as per manufacturer's written maintenance review.

END OF SECTION 09 68 13

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 All labor, materials, tools and other equipment, services and supervision required to complete all interior and exterior painting and decorating work to the full extent of the drawings and specifications. Colour schedule to be provided by the Consultant at a later date. Coordinate with Interior Design + Client.
- .2 For preparation of existing surfaces to receive painting and finishing, refer to the Master Painters Institute (MPI) specification manuals for priming and back-priming and specific pre-treatments.

1.2 RELATED REQUIREMENTS

- .1 Division 01 General Requirements
- .2 Section 07 92 00 Joint Sealant
- .3 Section 08 11 00 Metal Doors and Frames
- .4 Section 09 21 16 Gypsum Board Assemblies

1.3 QUALITY ASSURANCE

- .1 Contractor shall have a minimum of five (5) years proven satisfactory experience and shall show proof before commencement of work that he or she will maintain a qualified crew of painters throughout the duration of the work. When requested, Contractor shall provide a list of the last three comparable jobs including, name and location, specifying authority / project manager, start and completion dates and cost amount of the painting work.
- .2 Only qualified journeymen who have a "Tradesman Qualification Certificate of Proficiency" shall be engaged in painting and decorating work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with trade regulations.
- .3 Conform to the standards contained in the Master Painters Institute Architectural Painting Specification Manual, latest edition (hereafter referred to as MPI Painting Specification Manual) for all painting products including preparation and application of materials. MPI Painting Specification Manual as issued by the local MPI Accredited Quality Assurance Association having jurisdiction. All paint to be premium grade unless otherwise noted.
- .4 All paint manufacturers and products used shall be as listed under the "Approved Products" section of the MPI Architectural Painting Specification Manual.

1.4 REGULATORY REQUIREMENTS

- .1 Conform to work place safety regulations for storage, mixing, application and disposal of all paint related materials to requirements of those authorities having jurisdictions.
- .2 Conform to safety precautions in accordance with the latest requirements to Industrial Health and Safety Regulations, latest edition, of authorities having jurisdictions.

1.5 SUBMITTALS

- .1 Submit list of all painting materials to the Consultant for review prior to ordering materials.
- .2 Provide duplicate minimum 300mm (12") square samples of surfaces or acceptable facsimiles requested painted with specified paint or coating in colours, gloss / sheen and textures required to MPI Architectural Painting Specification Manual standards for review and approval. When approved, samples shall become acceptable standard of quality for appropriate on-site surface with one of each sample retained on site.

- .3 Submit two sets of Material Safety Data Sheets (MSDS) prior to commencement of work for review and for posting at job site as required.
- .4 At project completion provide an itemized list complete with manufacturer, paint type and colour coding for all colours used for Owner's later use in maintenance.
- .5 At project completion provide properly packaged maintenance materials as noted herein and obtain a signed receipt.
- .6 Instructions: submit manufacturer's installation instructions and comply with written recommendations or specifications, including product technical bulletins, handling, storage and datasheet.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver all painting materials in sealed, original labeled containers bearing manufacturer's name, brand name, type of paint or coating and color designation, standard compliance, materials content as well as mixing and/or reducing and application requirements. Only approved paint products as listed in the MPI Architectural Painting Specification Manual, latest edition, shall be delivered to the site.
- .2 Store all paint materials in original labeled containers in a secure (lockable), dry, heated and well ventilated single designated area meeting the minimum requirements of both paint manufacturer and authorities having jurisdiction and at a minimum ambient temperature of 45° F (7° C). Only material used on this project to be stored on site.
- .3 Where toxic and/or volatile/explosive/flammable materials are being used, provide adequate fireproof storage lockers and take all necessary precautions and post adequate warnings (e.g. no smoking) as required. Take adequate measures to prevent the release of volatile organic compounds (VOC) into the atmosphere.
- .4 Take all necessary precautionary and safety measures to prevent fire hazards and spontaneous combustion and to protect the environment from hazard spills. Materials that constitute a fire hazard (paints, solvents, drop clothes, etc.) shall be stored in suitable closed and rated containers and removed from the site on a daily basis.
- .5 Comply with requirements of authorities having jurisdiction, in regard to the use, handling, storage and disposal of hazardous materials.

1.7 PROJECT / SITE REQUIREMENTS

- .1 Unless specifically pre-approved by the specifying body, paint inspection agency and the applied product manufacturer, perform no painting or decorating work when the ambient air and substrate temperatures are below 50° f (10° c) for both interior and exterior work.
- .2 Perform no painting or decorating work when the relative humidity is above 85% or when the dew point is less than 5° F (3° C) variance between the air/surface temperature.
- .3 Perform no painting or decorating work when the maximum moisture content of the substrate exceeds:
 - .a 12 % for concrete and masonry (clay and concrete brick/block).
 - .b 15% for wood.
- .4 Conduct all moisture tests using a properly calibrated electronic Moisture Meter, except test concrete floors for moisture using a simple "cover patch test".
- .5 Perform no painting or decorating work unless a minimum lighting level of 323 Lux (30 foot candles) is provided on surfaces to be painted or decorated. Adequate lighting facilities shall be provided by the General Contractor.
- .6 Perform no painting or decorating work unless adequate continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above 50° F (10° C) for 24 hours before, during and after paint application. Provide supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.

- .7 Apply paint only to dry, clean, properly cured and adequately prepared surfaces in areas where dust is no longer generated by construction activities such that airborne particles will not affect the quality of finished surfaces.

1.8 SCHEDULING

- .1 Schedule painting operations to prevent disruption of and by other trades.
- .2 Schedule painting operations to prevent disruption of occupants in and about the building.

1.9 MAINTENANCE MATERIALS

- .1 At project completion provide 4 liters (1 gallon) of each type and color of paint from same production run (batch mix) used in unopened cans, properly labeled and identified for Owner's later use in maintenance. Store where directed.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 All materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) shall be in accordance with the MPI Painting Specification Manual "approved product" listing.
- .2 Other paint materials shall be the highest quality product of an approved manufacturer listed in the MPI Painting Specification Manual and shall be compatible with other coating materials as required.
- .3 All materials and paints shall be lead and mercury free and shall have low VOC content where possible.
- .4 Supply paint materials for paint systems from single manufacturer.
- .5 Metal Flashings, copings and covering pieces to be prefinished and touched up to manufacturers requirements.

PART 3 EXECUTION

3.1 PREPARATION OF SURFACES

- .1 Prepare all surfaces in accordance with MPI Painting Specification Manual requirements. Refer to the Manual or specific surface preparation requirements for each substrate material not included in the following.
- .2 Prepare all surfaces to Manufacturer's specifications for products.

3.2 INSPECTION

- .1 Inspect the work and notify the Architect of any conditions that would affect the installation or performance of the work.
- .2 Start of painting indicates installer's acceptance of substrate conditions.

3.3 APPLICATION

- .1 Do not paint unless substrates are acceptable and/or until environmental conditions (heating, ventilation, lighting and completion of other subtrade work) are acceptable for applications of products.
- .2 Paint surfaces to minimum MPI Painting Specification Manual finish requirements with application methods in accordance with best trade practices for type and application of materials used.

3.4 SURFACES

Paint interior surfaces in accordance with the following MPI Painting Specification Manual requirement for Premium Grade (3 coats):

- .1 WALLS:
 - .1 Interior Gypsum Board (colour to be confirmed)

1. Prepare surfaces in accordance with MPI Specifications – Level 5.
 2. INT 9.2A Latex (over latex sealer) – gloss level to be confirmed by Owner.
 2. DOORS AND FRAMES:
 - .1 Interior Wood (colour to be confirmed)
 - 1.INT 6.4A Latex (over alkyd sealer) – gloss level to be confirmed by Owner.
 - .2 Interior Metal (colour to be confirmed)
 - 1.INT 5.3A Latex – gloss level to be confirmed by Owner.
 - .3 Exterior Metal (colour to be confirmed)
 - 1.EXT 5.3H Latex (over water based primer) – gloss level to be confirmed by Owner
 6. STRUCTURAL STEEL
 - .1 Exterior Primed Steel (colour to be confirmed)
 1. Surface Preparation to SSPC-SP6 / NACE 3 Commercial Blast Cleaning
Provided evidence of surface preparation to Architect prior to delivery of steel.
 2. EXT 5.1P Polyurethane, pigmented finish (over epoxy zinc rich primer)
 - .2 Interior Primed Steel (exposed) (colour to be confirmed)
 - 1.INT 5.1R High performance architectural latex finish – gloss level to be confirmed by Owner.
 - .3 Touch up field welds w. field applied galvanizing such as “galvacon” or equivalent.

3.5 MECHANICAL / ELECTRICAL EQUIPMENT AND RELATED SURFACES

- .1 Unless otherwise specified or noted, paint all “unfinished” conduits, piping, hangers, ductwork and other mechanical and electrical equipment with color and texture to match adjacent surfaces, in the following areas:
 - .1 where exposed-to-view in all exterior and interior areas.

3.6 FIELD QUALITY CONTROL

- .1 Painted surfaces shall be considered to lack uniformity and soundness if any of the following defects are apparent:
 - .1 Runs, sags, hiding or shadowing by inefficient application methods.
 - .2 Evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles.
 - .3 Damage due to touching before paint is sufficiently dry or any other contributory cause.
 - .4 Damage due to application on moist surfaces or caused by inadequate protection from the weather.
 - .5 Damage and/or contamination of paint due to wind blown contaminants (dust, sand blast materials, salt spray, etc.).
2. Painted surfaces rejected by the Consultant shall be made good at the expense of the Contractor. Small affected areas may be touched up; large affected areas or areas without sufficient dry film thickness of paint shall be repainted. Runs, sags of damaged paint shall be removed by scraper or by sanding prior to application of paint.

3.7 PROTECTION

- .1 Protect all newly painted exterior surfaces from rain and snow, condensation, contamination, dust, salt spray and freezing temperatures until paint coatings are completely dry. Curing periods shall exceed the manufacturer's recommended minimum time requirements.
- .2 Erect barriers or screens and post signs to warn of or limit or direct traffic away or around work area as required.

3.8 CLEAN UP

- .1 Remove all paint where spilled, splashed, splattered or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.
- .2 Keep work area free from an unnecessary accumulation of tools, equipment, surplus materials and debris.
- .3 Remove combustible rubbish materials and empty paint cans each day and safely dispose of same in accordance with requirements of authorities having jurisdiction.
- .4 Clean equipment and dispose of wash water / solvents as well as all other cleaning and protective materials (e.g. rags, drop cloths, masking papers, etc.), paints, thinners, paint removers/strippers in accordance with the safety requirements of authorities having jurisdiction.

END OF SECTION 09 90 00

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 All labor, materials, tools and other equipment, services and supervision required to complete surface preparation and application of water-based, elastomeric waterproofing coating.
- .2 Ensure compatibility with other materials and surfaces.

1.2 RELATED REQUIREMENTS

- .1 Section 01 00 00 General Requirements
- .2 Cast-in-Place Concrete – Refer to Structural
- .3 Section 07 92 00 Joint Sealant
- .4 Section 09 90 00 Painting and Coating

1.3 REFERENCES

- .1 ASTM C 920 – Standard Specification for Elastomeric Joint Sealants
- .2 ASTM D 412 – Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension
- .3 ASTM D 624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
- .4 ASTM D 4263 - Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
- .5 ASTM D 4541 - Standard Test Method for Pull-Off Strength of Coatings using Portable Adhesion Testers
- .6 ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials
- .7 ASTM E 96 – Standard Test Methods for Water Vapor Transmission of Materials
- .8 ASTM E 2178 - Standard Test Methods for Air Performance of Building Materials

1.4 SUBMITTALS

- .1 Product Data: For each type of product indicated.
- .2 Samples for Initial Selection: For each type of Wall coating indicated.
- .3 Product List: For each product indicated, including the following:
 - .1 Cross-reference to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 - .2 Manufacturer's recommended spreading rate for each separate coat, including primers and block fillers for each type of substrate as applicable.

1.5 QUALITY ASSURANCE

- .1 Contractor shall have a minimum of five (5) years proven satisfactory experience and shall show proof before commencement of work that he or she will maintain a qualified crew of painters throughout the duration of the work. When requested, Contractor shall provide a list of the last three comparable jobs including, name and location, specifying authority / project manager, start and completion dates and cost amount of the painting work.
- .2 Only qualified journeymen who have a "Tradesman Qualification Certificate of Proficiency" shall be engaged in painting and decorating work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with trade regulations.
- .3 Conform to the standards contained in the Master Painters Institute Architectural Painting Specification Manual, latest edition (hereafter referred to as MPI Painting Specification Manual) for all painting products including preparation and

application of materials. MPI Painting Specification Manual as issued by the local MPI Accredited Quality Assurance Association having jurisdiction. All paint to be premium grade unless otherwise noted.

- .4 All paint manufacturers and products used shall be as listed under the "Approved Products" section of the MPI Architectural Painting Specification Manual.
- .5 Mockups:
 - .1 Install at Project site or pre-selected area of building an area for field sample, minimum 4 feet by 4 feet (1.2m by 1.2m), using specified material.
 - .2 Apply material in accordance with manufacturer's written application instructions.
 - .3 Manufacturer's representative or designated representative will review technical aspects; surface preparation, repair, and workmanship.
 - .4 Field sample will be standard for judging workmanship on remainder of Project.
 - .5 Maintain field sample during construction for workmanship comparison.
 - .6 Do not alter, move, or destroy field sample until Work is completed and approved by Owner.
 - .7 Obtain Owners written approval of field sample before start of material application, including approval of aesthetics, color, texture, and appearance.
 - .8 Perform adhesion test in accordance with ASTM D3359, Method A. Minimum adhesion rating of 4A required on 0 to 5 scale.

1.6 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 8 °C (45°F).
 - .1 Maintain containers in clean condition, free of foreign materials and residue.
 - .2 Remove rags and waste from storage areas daily.

1.7 PROJECT CONDITIONS

- .1 Do not Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are below 5 °C (40°F) or expected to be below 5 °C (40°F) within 24 hours after application.
- .2 Do not apply coatings in snow, rain, fog, or mist; when relative humidity exceeds 85% or to damp or wet surfaces or when rain is expected within 24 hours of application.
- .3 Allow wet surfaces to dry thoroughly and attain temperature and conditions specified before starting or continuing coating operation.
- .4 Do not apply over moving cracks, control or expansion joints.
- .5 Do not apply on Horizontal Surfaces that will receive traffic.
- .6 Apply according to manufactures application instructions and recommendations.

1.8 WARRANTY

- .1 Deliver Manufacturer's single source standard form warranting material within specified warranty period.
 - .1 Warranty Period: Ten years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- .1 Basis of Design: TREMGard HB by Tremco Commercial Sealants & Waterproofing.
- .2 Ensure all Wall Coatings and Exterior Joint Sealants are provided from a single source.

2.2 OTHER MATERIALS

- .1 Crack Fillers: Wall coating manufacturer's recommended crack fillers or sealants, including crack filler primers, compatible with substrate and other materials indicated; VOC content complying with limits of authorities having jurisdiction.
- .2 Joint Sealants: Single or multi-component polyurethane sealants, supplied by coating manufacturer.
 - .1 Dymonic 100
 - .2 illmod 600
 - .3 Spectrem 1
 - .4 Spectrem Simple Seal
- .3 Primer: Wall coating manufacturer's recommended, factory-formulated, alkali-resistant primer compatible with substrate and other materials indicated.
 - .1 Basis of Design: TREMGard H/P Primer
- .4 Concrete Unit Masonry Block Filler: Elastomeric coating manufacturer's recommended, factory-formulated, high-performance latex block filler compatible with substrate and other materials indicated.
 - .1 VOC Content: 100 g/L or less.
 - .2 Basis of Design: TREMGard Masonry Primer.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Protection: Protect adjacent Work areas and finish surfaces from damage during coating application.
- .2 Prepare surfaces in accordance with manufacturer's instructions.
- .3 Ensure that substrate is sound, clean, dry, and free of dust, dirt, oils, grease, laitance, efflorescence, mildew, fungus, biological residues, and other contaminants that could prevent proper adhesion.
- .4 Ensure concrete substrates have a minimum 28-day cure and are free of bond-inhibiting contaminants.
- .5 Clean surface to achieve texture similar to medium grit sandpaper.
- .6 Repair holes and spalled and damaged concrete with repair materials approved by coating manufacturer.
- .7 Remove protruding concrete accessories and smooth out irregularities.
- .8 When chemical cleaners are utilized, neutralize compounds and fully rinse surface with clean water. Allow surface to dry before proceeding.
- .9 Remove blisters and delaminated areas and sand edges to smooth rough areas and provide transition to existing paint areas.
- .10 Check adhesion of existing paint in accordance with ASTM D 3359, measuring adhesion by Tape Method A.
- .11 Treat cracks greater than 1/32 inch (0.8mm) with approved patching compound or Approved Tremco Sealant.
- .12 Treat cracks greater than 1/4 inch (6mm) as expansion joints and fill with sealant approved by coating manufacturer.
- .13 Prepare and treat cracks in accordance with manufacturer's instructions.

3.2 PREPARATION

- .1 Comply with manufacturer's written instructions applicable to substrates and coating systems indicated.
- .2 Start of painting indicates installer's acceptance of substrate conditions.

3.3 APPLICATION

- .1 Apply coatings according to manufacturer's written instructions per the project.
 - .1 Use equipment and techniques best suited for substrate and type of material being applied.
 - .2 Coat surfaces behind movable items the same as similar exposed surfaces.
 - .3 Apply as a 2 coat system according to manufacturer's written instructions
 - .4 Maintain proper uniform wet-film thickness during application to ensure performance characteristics desired.
 - .5 Apply coating using consistent application techniques to achieve uniform color and texture.
- .2 Primers: Apply at a rate to ensure complete coverage.
- .3 Block Fillers: Apply at a rate to ensure complete coverage with pores filled.
- .4 Mixing: Mix coating in accordance with manufacturer's instructions to ensure uniform color and aggregate disbursement and to minimize air entrapment.
- .5 In multi-pail applications, mix contents of each new pail into partially used pail to ensure color consistency and smooth transitions from pail to pail.

3.4 FIELD QUALITY CONTROL

- .1 Painted surfaces shall be considered to lack uniformity and soundness if any of the following defects are apparent:
 - .1 Runs, sags, hiding or shadowing by inefficient application methods.
 - .2 Evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles.
 - .3 Damage due to touching before paint is sufficiently dry or any other contributory cause.
 - .4 Damage due to application on moist surfaces or caused by inadequate protection from the weather.
 - .5 Damage and/or contamination of paint due to wind blown contaminants (dust, sand blast materials, salt spray, etc.).
- .2 Painted surfaces rejected by the Consultant shall be made good at the expense of the Contractor. Small affected areas may be touched up; large affected areas or areas without sufficient dry film thickness of paint shall be repainted. Runs, sags of damaged paint shall be removed by scraper or by sanding prior to application of paint.

3.5 PROTECTION & CLEAN UP

- .1 Protect all newly painted exterior surfaces from rain and snow, condensation, contamination, dust, salt spray and freezing temperatures until paint coatings are completely dry. Curing periods shall exceed the manufacturer's recommended minimum time requirements.
- .2 Remove all paint where spilled, splashed, splattered or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.
- .2 Keep work area free from an unnecessary accumulation of tools, equipment, surplus materials and debris.
- .3 Remove combustible rubbish materials and empty paint cans each day and safely dispose of same in accordance with requirements of authorities having jurisdiction.
- .4 Clean equipment and dispose of wash water / solvents as well as all other cleaning and protective materials (e.g. rags, drop cloths, masking papers, etc.), paints, thinners, paint removers/strippers in accordance with the safety requirements of authorities having jurisdiction.

END OF SECTION 09 96 53

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Furnishing of all labor, materials, services and equipment necessary for surface preparation and supply and installation of the following:
 - .1 Exterior Signage
 - .1 Address Sign
 - .2 Firehall Signage
 - .3 Parking Signage
 - .4 Accessibility Signage
 - .5 Crest Signage
 - .2 Interior Signage
 - .1 Room Identification
 - .2 Stair Signage
 - .3 Egress Signage
 - .4 Accessibility Signage

1.2 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 26 00 00 – Electrical

1.3 REFERENCES

- .1 BC Building Code 2018

1.4 SUBMITTALS

- .1 Product Data: Provide manufacturer's standard product data + installation details for specified products.
- .2 Shop Drawings: Prepared specifically for this project; show fabrication details, location, size, style, finish and/or colour selection, elevations, edge details, hardware, and installation details. Including but not limited to, backing and framework for installation of signage.

1.5 DELIVERY, STORAGE AND HANDLING

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

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Address Sign: **230 HOBBS ROAD**
 - .1 300mm high x 13mm thick anodized aluminum (colour, if any TBD)
- .2 Firehall Signage: **DASHWOOD STN. 61**
 - .1 300mm high x 13mm thick anodized aluminum (colour, if any TBD)
- .3 Parking Signage: as required by firehall occupants

- .1 Size + location TBD
- .4 Accessibility Signage (exterior) :
 - .1 Provide signage to indicate location of accessible entrance, parking stalls and elevators per BCBC 3.8.2.10.
 - .2 Signs required by BCBC Article 3.8.2.10. shall incorporate the *Dynamic Symbol of Access* and meet the graphical and textural requirements per BCBC 3.8.3.9.
- .5 Crest Signage:
 - .1 Assume vinyl on acrylic push through; include for electrical to illuminate
- .6 Room Identification:
 - .1 High contrast digital prints on matte laminate applied to 3mm aluminum panel
- .7 Stair Signage:
 - .1 Exit Level signage: to be mounted within stair at exit level, to establish exit level and that travel beyond (up or down) from that level does not lead to an exit per BCBC 3.4.5.2.
 - .2 Floor Numbering signage: to be mounted within stair, 1500mm high above finish floor and within 300mm from latch side of door per BCBC 3.4.6.19.
 - .1 Sign to include stair symbol, assigned "STAIR" number and "LEVEL" floor number in Arabic numerals to be min. 60mm high and raised 0.7mm above surface. To be contrasting in colour and provide braille below.
- .8 Egress Signage:
 - .1 Provide Exit Signs over every exit door per BCBC 3.4.5.1; Refer to Electrical drawings for type and locations of illuminated exit signs.
 - .2 Provide illuminated egress signs within services rooms per BCBC 3.3.1.24.
- .9 Accessibility Signage (interior):
 - .1 Provide signage on accessible washroom and any other areas as req'd.

PART 3 EXECUTION

3.1 CONDITIONS

- .1 Examine all conditions on which the successful work of this section depends. Report to the Consultant (Architect) in writing defects of work prepared by other trades and unsatisfactory site conditions. Starting of the work shall imply acceptance of surfaces.

3.2 INSTALLATION

- .1 Install as specified by manufacturer.
- .2 Install to structural elements, substrate or applied elements, provide all clips and attachments for direct connection to elements of the building.

3.3 PROTECTION AND CLEAN UP

- .1 Protect during installation any adjacent surfaces from damage due to the work of this section.
- .2 Protect items installed under this section from damage resulting from the work of other sections.
- .3 Promptly as the work proceeds and on completion, remove all crating, surplus materials, and equipment.

END OF SECTION 10 14 00

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Stainless Steel Corner Guard Systems. Assume for all exposed outside GWB corners.

1.2 SUBMITTALS

- .1 Product data for each type of Corner Guard specified.
- .2 3 each full size profiles, 6" long samples of each type Corner Guard indicated.
- .3 Cleaning and maintenance instructions.
- .4 Schedule: Submit a marked-up plan confirming locations for corner guard installation.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials in unopened factory packaging to the jobsite and store in original packaging in a climate controlled location away from direct sunlight.

1.4 PROJECT CONDITIONS

- .1 Products must be installed in an interior climate controlled environment.

1.5 WARRANTY

- .1 Manufacturer's Limited Lifetime Warranty against material and manufacturing defects.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- .1 Acceptable Manufacturer: Ace Corner Guards, 4789 Yonge Street, Suite #807, Toronto, Ontario; Telephone: 1-800-638-0126, email: info@acecornerguards.com; Internet address www.acecornerguards.com

2.2 MATERIALS

- .1 Corner Guards shall be manufactured from Type 304, 16 gauge Stainless Steel.
- .2 Height: 1200mm

2.3 COMPONENTS

- .1 Attachment options;
 - .1 Field applied heavy duty construction adhesive.
 - .2 Factory applied two sided tape.

2.4 FINISHES

- .1 Stainless steel: No. 4 brushed vertical finish.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Examine areas and conditions in which the corner guard systems will be installed.
 - .1 Complete all finishing operations, including painting, before beginning installation of corner guards.
- .2 Wall surface shall be dry and free from dirt, grease and loose paint.

3.2 PREPARATION

- .1 Prior to installation, clean substrate to remove dust, debris and loose particles.

3.3 INSTALLATION

- .1 General: Locate the Corner Guard as indicated on the approved marked up plan for the appropriate substrate and Install corner guard level and plumb at the height indicated above.
- .2 Installation of Stainless Steel Corner Guards:
 - .1 Surface must be dry, clean and properly sealed.
 - .2 Two sided tape: Peel paper from the factory applied tape and apply pressure until a tight fit is achieved.
 - .3 Cement on: Apply a bead of Premium Heavy Duty Construction Adhesive in a zigzag pattern over the back of each wing of the corner guard. Position corner guard on the wall and apply pressure until a tight fit is achieved.

3.4 CLEANING AND PROTECTION

- .1 At completion of the installation, clean surfaces with a neutral based, non-abrasive cleaner. Ammonia and alcohol based cleaners may be used.

END OF SECTION 10 26 13

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 This section includes the following types of wall protection systems:
 - .1 Wall Coverings

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)

1.3 SUBMITTALS

- .1 Product data and detailed specifications for each system component and installation accessory required, including installation methods for each type of substrate.
- .2 Show drawings showing locations, extent and installation details of wall covering products.
- .3 Samples for verification purposes: Submit the following samples, as proposed for this work, for verification of color, texture, pattern and thickness:
 - .1 Sample of each product specified.
- .4 Product test reports from a qualified independent testing laboratory showing compliance of each component with requirements indicated.
- .5 Maintenance data for wall protection system components for inclusion in the operating and maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

- .1 Installer qualifications: Engage an installer who has no less than 3 years' experience in installation of systems similar in complexity to those required for this project.
- .2 Manufacturer qualifications: Not less than 5 years' experience in the production of specified products and a record of successful in-service performance.
- .3 Code Compliance: Assemblies should conform to all applicable codes, including IBC, UBC, SBCCI, BOCA and Life Safety.
 - .1 Flame spread: 26 – 75
 - .2 Smoke developed: 450 or less
- .4 Fire performance characteristics: Provide engineered PETG wall protection system components identical to those tested in accordance with ASTM E84 for Class B characteristics listed below:
 - .1 Flame spread: 26 – 75
 - .2 Smoke developed: 450 or less
- .5 Chemical and stain resistance: Provide wall protection system components with chemical and stain resistance in accordance with ASTM D543.
- .6 Single source responsibility: Provide all components of the wall protection system manufactured by the same company to ensure compatibility of color, texture and physical properties.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials to the project site in unopened original factory packaging clearly labeled to show manufacturer.
- .2 Store materials in original, undamaged packaging in a clean, dry place out of direct sunlight and exposure to the elements. A minimum room temperature of 40°F (4°C) and a maximum of 100°F (38°C) should be maintained.
- .3 Materials must be stored flat.

1.6 PROJECT CONDITIONS

- .1 Materials must be acclimated in an environment of 65–76°F (18–24°C) for at least 24 hours prior to beginning the installation.
- .2 Installation areas must be enclosed and weatherproofed before installation commences.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- .1 Basis of Design Products: Interior surface protection products specified herein and included on the submittal drawings shall be manufactured by Construction Specialties, Inc.

2.2 MATERIALS

- .1 Engineered PETG: Rigid sheet should be high-impact Acrovyn by Design with standard Suede texture, nominal .040" (1.02mm) thickness.
- .2 Aluminum: Optional aluminum trims to be alloy 6063 T5 with clear or color anodized finish; minimum strength and durability properties as specified in ASTM B221. The color anodized finish is available in eight colors and is not covered under 1.04 G.

2.3 WALL COVERING

- .1 Engineered PETG rigid sheet to be Acrovyn by Design Tapestry Collection: Nominal .040" (1.02mm) thick rigid sheet supplied in 4'x8' (1.2m x 2.4m) sheet size in Suede texture. Tapestry is a fused sheet product with an opaque backer. Select from one of the four standard fabric inner-layers and 16 color options. Specify color-matched or clear caulk for butt-joint installations; aluminum trims are recommended. See aluminum trim finish options.

2.4 FABRICATION

- .1 General: Fabricate wall covering to comply with requirements indicated for design, dimensions, detail, finish and sizes.

2.5 FINISHES

- .1 General: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applications and designations of finishes.

2.6 ACCESSORIES

- .1 Adhesive: Acrovyn wall covering shall be furnished as a complete packaged system, including appropriate standard adhesive.
- .2 Primer, caulk and trims available for purchase.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Verification of conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
- .2 Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- .1 Surface preparation: Prior to installation, clean substrate to remove dirt, debris and loose particles. Perform additional preparation procedures as required by manufacturer's instructions.

- .2 Preparation: Take all necessary steps to prevent damage to material during installation as required in manufacturer's installation instructions.

3.3 INSTALLATION

- .1 Install the work of this section in strict accordance with the manufacturer's recommendations using approved adhesive.
- .2 Temperature at the time of installation must be between 65–75°F (18–24°C) and be maintained for at least 48 hours after the installation to allow for proper adhesive setup.
- .3 Relative humidity shall not exceed 80%.
- .4 Do not expose wall covering to direct sunlight during or after installation. This will cause the surface temperature to rise, which in turn will cause bubbles and delamination.

3.4 CLEANING

- .1 General: Immediately upon completion of installation, clean material in accordance with manufacturer's recommended cleaning method.
- .2 Remove surplus materials, rubbish and debris resulting from installation as work progresses and upon completion of work.

3.4 PROTECTION

- .1 Protect installed materials to prevent damage to other trades. Use materials that may be easily removed without leaving residue or permanent stains.

END OF SECTION 10 26 23

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Washroom accessories as scheduled in this Section and as indicated on the Drawings.

1.2 RELATED REQUIREMENTS

- .1 Section 01 General Requirements
- .2 Section 09 21 16 Gypsum Board Assemblies
- .3 Section 09 90 00 Painting and Coating

1.3 SUBMITTALS

- .1 Product Data: Submit manufacturer's data sheets for each product specified, including the following:
 - .1 Installation instructions and recommendations.
 - .2 Storage and handling requirements and recommendations.
 - .3 Cleaning and maintenance instructions.
 - .4 Replacement parts information.
- .2 Schedule: Submit a toilet accessory schedule, indicating the type and quantity to be installed in each washroom. Use room numbers as indicated on the Drawings.

1.4 QUALITY ASSURANCE

- .1 Manufacturer: Provide products manufactured by a company with a minimum of 10 years successful experience manufacturing similar products.
- .2 Single Source Requirements: To the greatest extent possible provide products from a single manufacturer.
- .3 Accessibility Requirements: Comply with requirements applicable in the jurisdiction of the project, including but not limited to ADA and ICC/ANSI A117.1 requirement as applicable.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations. Protect from damage.

1.6 WARRANTY

- .1 Manufacturer's Warranty for Washroom Accessories: Manufacturer's standard 1 year warranty for materials and workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- .1 Basis of Design Products: Based on the quality and performance requirements of the project, specifications are based solely on the products of Bobrick Washroom Equipment, Inc. www.bobrick.com. Location of manufacturing shall be the United States.
- .2 Substitutions: The Architect will consider products of comparable manufacturers as a substitution, pending the contractor's submission of adequate documentation of the substitution in accordance with procedures in Division 1 of the Project Manual. Documentation shall include a list of five similar projects of equivalent size where products have been installed for a minimum of two years, and manufacturer's certification that products are fabricated in the United States.

2.2 TOILET ACCESSORY SCHEDULE

- .1 Toilet Tissue Dispenser:
 - .1 B-2888 (surface-mounted multi-roll)
 - .2 B-9543 (toilet roll holder single roll)
- .2 Soap Dispenser:
 - .1 B-2012 (automatic wall-mounted)
 - .2 B-26607 (wall-mounted)
- .3 Paper Towel Dispenser:
 - .1 B-72974 (automatic)
 - .2 B-72860 (touch-free)
 - .3 B-43944 (combination paper towel dispenser and waste receptacle; recessed)
- .4 Waste Receptacle:
 - .1 B-43644 (recessed)
- .5 Sanitary Napkin Disposal:
 - .1 B-254
- .6 Coat Hook:
 - .1 B-682
- .7 Baby Changing Station:
 - .1 KB300-SS (horizontal)
- .8 Grab Bar:
 - .1 B-6898.99 (90° in accordance w. BCBC 2018)
 - .2 B-5806 (straight in accordance w. BCBC 2018)
- .9 Shelf:
 - .1 B-298 (in accordance w. BCBC 2018)
- .10 Mirror:
 - .1 Frameless w. polished edges and concealed clips; size as shown on elevations

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Examine areas and conditions in which the washroom accessories will be installed.
 - .1 Complete all finishing operations, including painting, before beginning installation of washroom accessories.
- .2 Wall surface shall be dry and free from dirt, grease and loose paint.

3.2 PREPARATION

- .1 Prior to installation, clean substrate to remove dust, debris and loose particles.

3.3 INSTALLATION

- .1 Install products in strict compliance with manufacturer's written instructions and recommendations, including the following:
 - .1 Verify backing has been installed properly.
 - .2 Verify location does not interfere with door swings or use of fixtures.

- .3 Comply with manufacturer's recommendations for backing and proper support.
- .4 Use fasteners and anchors suitable for substrate and project conditions.
- .5 Install units rigid, straight, plumb, and level, in accordance with manufacturer's installation instructions and approved shop drawings.
- .6 Conceal evidence of drilling, cutting, and fitting to room finish.
- .7 Test for proper operation.

3.4 CLEANING AND PROTECTION

- .1 Clean exposed surfaces of compartments, hardware, and fittings using methods acceptable to the manufacturer.
- .2 Touch-up, repair or replace damaged products until Substantial Completion.

END OF SECTION 10 28 00

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Washroom accessories as scheduled in this Section and as indicated on the Drawings.

1.2 RELATED REQUIREMENTS

- .1 Section 01 General Requirements
- .2 Section 09 21 16 Gypsum Board Assemblies
- .3 Section 09 90 00 Painting and Coating

1.3 SUBMITTALS

- .1 Product Data: Submit manufacturer's data sheets for each product specified, including the following:
 - .1 Installation instructions and recommendations.
 - .2 Storage and handling requirements and recommendations.
 - .3 Cleaning and maintenance instructions.
 - .4 Replacement parts information.
- .2 Schedule: Submit a toilet accessory schedule, indicating the type and quantity to be installed in each washroom. Use room numbers as indicated on the Drawings.

1.4 QUALITY ASSURANCE

- .1 Manufacturer: Provide products manufactured by a company with a minimum of 10 years successful experience manufacturing similar products.
- .2 Single Source Requirements: To the greatest extent possible provide products from a single manufacturer.
- .3 Accessibility Requirements: Comply with requirements applicable in the jurisdiction of the project, including but not limited to ADA and ICC/ANSI A117.1 requirement as applicable.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations. Protect from damage.

1.6 WARRANTY

- .1 Manufacturer's Warranty for Washroom Accessories: Manufacturer's standard 1 year warranty for materials and workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- .1 Basis of Design Products: Based on the quality and performance requirements of the project, specifications are based solely on the products of Bobrick Washroom Equipment, Inc. www.bobrick.com. Location of manufacturing shall be the United States.
- .2 Substitutions: The Architect will consider products of comparable manufacturers as a substitution, pending the contractor's submission of adequate documentation of the substitution in accordance with procedures in Division 1 of the Project Manual. Documentation shall include a list of five similar projects of equivalent size where products have been installed for a minimum of two years, and manufacturer's certification that products are fabricated in the United States.

2.2 TOILET ACCESSORY SCHEDULE

- .1 Toilet Tissue Dispenser:
 - .1 B-2888 (surface-mounted multi-roll)
- .2 Soap Dispenser:
 - .1 B-2012 (automatic wall-mounted)
- .3 Paper Towel Dispenser:
 - .1 B-72974 (automatic)
- .4 Waste Receptacle:
 - .1 B-43644 (recessed)
- .5 Sanitary Napkin Disposal:
 - .1 B-270
- .6 Coat Hook:
 - .1 B-682
- .7 Grab Bar:
 - .1 B-6898.99 (90° in accordance w. BCBC 2018)
 - .2 B-5806 (straight in accordance w. BCBC 2018)
- .8 Shelf:
 - .1 B-298x18 (in accordance w. BCBC 2018)
- .9 Mirror:
 - .1 Frameless w. polished edges and concealed clips; size as shown on elevations

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Examine areas and conditions in which the washroom accessories will be installed.
 - .1 Complete all finishing operations, including painting, before beginning installation of washroom accessories.
- .2 Wall surface shall be dry and free from dirt, grease and loose paint.

3.2 PREPARATION

- .1 Prior to installation, clean substrate to remove dust, debris and loose particles.

3.3 INSTALLATION

- .1 Install products in strict compliance with manufacturer's written instructions and recommendations, including the following:
 - .1 Verify backing has been installed properly.
 - .2 Verify location does not interfere with door swings or use of fixtures.
 - .3 Comply with manufacturer's recommendations for backing and proper support.
 - .4 Use fasteners and anchors suitable for substrate and project conditions.
 - .5 Install units rigid, straight, plumb, and level, in accordance with manufacturer's installation instructions and approved shop drawings.

- .6 Conceal evidence of drilling, cutting, and fitting to room finish.
- .7 Test for proper operation.

3.4 CLEANING AND PROTECTION

- .1 Clean exposed surfaces of compartments, hardware, and fittings using methods acceptable to the manufacturer.
- .2 Touch-up, repair or replace damaged products until Substantial Completion.

END OF SECTION 10 28 00

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Furnishing of all labor, materials, services and equipment necessary for the supply and installation of metal lockers as indicated on the drawings and as specified herein.
 - .1 Gear Storage Lockers
 - .2 Metal Lockers

1.2 SUBMITTALS

- .1 Product Data: Manufacturer's data sheets for specified products.
- .2 Shop Drawings: Provide shop drawings for coordination of layout and installation.

PART 2 PRODUCTS

2.1 MANUFACTURER

- .1 Gear Storage Lockers:
 - .1 Basis of Design: Gear Grid: Wall Mounted and Mobile Gear Storage in layout as shown on drawings.
 - .1 Size: Jumbo 610mm W x 508mm D x 1892mm H (24" W x 20" D x 74.5")
(wall mounted + floor mounted)
 - .2 Size: Jumbo – 4 pack 1295mm W x 990mm D x 2108mm H (51" W x 39" D x 83" H)
(mobile units)
 - .3 Accessories:
 - .a Name Plate
 - .b 1 heavy hanger
 - .c Gear Hanger
 - .d Secure Box
 - .e Top Side Storage
 - .f 3 Apparel Hooks
 - .4 Bolt down supports for mobile units. Ensure legs can extend 100mm above finished floor for mobile units.
 - .2 Metal Lockers:
 - .1 Basis of Design: Uline (single tier and double tier)
 - .1 Single Tier
 - .a Model No. H-5529 (3 wide)
 - .b Size: 45" W x 18" D x 72" H
 - .c Colour: Gray
 - .2 Double Tier
 - .a Model No. H-5533 (3 wide)
 - .b Size: 45" W x 18" D x 72" H
 - .c Colour: Gray
 - .3 Include front and end base plates and sloping tops.

PART 3 EXECUTION

3.1 CONDITIONS

- .1 Examine all conditions on which the successful work of this section depends.
- .2 Report to the Consultant (Architect) in writing defects of work prepared by other trades and unsatisfactory site conditions. Starting of the work shall imply acceptance of surfaces.

3.2 INSTALLATION

- .1 Install as specified by manufacturer.
- .2 Finished work shall be plumb and level, and free from distortion and defects, detrimental to appearance or performance.

3.3 PROTECTION AND CLEAN UP

- .1 Protect during installation any adjacent surfaces from damage due to the work of this section.
- .2 Protect items installed under this section from damage resulting from the work of other sections.
- .3 Promptly as the work proceeds and on completion, remove all crating, surplus materials, and equipment.

END OF SECTION 10 51 00

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Furnishing of all labor, materials, services and equipment necessary for the supply and installation of cone-tapered aluminum flagpole as indicated on the drawings and as specified herein.

1.2 RELATED REQUIREMENTS

- .1 Section 01 00 00 General Requirements
- .2 Section 03 30 00 Cast-in-Place Concrete

1.3 SUBMITTALS

- .1 Product Data: Manufacturer's data sheets for specified products.
- .2 Shop Drawings: Provide shop drawings for coordination w. structural for base requirements.

PART 2 PRODUCTS

2.1 MANUFACTURER

- .1 Basis of Design Manufacturer: Ewing Flagpole 1445 Hopkins Street, Whitby, Ontario L1N 2C2
www.ewinggroup.ca
 - .1 Description: Cone-tapered aluminum Flagpole (Commercial Line)
 - .2 Base:
 - .3 Halyard: Econoline Internal System
 - .4 Height: 9.1m / 30'
 - .5 Finish: satin brushed (sateen)

PART 3 EXECUTION

3.1 CONDITIONS

- .1 Examine all conditions on which the successful work of this section depends.
- .2 Report to the Consultant (Architect) in writing defects of work prepared by other trades and unsatisfactory site conditions. Starting of the work shall imply acceptance of surfaces.

3.2 INSTALLATION

- .1 Install as specified by manufacturer.
- .2 Finished work shall be plumb and level, and free from distortion and defects, detrimental to appearance or performance.

3.3 PROTECTION AND CLEAN UP

- .1 Protect during installation any adjacent surfaces from damage due to the work of this section.
- .2 Protect items installed under this section from damage resulting from the work of other sections.
- .3 Promptly as the work proceeds and on completion, remove all crating, surplus materials, and equipment.

END OF SECTION 10 75 00

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Provide labour, materials, tools and equipment necessary to complete the Work of this Section including, but not limited to:
 - .1 Roller shades for manual operation and accessories.
 - .2 Shade fabric.

1.2 RELATED REQUIREMENTS

- .1 Division 01 General Requirements
- .2 Section 09 21 16 Gypsum Board Assemblies
- .3 Section 09 51 23 Acoustic Tile Ceiling

1.3 REFERENCES

- .1 American Society for Testing and Materials, (ASTM)
 - .1 ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- .2 National Fire Protection Association (NFPA):
 - .1 NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
 - .2 NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.
- .3 Underwriters Laboratories of Canada (ULC):
 - .1 ULC(GGG) - GREENGUARD Gold Certified Products; Current Edition.
- .4 Window Covering Manufacturers Association (WCMA):
 - .1 WCMA A100.1 - Safety of Window Covering Products; 2018.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination:
 - .1 Coordinate the work with other trades to provide rough-in of electrical wiring as required for installation of hardwired motorized shades, as applicable.
- .2 Preinstallation Meeting: One week prior to commencing work related to this section. Require attendance of all affected installers.
- .3 Sequencing:
 - .1 Do not fabricate shades until field dimensions for each opening have been taken with finished conditions in place. "Hold to" dimensions are not acceptable.
 - .2 Do not install shades until final surface finishes and painting are complete.

1.5 SUBMITTALS

- .1 Product Data: Manufacturer's catalog pages and data sheets for products specified including materials, finishes, dimensions, profiles, mountings, and accessories.
 - .1 Preparation instructions and recommendations.
 - .2 Styles, material descriptions, dimensions of individual components, profiles, features, finishes, accessories, and operating instructions.

- .3 Storage and handling requirements and recommendations.
 - .4 Mounting details and installation methods.
 - .5 Manufacturer's Instructions: Include storage, handling, protection, examination, preparation, and installation.
 - .6 Project Record Documents: Record actual locations of control system components and show interconnecting wiring.
 - .7 Operation and Maintenance Data: Component list with part numbers, and operation and maintenance instructions.
- .2 Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings and include opening sizes and key to typical mounting details.
 - .3 Verification Samples: For each finish product specified, one complete set of shade components, unassembled, demonstrating compliance with specified requirements.
 - .1 Shadecloth Sample: Mark face of material to indicate interior faces.
 - .a Test reports indicating compliance with specified fabric properties.
 - .b Verification Samples: 6 inches (150 mm) square, representing actual materials, color and pattern.
 - .4 Maintenance Data: Bill of materials for all components with part numbers. Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.
 - .5 Warranty: Provide manufacturer's warranty documents as specified in this Section.

1.6 QUALITY ASSURANCE

- .1 Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
- .2 Manufacturer Qualifications: Obtain roller shades system through one source from a single manufacturer with a minimum of ten years experience and minimum of five projects of similar scope and size in manufacturing products comparable to those specified in this section.
- .3 Installer for Roller Shade System - Qualifications: Installer trained and certified by the manufacturer with a minimum of ten years experience in installing products comparable to those specified in this section.
- .4 Product Listing Organization Qualifications: Organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
- .5 Fire-Test-Response Characteristics: Passes NFPA 701 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.
- .6 Shadecloth Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC9644, ATCC9645.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in Window Treatment Schedule.
- .2 Store and handle products per manufacturer's recommendations.

1.8 PROJECT CONDITIONS

- .1 Environmental Limitations: Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.9 WARRANTY

- .1 Roller Shade Hardware and Chain Warranty: Manufacturer's standard non-depreciating warranty for interior shading.
 - .1 Shade Hardware: 10 years unless otherwise indicated.
 - .a Mecho/5 and Mecho/5X with ThermoVeil, EuroVeil, EuroTwill, Soho, Equinox, Midnite, Chelsea, or Classic Blackout shade fabric: 25 years.
 - .b Mecho/7 including bead chain with ThermoVeil, EuroVeil, EuroTwill, Soho, Equinox, Midnite, Chelsea, or Classic Blackout shade fabric: 25 years.
 - .2 Standard Shadecloth: Manufacturer's standard twenty-five year warranty.
 - .3 Roller Shade Installation: One year from date of Substantial Completion, not including scaffolding, lifts or other means to reach inaccessible areas, which are deemed owner's responsibility.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- .1 Acceptable Manufacturer: Mecho, which is available through Fraser Shading Systems Inc. 5219 192nd Street, Unit 101, Surrey, British Columbia V3S 4P6
Email: kerry@frasershading.com Web: www.frasershading.com Tel: 604-881-4881

2.2 ROLLER SHADES, MANUAL OPERATION AND ACCESSORIES

- .1 Basis of Design: UrbanShade, manual operation. As manufactured by Mecho. Fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and accessories.
 - 1. Shade Type:
 - a. Single roller: typical
 - b. Double roller: dorm rooms
 - 2. Drop Position: Regular. Fabric falls off roller tube, close to glass.
 - 3. Mounting: Window jamb mounted.
 - 4. Size: To suit.
 - 5. Fabric: As indicated under Shade Fabric article.
 - 6. Brackets and Mounting Hardware: Stamped steel. As recommended by manufacturer for mounting indicated accommodating shade fabric roll-up size and weight.
 - a. Double Roller Brackets: Configured for light-filtering and room-darkening shades in one opening.
 - 1) Light-Filtering Fabric: Glass-side of opening.
 - 2) Room-Darkening Fabric: Room-side of opening.
 - 7. Roller Tubes: Extruded aluminum. Capable of being removed and reinstalled without affecting roller shade limit adjustments.
 - a. Size: As recommended by manufacturer; for installation conditions, span, and weight of shades.
 - b. Fabric Attachment: Extruded channel in tube accepts vinyl spline welded to fabric edge.
 - 1) Shade Band: Removable and replaceable without removing roller tube from brackets or inserting spline from the side of the roller tube.
 - 8. Hembars: Maintains bottom of shade straight and flat.
 - a. Style: Exposed aluminum bottom bar with matching finials.
 - b. Room-Darkening Shades: Slotted bottom bar with wool-pile light seal.
 - 9. Manual Operation:
 - a. Clutch Operator: Manufacturer's standard material and design integrated with bracket/brake assembly.
 - 1) Brake Assembly: Mounted on a low-friction plastic hub with wrapped spring clutch.
 - a) Brake must withstand minimum pull force of 25 lbs (12 kg) in stopped position.
 - 2) Clutch/Brake Mounting: On support brackets, independent of roller tube components.
 - b. Drive Chain: Continuous loop beaded ball chain. Upper and lower limit stops.

- 1) Breaking Force: 45 lbf (200 N) minimum.
 - 2) Chain Retainer per WCMA A100.1: Tensioning device.
 - c. Lift Assist Mechanism: Contained in idler end of roller tube. When hanging weights exceed roller tube weight limits. Manufacturer's standard.
- 10. Accessories:
 - a. Fascia: Removable extruded aluminum. Size as required to conceal shade mounting. Attachable to brackets without exposed fasteners.
 - 1) Finish: to match window frames.
 - b. Ceiling Pockets: Manual Premanufactured metal shade pocket with removable closure panel, for recess mounting in acoustical tile or drywall ceilings; size and configuration as indicated on drawings.
 - c. Room-Darkening Channels, Standard: Extruded aluminum side and center channels with brush pile edge seals, SnapLoc mounting base, and concealed fasteners. Channels to accept one-piece exposed blackout hembar to assure side light control and sill light control.

2.3 ROLLER SHADE FABRICATION

- .1 Field measure finished openings prior to ordering or fabrication.
- .2 Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
 - .1 Vertical Dimensions: Fill Opening from Head to Sill: 1/2 inch (13 mm) space between bottom bar and window stool.
 - .2 Horizontal Dimensions: Inside Mounting.
 - .1 Symmetrical Light Gaps on Both Sides of Shade 5mm total.
- .3 Openings Requiring Continuous Multiple Shade Units with Separate Rollers: Locate roller joints at window mullion centers; butt rollers end-to-end.

2.3 SHADE FABRIC

- .1 Solar Shadecloths:
 - .1 Fabric: Soho: 1600 series. 3 percent open. 2 x 2 basket-weave pattern of fine yarn PVC and polyester blend, same colors as in 1100 (1 percent open) and 1900 series, (5 percent open).
- .2 Blackout Shadecloths:
 - .1 Fabric: Midnite Blackout: 0200 series. Opaque. Acrylic backing, PVC-free, white color reverse side (for exterior). Available 98 inch (24789 mm).
 - .2 Provide blackout shadecloths in the following locations:
 - .1 Training / Meeting 110
 - .2 Dorms 1 – 4 (206A, 206B, 206C and 206D)
- .3 Performance Requirements:
 - .1 Flammability per NFPA 701: Pass. Large or small scale test.
 - .2 Fungal Resistance: No growth when tested per ASTM G21.
- .4 Colour: As selected by Architect from manufacturer's full range of colours.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Do not begin installation until substrates have been properly prepared.
- .2 If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- .3 Start of installation shall be considered acceptance of substrates.

3.2 PREPARATION

- .1 Clean surfaces thoroughly prior to installation.
- .2 Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.
- .3 Coordinate with window installation and placement of concealed blocking to support shades.

3.3 INSTALLATION

- .1 Install shades level, plumb, square, and true per manufacturer's instructions and approved shop drawings. Locate so shade band is at least 2 inches (51 mm) from interior face of glass. Allow proper clearances for window operation hardware. Use mounting devices as indicated.
- .2 Replace shades exceeding specified tolerances at no extra cost to Owner.
- .3 Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric.
- .4 Clean roller shade surfaces after installation, per manufacturer's written instructions.
- .5 Demonstrate operation and maintenance of window shade system to Owner's personnel.
- .6 Manufacturer's authorized personnel are to train Owner's personnel on operation and maintenance of system.
 - .1 Use operation and maintenance manual as a reference, supplemented with additional training materials as required.

3.4 ADJUSTING AND CLEANING

- .1 Protect installed products until completion of project.
- .2 Touch-up, repair or replace damaged products before Substantial Completion.
 - .1 Clean soiled shades and exposed components as recommended by manufacturer.
 - .2 Replace shades that cannot be cleaned to "like new" condition.

END OF SECTION 12 24 13

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Furnishing of all labor, materials, services and equipment necessary for surface preparation and supply and installation of the following:
 - .1 Interlocking Precast Concrete Unit Paving
 - .2 Precast Concrete Unit Paving Slabs

1.2 SUBMITTALS

- .1 Product Data: Provide manufacturer's standard product data + installation details for specified products.
- .2 Shop Drawings: Prepared specifically for this project; show layout + critical dimensions and details.

PART 2 PRODUCTS

2.1 INTERLOCKING PRECAST CONCRETE UNIT PAVING

- .1 Basis of Design - Abbotsford Concrete Products: Old Country Stone Series Concrete Paver
 - .1 Colour: Shadow Blend
 - .2 Size: Include Type 1, Type 2 and Type 3 as req'd to suit specified pattern.
 - .1 Type 1:
 - .1 Length = 226mm (8 7/8")
 - .2 Width = 181mm (7 1/8")
 - .3 Area: 25 stones / m² (2.3 stones / ft²)
 - .4 Thickness: 60mm (2 3/8")
 - .2 Type 2:
 - .1 Length = 151mm (5 15/16")
 - .2 Width = 181mm (7 1/8")
 - .3 Area: 37 stones / m² (3.4 stones / ft²)
 - .4 Thickness: 60mm (2 3/8")
 - .3 Type 3:
 - .1 Length = 76mm (3")
 - .2 Width = 181mm (7 1/8")
 - .3 Area: 74 stones / m² (6.8 stones / ft²)
 - .4 Thickness: 60mm (2 3/8")

2.2 PRECAST CONCRETE UNIT PAVING SLABS

- .1 Basis of Design - Abbotsford Concrete Products: Aristokrat Series Porcelain Slabs
 - .1 Colour: Dover Grey
 - .2 Size: 598mm x 598mm x 20mm (23.5" x 23.5" x .75")

2.3 INSTALLATION SYSTEM

- .1 Installation System to suit substrate:
 - .1 Adjustable BlackJack Pedestal System
 - .2 Expanded Polypropylene Panels (EPP)
 - .3 Aggregate Set

PART 3 EXECUTION

3.1 CONDITIONS

- .1 Examine all conditions on which the successful work of this section depends.
- .2 Report to the Consultant (Architect) in writing defects of work prepared by other trades and unsatisfactory site conditions. Starting of the work shall imply acceptance of surfaces.

3.2 INSTALLATION

- .1 Install as specified by manufacturer.
- .2 Trim pavers as required to fit specified area.
- .3 Finished work shall be level, and free from distortion and defects, detrimental to appearance or performance.

3.3 PROTECTION AND CLEAN UP

- .1 Protect during installation any adjacent surfaces from damage due to the work of this section.
- .2 Protect items installed under this section from damage resulting from the work of other sections.
- .3 Promptly as the work proceeds and on completion, remove all crating, surplus materials, and equipment.

END OF SECTION 32 14 13

APPENDIX 1

GEOTECHNICAL

June 21, 2021
File: SGL21-014

Regional District of Nanaimo
6300 Hammond Bay Road
Nanaimo, BC V9T 6N2

Attention: Kyle Maynes, EIT

Re: Report of Geotechnical Assessment for Proposed Dashwood Firehall Replacement, 230 Hobbs Road, Qualicum Beach, BC

INTRODUCTION

As requested, Simpson Geotechnical Ltd. (SGL) has conducted a geotechnical assessment for the captioned project in general accordance with our proposal P530 of April 21, 2021. The subject property is approximately 2 acres (8000m²) in area located at 49.36685° N, 124.51970° W at the southwestern quadrant of the intersection of Island Highway West and Hobbs Road, as illustrated on Drawing G-1.

PROPOSED DEVELOPMENT

We understand that the proposed development is a two storey firehall structure that would replace the existing firehall on the site, as illustrated on Drawing G-2. That building is anticipated to have a grade supported main floor at an elevation near the existing ground surface of the site with a framed partial second level.

We anticipate that the proposed building would be designed and constructed in accordance with the seismic provisions of the 2018 BC Building Code and good construction practice.

BACKGROUND

Geological Survey of Canada Map 1111A of the site vicinity shows the site to be underlain by marine and glacio-marine sand and/or sandy gravel generally underlain by clay in thickness of several inches to 30 feet. That map also shows the geologic model of the site vicinity suggests that marine and glacio-marine sand is underlain by Vashon Drift ground moraine glacial till, Quadra sediments, in turn underlain by layers of silt, gravel, sand, peat, clay, and laminated clay of varying composition to depths of at least 60m.

Water well logs for water wells in the vicinity were obtained from the Provincial water well database. Those well logs indicated widely varying subsurface conditions of gravel, boulders, till, clay and "soupy blue clay" to depth of up to 90m. The depth to static water level in those wells ranged from approximately 4.3m to 42m. Those water well logs are suggestive of complex and locally varying subsurface conditions.

Topographic contours of the ground surface in the vicinity of the subject property were obtained from the Regional District of Nanaimo (RDN) RDNMap, and are shown on Drawing G-1. Those contours show the ground surface of the subject property to be at an elevation of approximately 64m geodetic. Notable in those topographic contours is a large gully that strongly suggests relatively large-scale slope instability along the shoreline northwards of the subject property, also shown on Drawing G-1. That slope instability appears to have locally regressed the slope upland by in the order of 200m, with the subject property located within approximately 50m of the current crest of the gully. The topographic contours also suggest other areas of past local regression of the shoreline slope in the vicinity.

SEISMIC DATA

Seismic data for the site was obtained from Natural Resources Canada for the 2% in 50-year probability of exceedance in 50-year event as tabled below. The seismic hazard calculation is appended.

2015 National Building Code Ground Motions at 49.36685° N, 124.51970° W 2% probability of exceedance in 50 years (0.000404 per annum)				
Sa(0.2)	Sa(0.5)	Sa(1.0)	Sa(2.0)	PGA (g)
0.870	0.825	0.518	0.325	0.390

SITE ASSESSMENT

General

We conducted our site assessment on June 14, 2021. That assessment comprised observation of the subject property and immediate vicinity, and four solid-stem auger drilled boreholes spaced around the proposed building footprint as shown on Drawing G-2.

The subject property was essentially level and developed with an existing single storey concrete block firehall building. Surrounding the firehall building on the property was a combination of grass lawn, gravel parking and driveways, concrete pavement at the vehicle bays, and local areas of brush and trees.

Subsurface Conditions

A track-mounted 11,000kg auger drill rig contracted from Drillwell Enterprises advanced four boreholes around the subject property at the approximate locations shown on Drawing G-1. The boreholes were advanced by solid stem auger method to a maximum depth of 6m, with soil samples and relative compactness collected at intervals by standard penetration tests (SPT), with additional soil samples collected from the auger flights. All four boreholes were ended due to auger refusal in very dense glacial till soil.

Those boreholes encountered relatively consistent subsurface conditions that comprised a relatively thin layer of either topsoil or pavement gravel atop loose sand with variable silt and organic content, in turn overlying sand and silt with variable gravel and cobble content that we interpret as ground moraine glacial till. The glacial till was typically weathered and compact at the surface and quickly graded to dense with depth. No groundwater seepage was encountered in any of the boreholes.

Standard Penetration Tests (SPT) in the glacial till material ranged from 25 to 100. Unconfined compressive strength of the glacial till material obtained from split spoon samples was measured by pocket penetrometer at as low as 50 kPa at the surface of the layer, and typically greater than 450 kPa with 1m of the layer surface, indicating stiff to hard consistency. The SPT and unconfined compressive strength test results are shown on the borehole logs.

The subsurface conditions encountered at the boreholes is summarized below and detailed logs of the boreholes are appended.

BOREHOLE SUMMARY

Borehole No.	Depth To Glacial Till Surface (m)	Total Depth Of Borehole (m)	Depth To Seepage (m)
BH-1	1.0	5.4	Not encountered
BH-2	0.2	5.7	Not encountered
BH-3	0.2	6.0	Not encountered
BH-4	0.8	4.2	Not encountered

LABORATORY TESTING

Soil samples considered representative of the encountered subsurface conditions were tested for moisture content and gradation. The tests indicated moisture content in the glacial till samples that ranged from 5.2 to 22.3% of dry weight. A sample of overlying material had a moisture content of 31.7%. The moisture contents are shown on the borehole logs.

Grain size analysis was conducted on two samples of the glacial till material obtained from auger samples at BH-1 and BH-3 at 2.0 and 5.7m depth respectively. Those test results indicated the glacial till material to comprise sand and silt/clay with some gravel to gravelly. The grain size analysis charts are attached.

DISCUSSION AND RECOMMENDATIONS

General

The recommendations presented in the following sections of this report are based on the information available regarding the proposed development, the boreholes, and our experience with similar projects. Because the boreholes represent a small statistical sampling of subsurface conditions, it is possible that conditions may be encountered during construction that are different from those indicated by the boreholes. In these instances, adjustments to design and construction may become necessary.

The materials encountered in the boreholes are not expected to be susceptible to seismic liquefaction due to their compactness, plastic consistency and high fines content. Consequently, no further assessment of seismic liquefaction is considered to be warranted.

A potential landslide hazard has been identified northwards and offsite of the subject property. That hazard should be assessed by a terrain stability or geohazard specialist and the potential risk that it presents to the proposed firehall and firehall operations

considered and accepted by the RDN prior to construction of a new firehall on the subject property.

Site Preparation

The building area should be stripped and grubbed to expose an approved subgrade of undisturbed, dense or hard, inorganic glacial till material. The anticipated minimum stripping depth to suitable subgrade at the boreholes ranged from approximately 0.6 to 1.5m, as shown in the table below. Deeper stripping may be required to remove tree roots, random fill in currently unidentified infilled excavations, or other disturbed materials.

The stripped materials are considered unsuitable for re-use as engineered fill below building foundations, floor slabs-on-grade, concrete or asphalt pavements due to the fine-grained and agglomerated nature of those materials, and organic content.

Minimum Stripping Depths at Boreholes

Borehole No.	Minimum Stripping Depth (m)	Anticipated Subgrade Material
BH-1	1.4	Glacial till
BH-2	0.8	Glacial till
BH-3	0.6	Glacial till
BH-4	1.5	Glacial till

Excavations

Temporary construction slopes should be in accordance with the Occupational Health and Safety Regulation. The contractor is solely responsible for protecting excavations by shoring, sloping, benching or other means as required to maintain stability of the excavation. SGL does not assume any responsibility for construction site safety or the activities of the contractor.

Although not encountered in the boreholes, excavations may encounter groundwater seepage, especially during wet seasonally wet weather. Contractors should be prepared to dewater excavations as required. Groundwater seepage from excavation sides and dewatering from within excavations will reduce excavation stability. Shallow excavation side-slopes and/or trench cages may be required for worker safety, dependent on the excavation depth and seepage conditions at the time of excavation.

Large boulders may be encountered in glacial till deposits that may require hydraulic splitting or blasting for removal.

Foundations

A spread and/or strip foundation system bearing on approved, undisturbed, inorganic, dense or hard glacial till material is considered the most practical foundation system for the proposed building. Approved footing subgrade may be raised or leveled with engineered fill prepared in accordance with the recommendations provided below, if desired.

Localized soft areas may be encountered in the subgrade. All identified soft areas should be excavated under the review of SGL and the desired subgrade elevation restored with engineered fill.

For Limit States Design the foundations may be designed based on an Ultimate (unfactored) Limit State (ULS) bearing resistance of 300kPa. Geotechnical resistance factors (Φ) of 0.5 for bearing and 0.8 for sliding are recommended. A Serviceability Limit State (SLS) bearing resistance of 150kPa may be used, based on limiting total settlement to less than 25mm and differential settlement to less than 15mm between typical 4.5m column spacing, which is normally tolerable for framed structures.

The site may be considered Site Class D as described in Section 4.1.8.4 (8) of the 2018 BC Building Code.

All footings should be located so that the smallest lateral clear distance between footings will be at least equal to the difference in their bearing elevations. All footings should be provided with a minimum 600mm of soil cover for confinement and frost protection.

All foundation bearing surfaces should be reviewed by SGL prior to the placement of engineered fill, footing formwork or concrete. Following approval of subgrade surfaces concrete should be placed as quickly as possible to avoid disturbance of the foundation subgrade. Engineered fill and footing concrete should not be placed atop frozen soil, and all prepared subgrades should be re-evaluated by SGL in the event that freezing occurs following the subgrade approval.

The anticipated subgrade materials will be fine-grained and easily disturbed by construction traffic (including foot traffic) when wet. If soils in the areas of foundation support become disturbed from construction traffic (including foot traffic), or softened by exposure and water, the softened and disturbed material should be removed from footing areas and the subgrade re-evaluated by SGL prior to concrete placement.

Floor Slabs on Grade

The undisturbed, inorganic, glacial till material is considered suitable for support of grade supported floor slabs. Floor slab on grade subgrade may be raised and leveled with engineered fill prepared in accordance with the recommendations below.

Floor slabs on grade should be immediately underlain by a minimum 100mm thickness of floor slab base aggregate in accordance with the recommendations below.

Drainage

All footings should be provided with a foundation drainage system using rigid plastic pipe installed in accordance with the 2018 BC Building Code. We currently envision the foundation drainage system and roof leaders would drain by gravity to the roadside ditch at either Hobbs Road or Island Highway West.

Final site grading should direct surface runoff away from the building.

Engineered Fill

Engineered fill may be used to raise and level approved subgrade for support of building foundations and floor slabs. The intent of these recommendations is to minimize the potential for settlement of the engineered fill and the resulting distress to the structural elements supported by the fill. Engineered fill should be approved, inorganic, free draining sand and gravel as tabled below. The site materials encountered in the boreholes are not considered suitable for reuse as engineered fill.

Engineered fill material should be placed and uniformly compacted in lift thicknesses appropriate for the compaction equipment and in no instance greater than 200mm loose lift thickness. Engineered fill below grade should extend laterally beyond the edges of the supported elements a distance equal to the fill thickness, plus one metre. Above grade engineered fill slopes should be no steeper than 2 horizontal : 1 vertical.

Engineered fill should be compacted in accordance with the criteria tabled below. Fill compaction in building support areas should be verified by field density testing.

Engineered Fill Recommendations

Area of Engineered Fill	Material Specification	Minimum Compaction Specification (ASTM D698 Standard Proctor)
Foundation Subgrade	Nominal 75mm minus well graded sand and gravel with less than 5% passing 0.075mm sieve	100%
Floor Slab on Grade Subgrade	Nominal 75mm minus well graded sand and gravel with less than 5% passing 0.075mm sieve	95%
Floor Slab Base Aggregate	Nominal 19mm minus well graded sand and gravel with less than 5% passing the 0.075mm sieve	95%

ADDITIONAL GEOTECHNICAL SERVICES

The recommendations presented in this report are contingent on SGL observing and/or monitoring:

- Construction documents for conformance to the geotechnical recommendations provided herein;
- Building area subgrade preparation for footings and floor slabs on grade;
- Suitability of engineered fill materials;
- Placement and compaction of engineered fill.

In addition to the above, the potential for slope instability from the existing gully to the north of the subject property should be assessed by a terrain stability or geohazard specialist and the associated risks to the proposed building and firehall operations considered and accepted by the RDN prior to construction of the proposed firehall on the subject property.

LIMITATIONS AND CHANGED CONDITIONS

Our recommendations are based on the proposed firehall development described in this report, and the expectation that future development will not result in significant changes to the site geometry, soil and groundwater conditions.

The conclusions and recommendations in this report are based upon the data obtained from local test holes. The nature and extent of variations between test holes may not become evident until construction. Although not expected, should undiscovered changed conditions become apparent our office should be contacted to allow reassessment of our recommendations in light of the new information.

Our recommendations only apply to the specific structure described in this report. Other structures or locations may have unique requirements and our recommendations should not be considered applicable to other locations and developments, even if located within the same property. A landslide hazard from off-site was identified in this assessment that should be addressed prior to the firehall construction.

It is a condition of this report that Simpson Geotechnical Ltd.'s performance of its professional services is subject to the attached Statement of Limitations and Conditions.

This report has been prepared in accordance with standard geotechnical engineering practice. No other warranty is provided, either expressed or implied.

This report is valid for a period of one-year after submittal or until major earthworks or drainage changes take place on or in the vicinity of the subject property, whichever comes first. Beyond that time Simpson Geotechnical Ltd. should be contacted to reaffirm or update this report as needed.

CLOSURE

We appreciate the opportunity to provide our services on this project. Please contact the undersigned if you have any questions.

Yours truly,

Simpson Geotechnical Ltd.

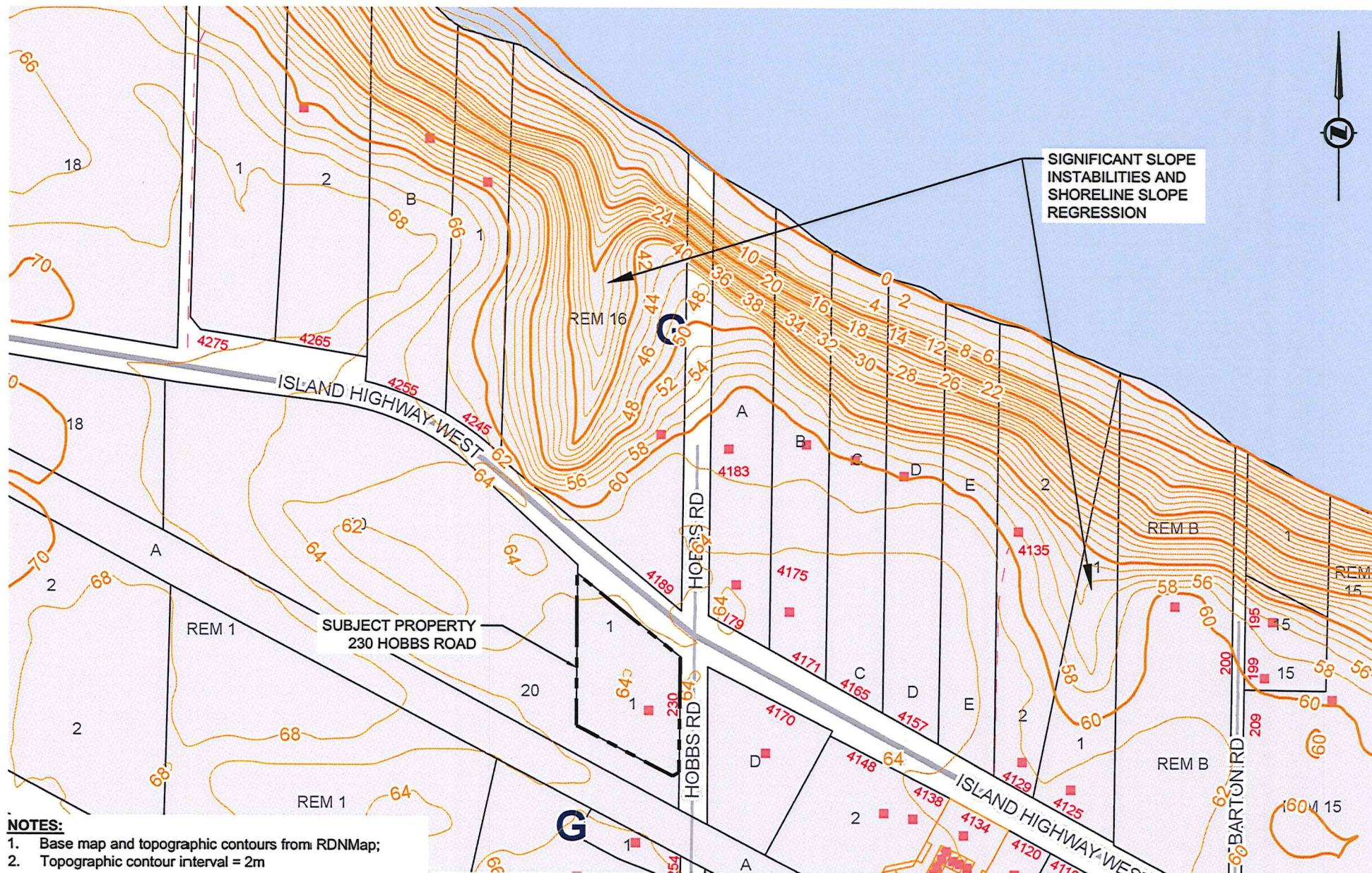
Per:

Richard Simpson, P.Eng.



Attachments:

Drawing G-1 Site Location Plan
Drawing G-2 Site Plan
Borehole Logs (4 Pages)
Grain Size Analysis (2 pages)
Seismic Hazard Calculation
Statement of Limitations and Conditions (1 page)



NOTES:

1. Base map and topographic contours from RDNMap;
2. Topographic contour interval = 2m

Project: DASHWOOD FIREHALL REPLACEMENT

Title: SITE LOCATION PLAN

Client: REGIONAL DISTRICT OF NANAIMO

File: SGL21-014

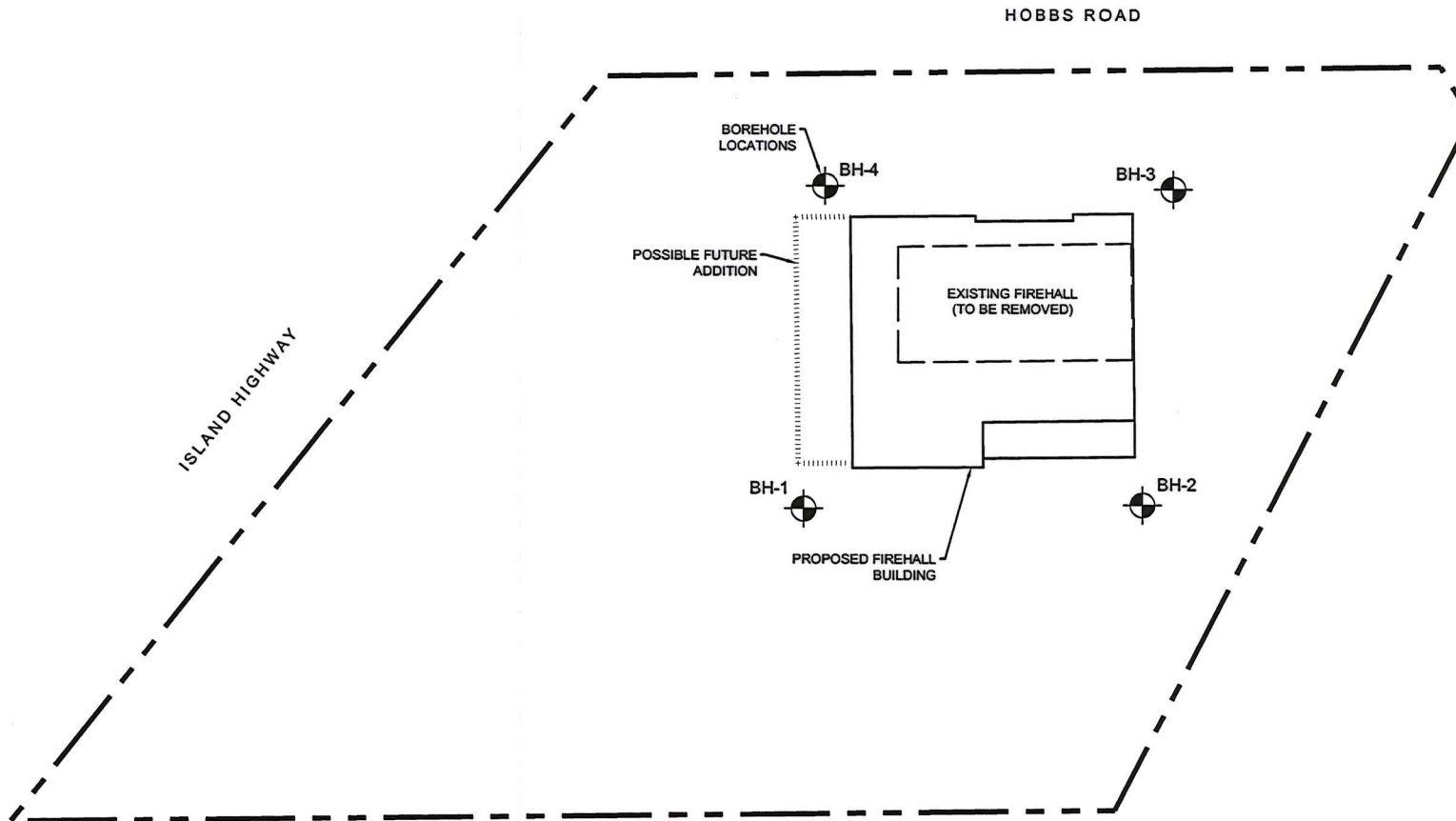
Drawn by: RRS

Scale: 1 : 4000

Date: JUNE 21, 2021


Dwg. No.: G-1

SIMPSON GEOTECHNICAL LTD



NOTES:

1. Based on site plan by Zeidler Architecture dated 2018.11.16, File 218-025
2. Borehole locations are approximate.

Project: DASHWOOD FIREHALL REPLACEMENT				
Title: SITE PLAN				
Client: REGIONAL DISTRICT OF NANAIMO				
File: SGL21-014	Drawn by: RRS	Scale: 1 : 750	Date: JUNE 21, 2021	Dwg. No.: G-2

Borehole # BH-1

Date Drilled: June 14, 2021
Rig: Acker Renegade Auger
Contractor: Drillwell Enterprises
Hammer Type: Auto

Location: 230 Hobbs Road, Qualicum
Elevation: 0
Co-ord:

Project No. SGL21-014
Project: Dashwood Firehall
Client: Regional District of Nanaimo

Depth (m)	Sample Type	Recovery Number	Blows/0.3 m	Symbols	SOIL DESCRIPTION	Elev. (m)	Water Level	Water Content %	SPT N		Pocket Penetrometer kPa	
									20	40	60	80
0					Ground Surface	0.0						
					SILTY SAND some rounded to subangular gravel, compact, moist, dark brown, trace of rootlets	0.0						
					SILTY SAND loose, moist, brown, slightly plastic consistency	-0.3						
						0.3		31.7				
1	SS	1	25		GLACIAL TILL sand and silt/clay, some gravel, stiff at 1.2m depth grading to hard by 1.4m depth, moist quickly grading to damp with depth, mottled tan-brown grading to grey with depth, tough drilling	-1.0		8.6		25		450
					occasional cobbles or boulders	1.0		9.3				
					auger refusal at 5.4m depth on probable boulder							
2												
	SS	2	35					8.6		35		450
3												
4												
5												
						-5.4						
					End of Borehole	5.4						
6					- Minor sloughing of upper 1m of borehole - No free water on completion							

Note: This borehole log has been prepared for geotechnical purposes only

SIMPSON GEOTECHNICAL LTD.

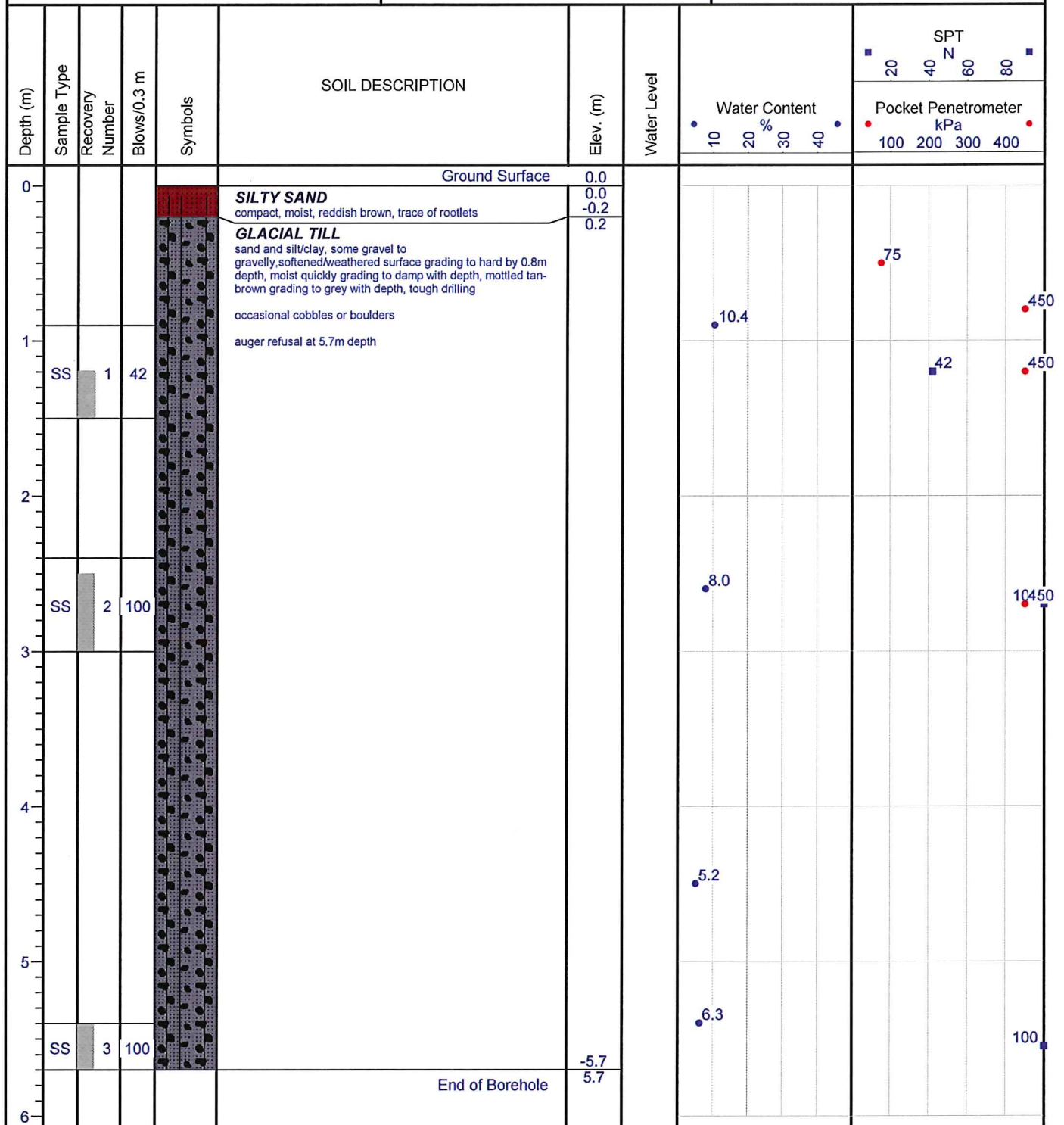
SimpsonGeotech.com

Borehole # BH-2

Date Drilled: June 14, 2021
Rig: Acker Renegade Auger
Contractor: Drillwell Enterprises
Hammer Type: Auto

Location: 230 Hobbs Road, Qualicum
Elevation: 0
Co-ord:

Project No. SGL21-014
Project: Dashwood Firehall
Client: Regional District of Nanaimo



Note: This borehole log has been prepared for geotechnical purposes only

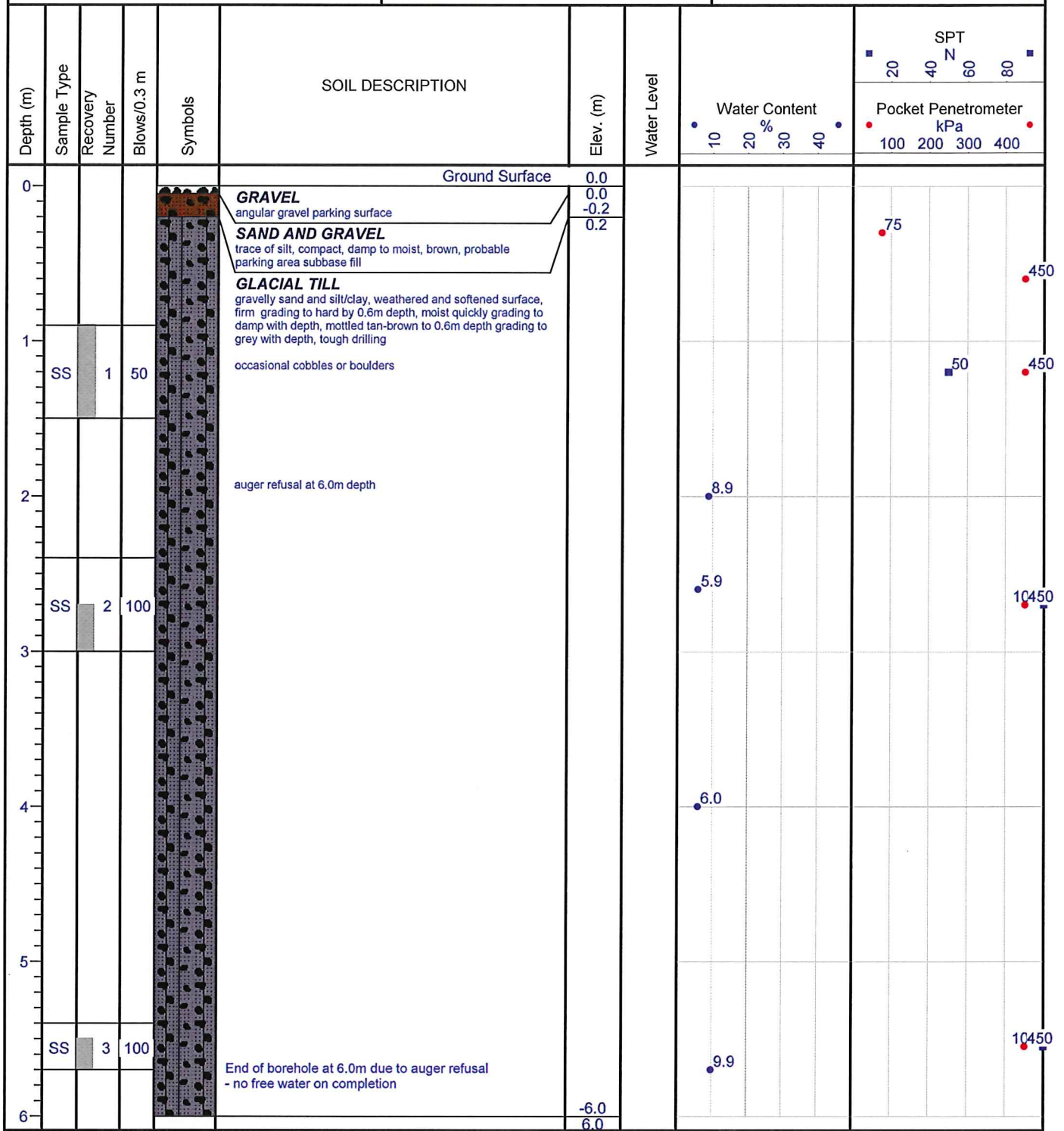
SIMPSON GEOTECHNICAL LTD.
SimpsonGeotech.com

Borehole # BH-3

Date Drilled: June 14, 2021
Rig: Acker Renegade Auger
Contractor: Drillwell Enterprises
Hammer Type: Auto

Location: 230 Hobbs Road, Qualicum
Elevation: 0
Co-ord:

Project No. SGL21-014
Project: Dashwood Firehall
Client: Regional District of Nanaimo



Note: This borehole log has been prepared for geotechnical purposes only

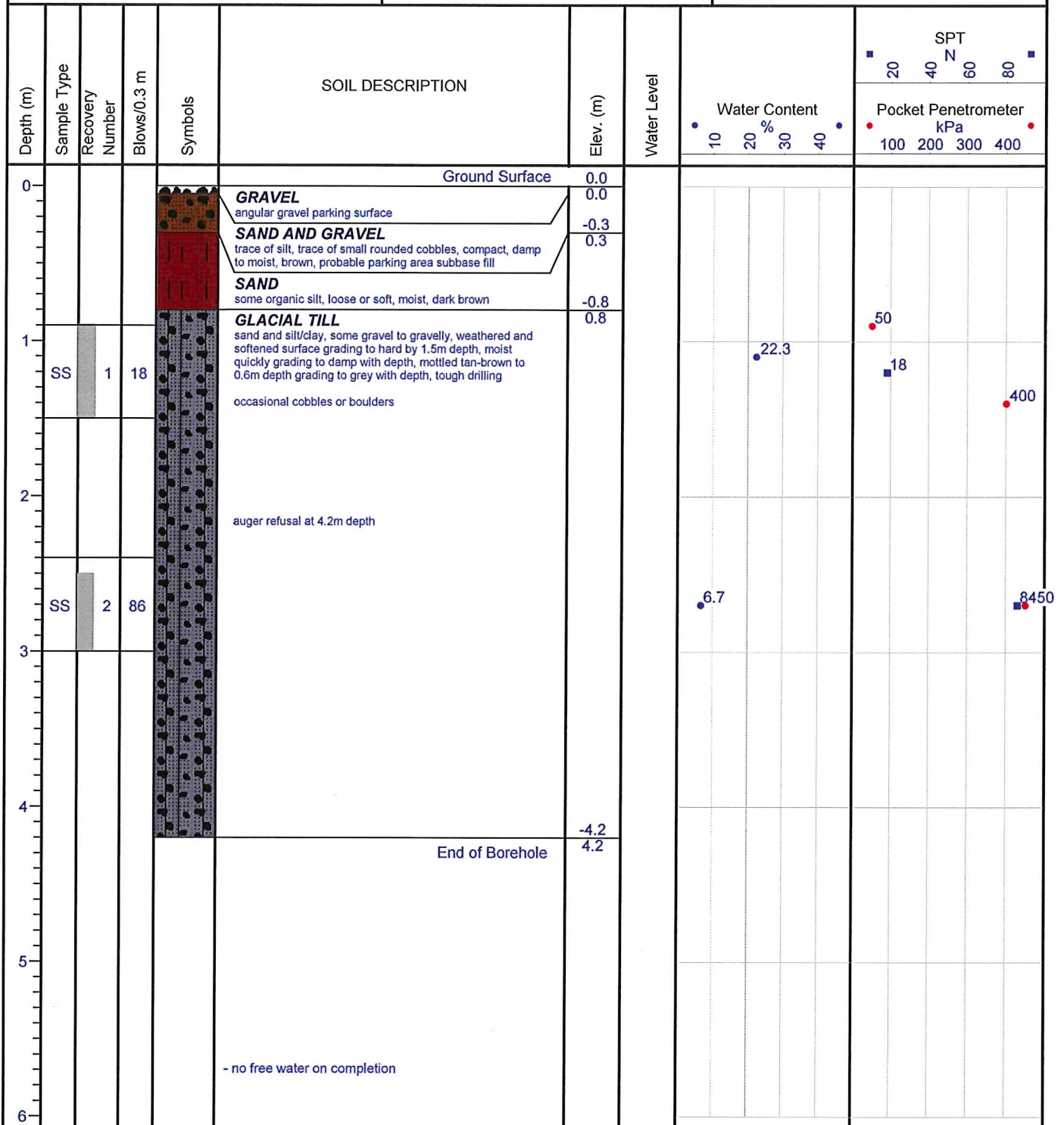
SIMPSON GEOTECHNICAL LTD.
 SimpsonGeotech.com

Borehole # BH-4

Date Drilled: June 14, 2021
Rig: Acker Renegade Auger
Contractor: Drillwell Enterprises
Hammer Type: Auto

Location: 230 Hobbs Road, Qualicum
Elevation: 0
Co-ord:

Project No. SGL21-014
Project: Dashwood Firehall
Client: Regional District of Nanaimo



Note: This borehole log has been prepared for geotechnical purposes only

SIMPSON GEOTECHNICAL LTD.
SimpsonGeotech.com

Grain Size Analysis

Client: Regional District of Nanaimo
CC: _____

Project No: SGL21-014
Project: Dashwood Firehall Replacement
Sample Date: 14-Jun-21
Sample By: RRS
Test Date: 17-Jun-21
Tested By: RS

SAMPLE INFORMATION:

Material Type: Glacial till
Source: Site
Specification: N/A
Sample Location: BH-3 5.7m depth
Sample No: 1

Moisture Content: 9.9%

Fracture: N/A

Washed Sieve: ☒

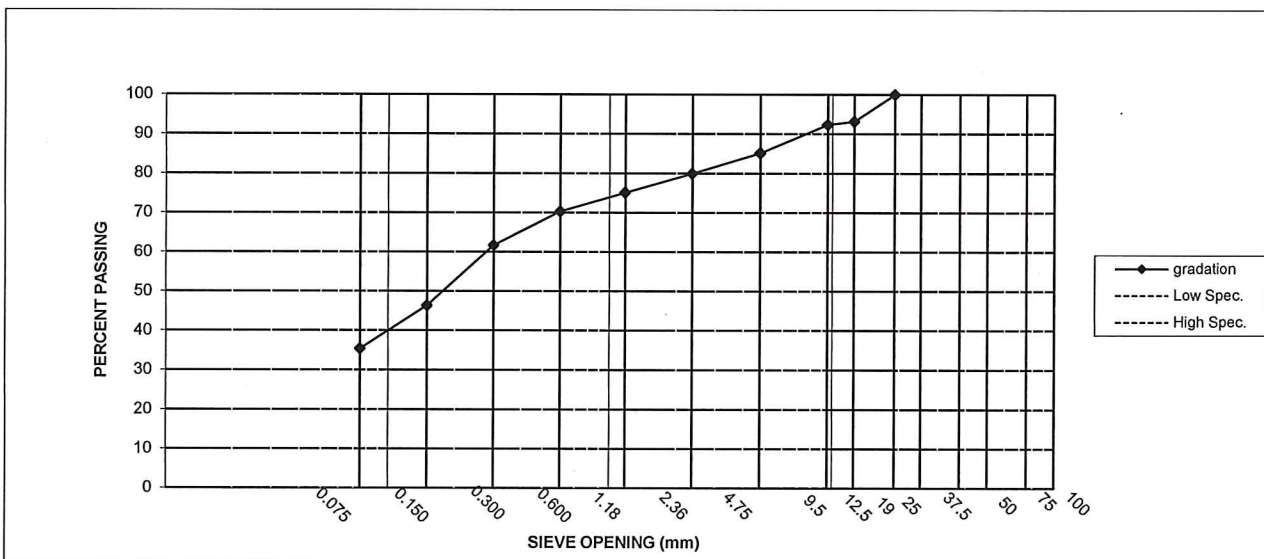
Dry Sieve: ☐

Sieve Analysis			
Sieve (mm)	% Passing	Low Spec.	High Spec.
100.0			
75.0			
50.0			
37.5			
25.0			
19.0	100.0		
12.5	93.2		
9.50	92.3		
4.75	85.2		
2.36	79.9		
1.18	75.1		
0.600	70.3		
0.300	61.7		
0.150	46.4		
0.075	35.4		

Sample Properties

Gravel (+2.36 mm): 20.1 %
 Sand (+0.075 to -2.36 mm): 44.5 %
 Silt and / or Clay (-0.075 mm): 35.4 %

AGGREGATE GRADATION:



Comments: _____

per: _____
 Richard Simpson, P.Eng.

Grain Size Analysis

Client: Regional District of Nanaimo
CC: _____

Project No: SGL21-014
Project: Dashwood Firehall Replacement
Sample Date: 14-Jun-21
Sample By: RRS
Test Date: 17-Jun-21
Tested By: RS

SAMPLE INFORMATION:

Material Type: Glacial till
Source: Site
Specification: N/A
Sample Location: BH-1 2.0m depth
Sample No: 2

Moisture Content: 9.3%

Fracture: N/A

Washed Sieve: ☒

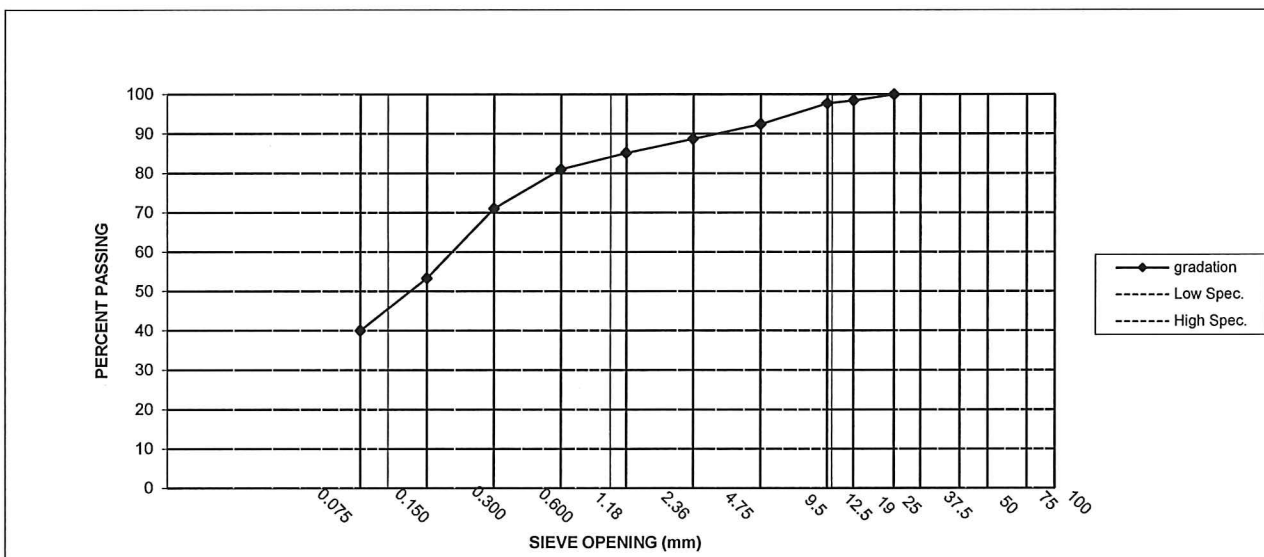
Dry Sieve: ☐

Sieve Analysis			
Sieve (mm)	% Passing	Low Spec.	High Spec.
100.0			
75.0			
50.0			
37.5			
25.0			
19.0	100.0		
12.5	98.5		
9.50	97.8		
4.75	92.5		
2.36	88.7		
1.18	85.2		
0.600	81.0		
0.300	71.1		
0.150	53.4		
0.075	40.1		

Sample Properties

Gravel (+2.36 mm): 11.3 %
Sand (+0.075 to -2.36 mm): 48.7 %
Silt and / or Clay (-0.075 mm): 40.1 %

AGGREGATE GRADATION:



Comments:

per: _____

Richard Simpson, P.Eng.

This report represents a testing service only.
No engineering interpretation opinion is expressed or implied.
Engineering review and interpretation can be provided on written request.

2015 National Building Code Seismic Hazard Calculation

INFORMATION: Eastern Canada English (613) 995-5548 français (613) 995-0600 Facsimile (613) 992-8836
Western Canada English (250) 363-6500 Facsimile (250) 363-6565

Site: 49.367N 124.520W

User File Reference: 230 Hobbs Road

2021-06-17 22:32 UT

Requested by: Simpson Geotechnical Ltd.

Probability of exceedance per annum	0.000404	0.001	0.0021	0.01
Probability of exceedance in 50 years	2 %	5 %	10 %	40 %
Sa (0.05)	0.448	0.309	0.216	0.084
Sa (0.1)	0.702	0.482	0.336	0.130
Sa (0.2)	0.870	0.606	0.424	0.164
Sa (0.3)	0.898	0.623	0.432	0.165
Sa (0.5)	0.825	0.556	0.376	0.137
Sa (1.0)	0.518	0.330	0.211	0.073
Sa (2.0)	0.325	0.201	0.123	0.040
Sa (5.0)	0.109	0.062	0.032	0.010
Sa (10.0)	0.039	0.022	0.011	0.004
PGA (g)	0.390	0.269	0.186	0.070
PGV (m/s)	0.629	0.408	0.265	0.087

Notes: Spectral ($S_a(T)$, where T is the period in seconds) and peak ground acceleration (PGA) values are given in units of g (9.81 m/s^2). Peak ground velocity is given in m/s . Values are for "firm ground" (NBCC2015 Site Class C, average shear wave velocity 450 m/s). NBCC2015 and CSAS6-14 values are highlighted in yellow. Three additional periods are provided - their use is discussed in the NBCC2015 Commentary. Only 2 significant figures are to be used. **These values have been interpolated from a 10-km-spaced grid of points. Depending on the gradient of the nearby points, values at this location calculated directly from the hazard program may vary. More than 95 percent of interpolated values are within 2 percent of the directly calculated values.**

References

National Building Code of Canada 2015 NRCC no. 56190; Appendix C: Table C-3, Seismic Design Data for Selected Locations in Canada

Structural Commentaries (User's Guide - NBC 2015: Part 4 of Division B)
Commentary J: Design for Seismic Effects

Geological Survey of Canada Open File 7893 Fifth Generation Seismic Hazard Model for Canada: Grid values of mean hazard to be used with the 2015 National Building Code of Canada

See the websites www.EarthquakesCanada.ca and www.nationalcodes.ca for more information



Natural Resources
Canada

Ressources naturelles
Canada

Canada

STATEMENT OF GENERAL CONDITIONS

1. STANDARD OF CARE

This Report has been prepared in accordance with generally accepted engineering consulting practices in the applicable jurisdiction. No other warranty, expressed or implied, is intended or made. Geological and geotechnical studies do not include environmental consulting unless specifically stated in the report.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report which is of a summary nature and is not intended to stand alone without reference to the instructions given to us by the Client, communications between us and the Client, and to any other reports, writings, proposals or documents prepared by us for the Client relative to the specific site described herein, all of which constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. WE ARE NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives and purpose that were described to us by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the document are only valid to the extent that there has been no material alteration to or variation from any of the said descriptions provided to us unless we are specifically requested by the Client to review and revise the Report in light of such alteration or variation.

4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT OUR WRITTEN CONSENT. We will consent to any reasonable request by the client to approve the use of this report by other parties as "approved users. Any use that a third party makes of the Report, or any portion of the Report, are the sole responsibility of such third parties. We accept no responsibility for damages suffered by any third party resulting from unauthorized use of the Report.

5. INTERPRETATION OF THE REPORT

a) Nature and Exactness of Soil Description: Identification of soils, rocks, terrain and geological units have been based on investigations performed in accordance with the standards set out in Paragraph 1. The field investigation cannot practically cover the entire area and will only identify soil conditions at the point and time of sampling. Identification of these factors are judgmental in nature and even comprehensive sampling and testing programs may fail to locate some conditions. All investigations involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual sample points. Actual conditions may vary significantly between the points investigated and all persons making use of such documents or records should be aware of, and accept, this risk. Some conditions change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the time of assessment.

- b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to us. We have relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, we cannot accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of persons providing information.
- c) Design Services: The Report may form part of the design and construction documents for information purposes even though it may have been issued prior to the final design being completed. We must be retained to review the final design, project plans and documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the report recommendations and the final design detailed in the contract documents must be reported to us immediately so that we can address potential conflicts.
- d) Construction Services: During construction we must be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions to confirm and document that the site conditions do not materially differ from those interpreted conditions considered in the preparation of the report. Adequate field reviews are necessary for Simpson Geotechnical Ltd. to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

6. CONSTRUCTION INSPECTIONS

Our scope of work may include inspections of the work during construction or after completion. Such field reviews do not replace the need for appropriate construction inspection and supervision on the part of the client or his agents. We accept no responsibility for damages caused by unforeseen conditions unless we are on site during construction.

7. INHERENT RISKS

Geotechnical hazard assessments typically occur where there are hazards. As such, inherent risks exist and landslides or other geotechnical hazards can occur even where the likelihood of has been identified as low. The client must operate with an understanding of this risk.

8. CONTROL OF WORK AND JOBSITE SAFETY

We are responsible only for the activities of our employees on the jobsite. The presence of our personnel on the site shall not be construed in any way to relieve the Client or any contractors on site from their responsibilities for site safety. The Client acknowledges that he, his representatives, contractors or others retain control of the site and that we never occupy a position of control of the site. The Client undertakes to inform us of all hazardous conditions, or other relevant conditions of which the Client is aware. The Client also recognizes that our activities may uncover previously, unknown hazardous conditions and that such a discovery may require that certain regulatory bodies be informed and the Client agrees that notification to such bodies by us will not be a cause of action or dispute.

9. INDEPENDENT JUDGEMENTS OF CLIENT

The information, interpretations and conclusions in the Report are based on our interpretation of conditions revealed through limited assessment conducted within a defined scope of services. We cannot accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or others who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes decisions made to either purchase or sell land.



DASHWOOD FIREHALL REPLACEMENT 230 HOBBS ROAD, QUALICUM BEACH, BC

Focused Geohazard Assessment Report

WSP Canada Inc.
1935 Bollinger Road
Nanaimo, BC
V9S 5W9



Table of Contents

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2. PROJECT AND SITE DESCRIPTION.....	1
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2.2 SITE DESCRIPTION	2
2.3 BACKGROUND INFORMATION	3
3. SITE RECONNAISSANCE	3
4. GEOTECHNICAL DISCUSSION.....	4
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Attachments

- Figure 1. Site Location Plan
- Appendix A. Photograph Log
- Appendix B. Standard Limitations



June 7, 2022

WSP File No.: 221-03307-00

Regional District of Nanaimo
6300 Hammond Bay Road
Nanaimo, BC
V9T 6N2

**Attention: Mr. Gerald St. Pierre, P.Eng., PMP
Project Engineer, Engineering Services**

**Re: Focused Geohazard Assessment Report
Proposed Dashwood Firehall Replacement
230 Hobbs Road, Qualicum Beach, BC**

Dear Sir,

1. INTRODUCTION

At the request of the Regional District of Nanaimo (RDN), WSP Canada Inc. (WSP) has completed a focused geohazard assessment related to the proposed replacement firehall at 230 Hobbs Road, Qualicum Beach, BC. The need for the assessment was identified in a geotechnical report prepared by Simpson Geotechnical Ltd. (SGL) dated 21 June 2021. The scope of WSP's geotechnical work was described in a proposal dated March 16, 2022, with written authorization to proceed provided on March 22, 2022.

Outlined below is a description of a ravine feature located to the north of the site along with the findings of our geohazard review. Discussion and recommendations are provided in relation to the proposed firehall project in the context of the potential geohazard. Attached to the report are a Site Location Plan and annotated Photograph Log.

This report was issued as a draft for client review on June 6, 2022.

2. PROJECT AND SITE DESCRIPTION

2.1 PROJECT DESCRIPTION

The RDN proposes to replace the existing Dashwood Firehall with a two-storey building that will be supported on a shallow foundation system with a grade supported slab. Finished grades will be similar to existing grades and the project may include upgrades to the existing adjacent gravel surfacing. Recommendations for the geotechnical aspects of the design were provided in the SGL 2021 geotechnical report. The report indicates that the building will be located in a similar position to the existing building towards the east side of the site and set back some 40 m from south side of Highway 19A.

2.2 SITE DESCRIPTION

The firehall site is located southwest of the intersection of Island Highway West (19A) and Hobbs Road in the Dashwood area of Qualicum Beach as shown in Figure 1. The northern boundary of the site is approximately 300 m south of the shoreline to the Salish Sea with Highway 19A running approximately east-west immediately north of the site. The site is bound on the west by undeveloped land, to the east by Hobbs Road and to the south by residential properties.

Contour information on RDNMap indicates that the ground surface in the vicinity of the site is relatively flat at an elevation of approximately 62 to 64 m above Mean Sea Level (aMSL). On the north side of Highway 19A the ground surface typically continues at close to that elevation for about 200 m to the north before sloping down steeply to the beach. As indicated on the contour plan on Figure 1, the shoreline is broken to the north-northwest of the site by a ravine feature that extends close to the north side of Highway 19A. That particular ravine feature and the potential for it to impact the firehall site is the focus of this geohazard assessment. Another ravine type feature is present some 300 m east of the site but is sufficiently removed to be of no concern.

The steep foreshore slope and ravine areas to the north of the site lie within the RDN's Development Permit Area G: Hazard Lands¹. There is at least 15 m between the crest of the ravine and the site and, therefore, the site lies to the south of DPA G. However, this assessment is intended to review the potential for the ravine feature to regress further south towards the site.

Published surficial geology mapping indicates that the site is underlain by an unconsolidated sandy, gravelly marine veneer and/or silty marine blanket underlain by glacial till^{2,3}. The Quadra Sand deposit (glaciofluvial channel fill and floodplain deposits, cross-bedded, sorted sand, minor gravel and silt) occurs below the till and has been mapped along the base of the shoreline slope to the northwest of the site. The till and Quadra Sand are very dense, heavily over-consolidated deposits that are generally resistant to seismically induced liquefaction and large seismically induced permanent deformations.

¹ Map No. 9 Development Permit Areas: Environmentally Sensitive Features and Hazard Lands. Electoral Area G Official Community Plan. (December 4, 2018). Bylaw No. 1540.02, 2018

² Horne Lake, British Columbia (Map 92F/7). Surveys and Mapping Branch, Department of Lands and Forests, British Columbia (1956)

³ Surficial Geology – Horne Lake-Parksville, British Columbia (2015). Natural Resources Canada, GSC Open File 7681.

2.3 BACKGROUND INFORMATION

As part of this review WSP was provided with a copy of the 2021 Geotechnical Assessment Report prepared by SGL. Ground conditions described in that report are in general agreement with the surficial geology mapping described above. Sand and silt with variable gravel and cobble content (interpreted to be glacial till) was encountered at the site at depths ranging from 0.2 to 1 m below ground surface. The upper portion of the till was weathered and increased in density with depth to become hard/very dense at about 0.4 to 0.7 m into the till deposit. No groundwater seepage was observed at the four boreholes that were advanced to 4 to 6 m depths.

The SGL report notes the presence of ravines eroded into the foreshore slope and recommended that a ravine to the north of the west portion of the site be further assessed.

3. SITE RECONNAISSANCE

The main site reconnaissance was completed on 4 April 2021 in the company of a representative from the RDN and the owner of 4189 Island Highway West. Conditions at the firehall site and within the ravine to the northwest corner of the site were reviewed. Access to the ravine was provided through 4189 Island Highway West located across the highway from the firehall site. A subsequent visit was made on June 3, 2022, to better review the Highway 19A culvert under conditions of lower flow. Photos taken during the reconnaissance are appended.

The ravine appears to correspond to overland flow from lands to the south of the head of the ravine. Photo 1 shows drainage from the firehall site entering the Highway 19A ditch, which is directed to a 900 mm dia. CSP culvert that conveys water under the highway and into the head of the ravine. Photos 2 and 3 show local armour improvements around the south (inlet) end of the culvert. Flow in the road ditch to the culvert extends east to at least Hobbs Road (i.e., the whole of the north side of the site). Ditch flow also occurs towards the culvert from the west. Discharge at the north end of the culvert is onto a steep slope of coarse angular rock (Photos 4 and 5) beyond which the flow travels in a local gully feature on natural soils to the base of the main ravine (Photo 6). An asphalt patch shown in Photo 7 indicates that the culvert has been replaced relatively recently.

Based on additional reconnaissance completed under more favorable weather conditions in June 2022, Highway 19A appears to truncate the southern end of the ravine and be supported on a steep embankment section about 40 m long (near the top) that ties into the headscarp area of

the ravine. Photo 8 shows a large old diameter Douglas fir located just beyond the western end of the inferred road embankment section.

The southern section of the ravine is steep, heavily vegetated, and readily accessed from the highway. Access into the ravine was made through an access road within 4189 Island Highway on the east side of the ravine. In the upper approximately 10 m of the ravine, exposures of very dense glacial till were present (Photo 9 and 10). A local gully that appeared to be associated with stormwater discharge from Hobbs Road had incised through the till as shown on Photo 11. Towards the base of this local gully were exposures of dense sand inferred to be Quadra Sand (Photo 12).

The side slopes of the ravine were steep to very steep with a typical inclination of 35 to 40 degrees relative to horizontal. Vegetation on the slopes was fairly complete and included shrubs, ferns and a mix of evergreen, alder, and maple trees. A large number of fallen trees were observed on the side slopes and base of the ravine. Pistol butted trunks present throughout the ravine slopes were indicative of on-going creep.

The ravine access road followed the base of the ravine to the foreshore. The base of the ravine was in the order of 10 to 15 m wide with a locally incised channel as shown on Photos 13 and 14. A cabin had been constructed in front of the mouth of the channel (Photo 15) and there were signs of accumulated debris in the vicinity of the cabin as well as the deposition of larger boulder size material on the foreshore (Photo 16).

Discussions with the homeowner of 4189 Island Highway during the visit indicated that the stream in the lower portion of the ravine runs all year but that the upper area can be dry in prolonged periods of no rain. This suggests that the lower part of the creek may be fed through a combination of storm/precipitation run-off and groundwater from a Quadra Sand aquifer.

4. GEOTECHNICAL DISCUSSION

The northwest corner of the site is located upslope of the eastern side of a ravine that has historically regressed approximately 300 m south from the current shoreline and down cut up to 60 m to sea level. The formation of the ravine appears to be associated with overland discharge from the south including run-off from the firehall site and road drainage from Highway 19A. The discharge currently enters the east slope of the ravine via a 900 mm diameter road culvert located directly north of the northwest corner of the site. WSP understands that the Ministry of Transportation & Infrastructure (MoTI) is responsible for the culvert and storm drainage, and it is apparent from our site visits that the culvert intake and discharge areas have recently been upgraded. Along with stormwater discharge, it is expected that the lower part of the ravine is fed with groundwater discharge.

The side slopes of the ravine are steep and there are indications of local slope failures, slope creep and fallen trees. In the northern (lower) half of the ravine a number of trees lie across the creek at the base of the channel. There is considered to be a high potential for periodic temporary blockages of the creek from these sources, which could in turn impound the creek and trigger a sudden release of water and debris causing bed scour and deposition at the creek mouth. This potential process is supported by an observed accumulation of debris in the mouth of the creek and a concentration of boulders in the foreshore area. These downstream natural processes are not considered to be a direct risk to the firehall site provided that the MoTI's on-going monitoring and maintenance works at the head of the ravine continue, as described below.

The head of the approximately 40 m wide gully is truncated by an embankment that supports Highway 19A. The area is difficult to safely access and the definition (shape) of the embankment is difficult to differentiate from the lower natural slope due to dense tree cover and a thick understory. However, based on our review, the inclination of the embankment slope was less than those of the ravine side slopes and there were no indications of large-scale instability. Overland discharge that would historically have entered the head of the ravine uncontrolled is now collected via road ditches and discharged to the east side of the ravine in a controlled manner via a road culvert and armoured discharge slope.

In the absence of the MoTI's monitoring and maintenance of the controlled stormwater management infrastructure, there is the potential for long-term regression of the ravine to the south and into the western portion of the firehall site. Long term erosion from stormwater discharge, reduced effectiveness of clogged rip rap, blockages caused by vegetation and tree fall are some of many factors that could reduce the effectiveness of the stormwater system. As such, on-going monitoring and maintenance by the Ministry of Transportation & Infrastructure is important in mitigating the risks of a gradual un-checked regression of the ravine towards the site. Given the presence, ease of accessibility and importance of Highway 19A, a scenario of un-checked gradual regression across the highway to the site is not considered credible.

Given the presence of the road embankment, stormwater management infrastructure and an assumed commitment from the MoTI to maintain the infrastructure, the risk of a single event slope failure of the ravine/embankment encroaching into the site under conditions of normal loading is considered to be extremely low and not worthy of further mitigative action. We note that the proposed building is located in the eastern part of the site and set back some 40 m from the highway, further reducing the risk of an impact from a single event slope failure.

The firehall is understood to be a post-disaster structure and, therefore, the potential influence of strong seismic shaking have been considered in

terms of a ravine stability risk to the firehall. As described in Section 2.2, the natural soils into which the ravine is incised consist of dense heavily over-consolidated till and Quadra Sediment; deposits that are not prone to widespread liquefaction or large seismically induced flow type slides. Strong seismic shaking of the ravine and embankment would be detrimental to stability and would be expected to induce shallow sliding in the weakened near surface natural soils as well potential movements of the road embankment. It is possible that strong seismically induced movements could locally impact the travel surface of Highway 19A near the embankment area causing a temporary road closure. However, given the nature of the natural soils within the site and the proposed location of the new firehall to the ravine and embankment, the risk of a single event seismically induced slope failure impacting the firehall is considered to be very low and not worthy of further mitigative action.

As an item of due diligence, WSP recommends that the RDN review with the MoTI the importance of monitoring and maintenance of the stormwater infrastructure at this location and establish a schedule of requirements. MoTI should be made aware if off-site discharge is expected to increase as a result of the new development such that further surveillance or mitigative works can be implemented to protect the head of the ravine from erosion. Likewise, any planned changes in off-site discharge should be fully considered in relation to potential changes in risk from hazards within the ravine of 4189 Island Highway West including, in particular, those to the cabin located at the mouth of the creek. Planned increases in off-site discharge to the ravine may warrant further off-site assessment and mitigative works that are beyond the scope of this focused assessment.

5. SUMMARY & CLOSURE

Based on the focused geohazard assessment described above, it is our opinion that the site may be used safely for its intended use as a firehall in relation to the ravine on the north side of Highway 19A. There are active environmental and geological processes within the ravine that may result in downstream hazards within the ravine that are beyond the scope of this assessment. Mitigative off-site measures may be required if increased run-off is expected to be generated from the project. Surveillance and maintenance are required for the off-site stormwater management works to prevent and/or manage any erosion at the head of the ravine.

This report has been prepared for the exclusive use of the Regional District of Nanaimo for application to a replacement firehall located at 230 Hobbs Road, Qualicum Beach, BC. Any assessment related to the residence and cabin located within 4189 Island Highway West were beyond the scope of this assessment. This report was prepared in accordance with the attached Standard Limitations.



WSP thank you for the opportunity to have provided geotechnical engineering services, and we would welcome the opportunity to support future stages of the project. Please do not hesitate to contact the undersigned should you have any questions or require further information.

Yours truly

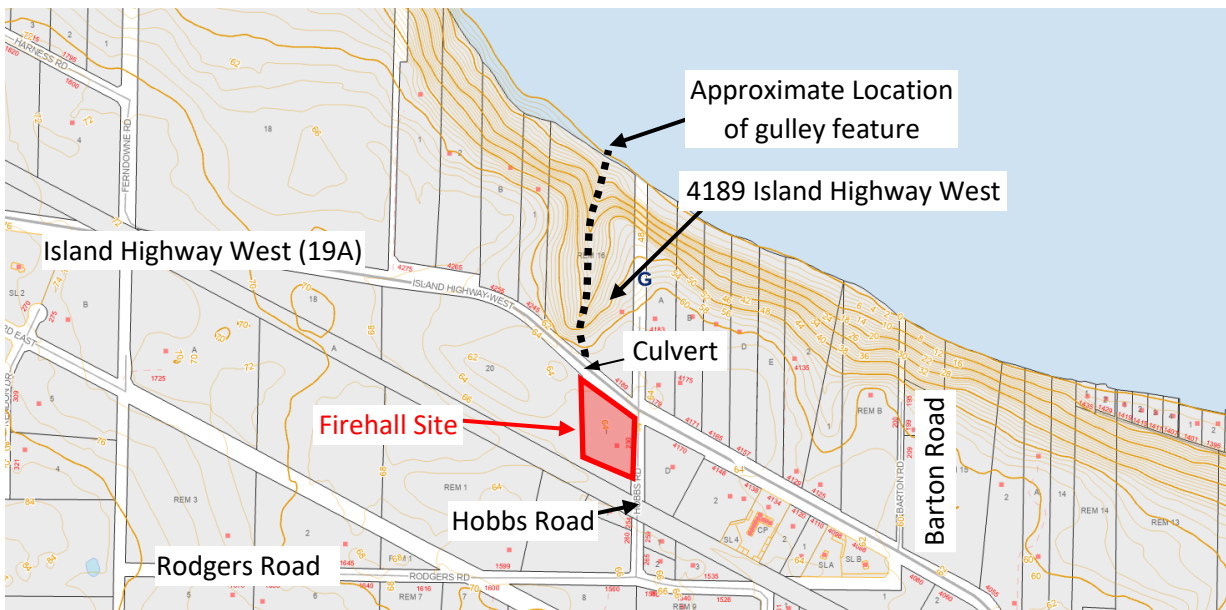
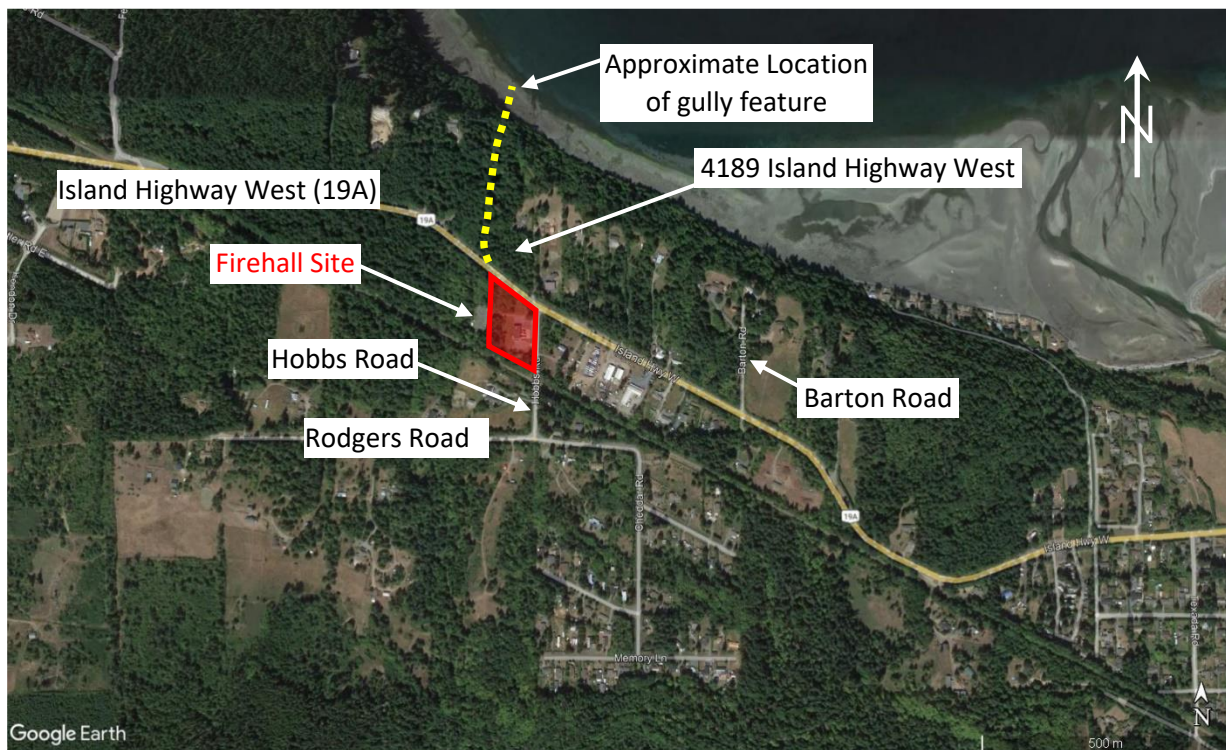
WSP Canada Inc.

Reviewed by:

Per: Carl Miller, M.Sc., P.Eng.
Senior Geotechnical Engineer

Darryl Furey, M.Eng., P.Eng.
Senior Geotechnical Engineer

Engineers & Geoscientists BC Permit #1000200



Topographic map from RDNMap (May 2022) – Contour Interval 2 m



PROJECT: FOCUSED GEOHAZARD ASSESSMENT
DASHWOOD FIREHALL REPLACEMENT
230 HOBBS ROAD, QUALICUM BEACH, BC

TITLE: SITE LOCATION PLAN

CLIENT: REGIONAL DISTRICT OF NANAIMO

FIGURE NO.:
1

DATE:
JUNE 2022

FILE NO.:
221-03307-00

SCALE:
NTS

DRAWN BY:
DF

REV NO.:
1

APPENDIX

A PHOTOGRAPH LOG



PHOTO TABLE



Photo	Description
	<p>Photo 1: April 2022</p> <p>View of water flowing from south (background) towards road (foreground) and culvert (to right of photo) from general area of site and lands to the west of the site. Refer to Photo 2 for locations.</p>
	<p>Photo 2: April 2022</p> <p>View of Highway 19 ditching looking east towards the site. White arrow shows location of Photo 1. Recent armouring at location of 900 mm dia. CSP road culvert.</p>

PHOTO TABLE





Photo	Description
	<p>Photo 3: April 2022</p> <p>General view of road ditching looking west from the site.</p>
	<p>Photo 4: June 2022</p> <p>View of down stream end of culvert with recent improvements in armouring and road embankment protection. Culvert discharges to the northwest to the gully feature.</p>

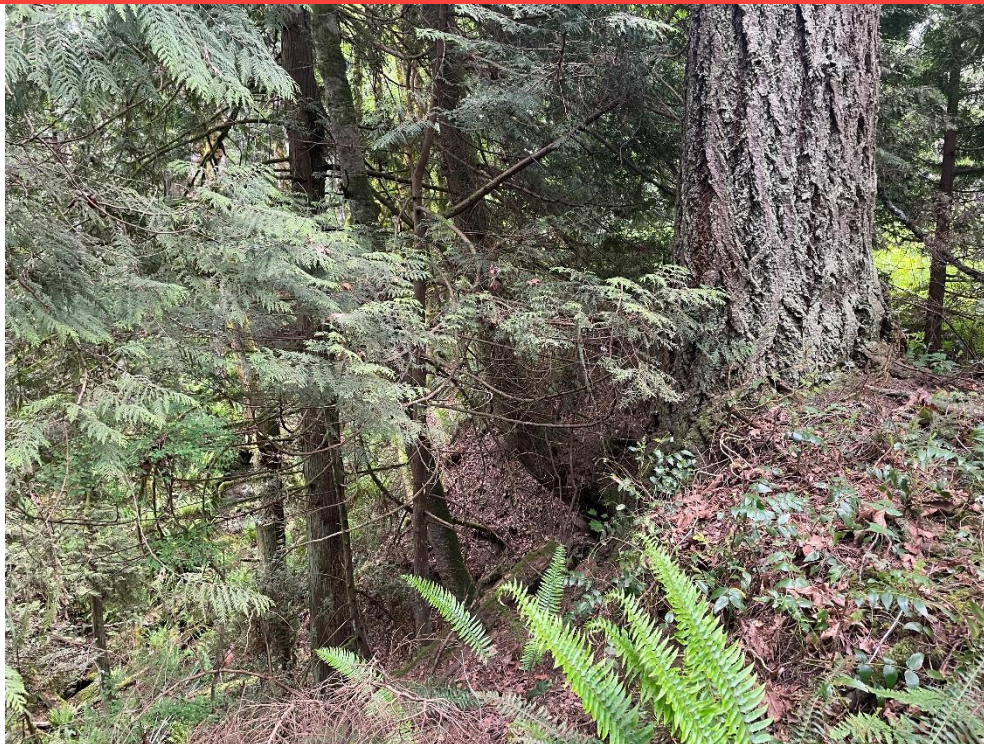
PHOTO TABLE

Photo	Description
	<p>Photo 5: April 2022</p> <p>View of culvert discharging onto rock armour looking south</p>
	<p>Photo 6: June 2022</p> <p>Photo of base of recent rock armouring looking north towards gully base.</p>



**Photo 7:
June 2022**

View of recent asphalt patching for replacement culvert.



**Photo 8:
June 2022**

View of large mature Douglas Fir on west side of gully approximately 45 m west of culvert.

PHOTO TABLE



Photo	Description
	<p>Photo 9: April 2022</p> <p>Exposure of dense glacial till in the upper portion of the gully access road within 4189 Island Highway.</p>
	<p>Photo 10: April 2022</p> <p>Close up of dense glacial till in the upper portion of the gully access road within 4189 Island Highway.</p>



Photo 11:
April 2022

Local gully within the east side of the main gully inferred to be related to drainage form Hobbs Road.



Photo 12:
April 2022

Exposure of dense sand (moist) below the glacial till in the east side of the main gully adjacent to the access road. Inferred to be Quadra Sand deposit.



Photo 13:
April 2022

View of more gentle gradient in the central portion of the gully alignment looking south. Note steeply incised natural slopes either side of channel.



Photo 14:
April 2022

View of north-central portion of the gully alignment looking north. Note extensive debris in the channel.



Photo 15:
April 2022

View of north end of gully with Georgia Strait (Salish Sea) in the background. Topography suggested of historical debris accumulations.

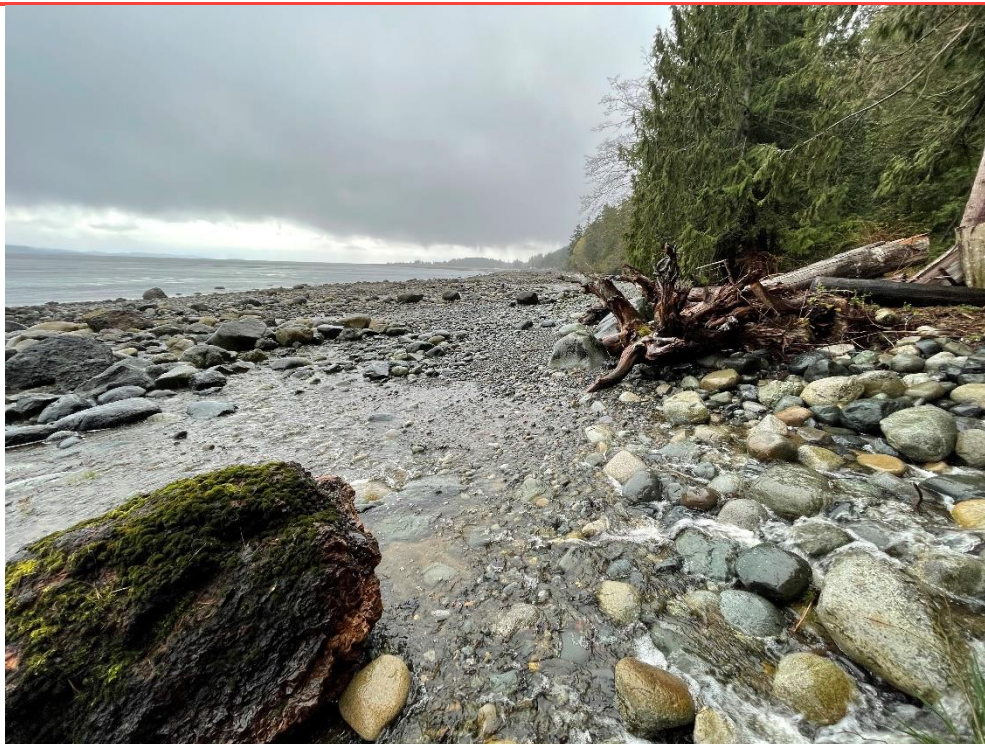


Photo 16:
April 2022

View of foreshore looking east. Note the presence of boulder size particles on the foreshore in front of the mouth of the channel.

APPENDIX

B

STANDARD
LIMITATIONS



Standard Limitations

WSP Canada Inc. ("WSP") prepared this report solely for the use of the intended recipient, Urban Systems Ltd., in accordance with the professional services agreement between the parties. In the event a contract has not been executed, the parties agree that the WSP General Terms for Consultant shall govern their business relationship which was provided to you prior to the preparation of this report.

The report is intended to be used in its entirety. No excerpts may be taken to be representative of the findings in the assessment.

The conclusions presented in this report are based on work performed by trained, professional and technical staff, in accordance with their reasonable interpretation of current and accepted engineering and scientific practices at the time the work was performed.

The content and opinions contained in the present report are based on the observations and/or information available to WSP at the time of preparation, using investigation techniques and engineering analysis methods consistent with those ordinarily exercised by WSP and other engineering/scientific practitioners working under similar conditions, and subject to the same time, financial and physical constraints applicable to this project.

WSP disclaims any obligation to update this report if, after the date of this report, any conditions appear to differ significantly from those presented in this report; however, WSP reserves the right to amend or supplement this report based on additional information, documentation or evidence.

WSP makes no other representations whatsoever concerning the legal significance of its findings.

The intended recipient is solely responsible for the disclosure of any information contained in this report. If a third party makes use of, relies on, or makes decisions in accordance with this report, said third party is solely responsible for such use, reliance or decisions. WSP does not accept responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken by said third party based on this report.

WSP has provided services to the intended recipient in accordance with the professional services agreement between the parties and in a manner consistent with that degree of care, skill and diligence normally provided by members of the same profession performing the same or comparable services in respect of projects of a similar nature in similar circumstances. It is understood and agreed by WSP and the recipient of this report that WSP provides no warranty, express or implied, of any kind. Without limiting the generality of the foregoing, it is agreed and understood by WSP and the recipient of this report that WSP makes no representation or warranty whatsoever as to the sufficiency of its scope of work for the purpose sought by the recipient of this report.

In preparing this report, WSP has relied in good faith on information provided by others, as noted in the report. WSP has reasonably assumed that the information provided is correct and WSP is not responsible for the accuracy or completeness of such information.

Benchmark and elevations used in this report are primarily to establish relative elevation differences between the specific testing and/or sampling locations and should not be used for other purposes, such as grading, excavating, construction, planning, development, etc.

WSP disclaims any responsibility for consequential financial effects on transactions or property values, or requirements for follow-up actions /or costs.]



Standard Limitations

Design recommendations given in this report are applicable only to the project and areas as described in the text and then only if constructed in accordance with the details stated in this report. The comments made in this report on potential construction issues and possible methods are intended only for the guidance of the designer. The number of testing and/or sampling locations may not be sufficient to determine all the factors that may affect construction methods and costs. We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.]

Overall conditions can only be extrapolated to an undefined limited area around these testing and sampling locations. The conditions that WSP interprets to exist between testing and sampling points may differ from those that actually exist. The accuracy of any extrapolation and interpretation beyond the sampling locations will depend on natural conditions, the history of Site development and changes through construction and other activities. In addition, analysis has been carried out for the identified chemical and physical parameters only, and it should not be inferred that other chemical species or physical conditions are not present. WSP cannot warrant against undiscovered environmental liabilities or adverse impacts off-Site.]

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This limitations statement is considered an integral part of this report.

APPENDIX 2

ENERGY MODELLING REPORT



DASHWOOD FIRE HALL REPLACEMENT

Project No.: 145a-004-20
230 HOBBS Road, QUALICUM BEACH, BC

Building Permit Energy Modelling Report

March 3, 2022

PREPARED FOR:

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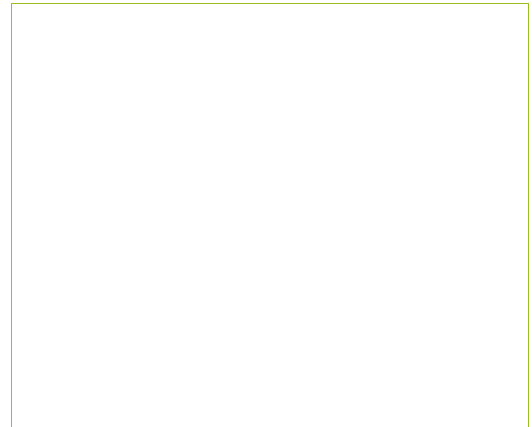
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3. BASIS OF DESIGN – MODEL INPUTS	3
4. RESULTS AND ANALYSIS	8
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1. EXECUTIVE SUMMARY

The Dashwood Firehall Replacement project is a 2-storey fire hall facility located at 230 Hobbs Road, Qualicum Beach, BC. The building will consist of 2 apparatus bays, gear room, meeting rooms dorm, fitness and living area. The project is required to meet BC Building Code energy requirements. The project will demonstrate compliance through NECB 2015 Building Energy Performance Compliance Path.

AME has conducted an energy modelling analysis to study the proposed design's energy performance against the NECB 2015 baseline building. The compliance metrics and model results are summarized in the table below.

Table 1: Energy Model Results

NECB 2015 Reference (kWh/m ² /year)	Proposed (kWh/m ² /year)	% Energy Savings
283	258	9%

These results show that the project complies with BC Building Code through compliance with the NECB 2015 Part 8 – Building Energy Performance Compliance Path. Energy savings are achieved in the proposed building relative to the baseline, primarily by using an HRV for the main areas.

This report has been prepared by the AME Consulting Group for the exclusive use of The Regional District of Nanaimo and the design team. The material in this report reflects the best judgement of the AME Consulting Group with the information made available to them at the time of preparation. Energy modelling results are not predictions of actual energy consumption or performance of the proposed design after construction. Actual performance will differ from these calculations due to variations in factors such as occupancy, building operation and maintenance, and actual weather conditions.

2. INTRODUCTION

This report is the energy model of the Dashwood Firehall Replacement project. The project is a 2-storey fire hall located at 230 Hobbs Road, Qualicum Beach, BC. The building will consist of 2 apparatus bays, gear room, meeting rooms dorm, fitness and living area. The project is required to meet BC Building Code. The project will demonstrate compliance through NECB 2015 Building Energy Performance Compliance Path.

Figure 1 shows a rendering of the building in the energy model software.

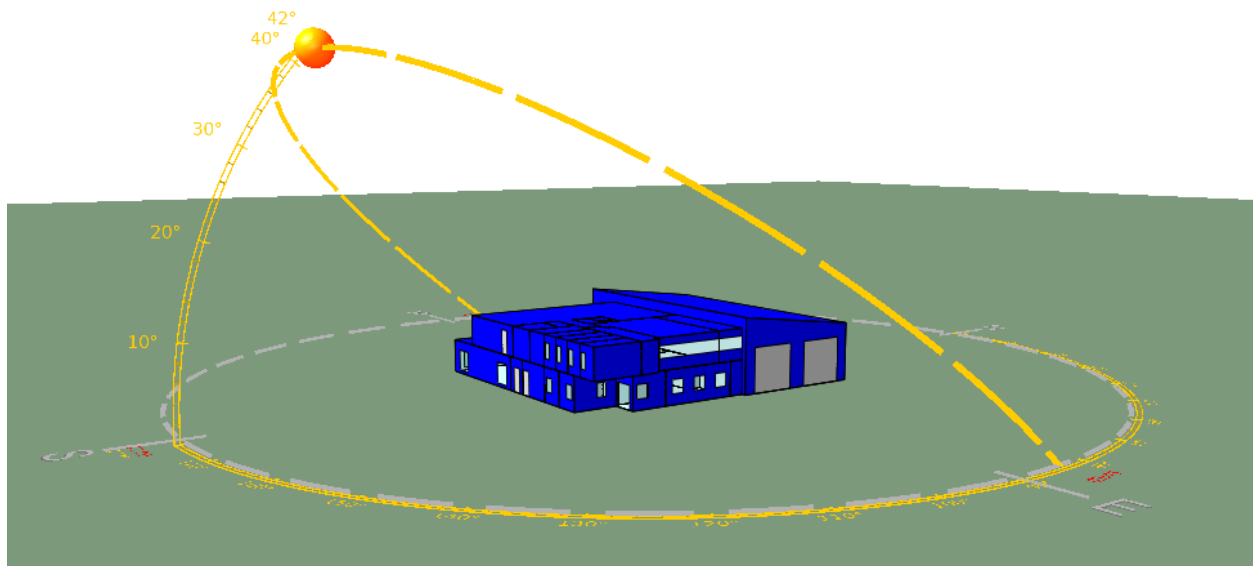


Figure 1: Energy Model Geometry and Orientation

3. BASIS OF DESIGN – MODEL INPUTS

The key model inputs for this project are summarized in Table 2.

Table 2. Model Inputs

	Reference Building	Proposed Building
General		
Project Location	230 Hobbs Road, Qualicum Beach, BC, V9K 2B2 District of Nanaimo	
Building Type(s)	Fire Hall	
Modelled Floor Area	11,485 ft ²	

	Reference Building	Proposed Building
Energy Performance Target(s)	BC Building Code 2018	
Reference Standard	NECB 2015	
Modelling Software	IESVE 2019.3.1.0	
Energy Modeling Guidelines	NECB 2015	
Climate Zone	NECB Climate Zone 5 Nearest Location: Nanaimo HDD: 3000 January 1% C: -8 July 2.5% Dry C: 27, Wet C: 19	
Weather File	Entrance Island CWEC 2016	
Envelope Performance		
Roof Effective R-value (h·ft²·°F/btu)	R31	R22 100 mm insulated metal panel
Exterior Walls effective R-value (h·ft²·°F/btu)	R20.4	R16.5 75mm insulated metal panel
Ground Contacting floor R-value (h·ft²·°F/btu)	F-0.88	F-1.26 (uninsulated)
Glazing percentage (%)	40%	21.66%
Overall Glazing Assembly U-value including frame (btu/h ft²·°F), and Solar Heat Gain Coefficient (SHGC)	Window: - U-0.39 - g-0.38	Metal Frame Fixed: U-0.38 Metal Frame Operable: U-0.46 Metal Frame Entrance Door: U-0.68 All: g-0.38
Door effective R-value (h·ft²·°F/btu)	R2.6	R2
Air leakage / airtightness (L/s/m2)	0.25	
Electrical Inputs and Internal Loads		
Lighting Power Density (LPD) (W/m2)	Meeting Room: 13.3 Locker Room: 8.1 Washroom: 10.5 Laundry: 6.5	Same as baseline

	Reference Building	Proposed Building
	Corridor: 7.1 Elec/Mech: 4.6 Stairwell: 7.4 Open Office: 10.6 Enclosed Office: 12 Workshop: 17.2 IT Room: 18.4 Lounge/Break Room: 7.9 Storage: 6.8 Dorm: 2.4 Fitness Room: 7.8 Apparatus Bay: 6.1	
Plug Loads (W/m ²)	Meeting Room: 1 Locker Room: 2.5 Washroom: 1 Laundry: 20 Corridor: 0 Elec/Mech: 1 Stairwell: 0 Open Office: 7.5 Enclosed Office: 7.5 Workshop: 10 IT Room: 200 Lounge/Break Room: 1 Storage: 1 Dorm: 2.5 Fitness Room: 1 Apparatus Bay: 0	Same as baseline
Occupancy (m ² /person)	Meeting Room: 5 Locker Room: 10 Washroom: 30 Laundry: 20 Corridor: 100 Elec/Mech: 200 Stairwell: 200 Open Office: 20 Enclosed Office: 20 Workshop: 30 IT Room: 100 Lounge/Break Room: 10	Same as baseline

	Reference Building	Proposed Building
	Storage: 100 Dorm: 1 person per dorm Fitness Room: 5 Apparatus Bay: 1000	
Internal Gain Schedule	Meeting Room: C Locker Room: * Washroom: * Laundry: C Corridor: * Elec/Mech: * Stairwell: * Open Office: A Enclosed Office: A Workshop: A IT Room: * Lounge/Break Room: B Storage: * Dorm: G Fitness Room: B Apparatus Bay: H *Typical schedule: NECB F	
Operating Schedules	Fire Hall in General: NECB F	
Mechanical System		
Heating/Cooling Plant	<u>Main Areas (meeting room, gear room, office, workshop, dorm, fitness area, day room):</u> Single zone packaged unitary rooftop heat pump Cooling COP: 4.09 Heating COP: 3 <u>Apparatus Bay:</u> System 4 – Single-zone make up air unit with electric baseboard heating <u>Misc. Spaces (mech/elec, storage, washroom, etc):</u>	<u>Main Areas (meeting room, gear room, office, workshop, dorm, fitness area, day room):</u> VRF fan coils served from condensing units Cooling COP: 3.28 Heating COP: 3 <u>Apparatus Bay:</u> Electric fan coil units <u>Misc. Spaces (mech/elec, storage, washroom, etc):</u> Electric baseboards

	Reference Building	Proposed Building
	System 4 – Single-zone make up air unit with electric baseboard heating	
Service hot water plant	Electric Water Heater	Electric Water Heater
DHW Load (W/person)	Meeting Room: 45 Locker Room: 0 Washroom: 0 Laundry: 60 Corridor: 0 Elec/Mech: 0 Stairwell: 0 Open Office: 90 Enclosed Office: 90 Workshop: 90 IT Room: 90 Lounge/Break Room: 60 Storage: 300 Dorm: 500 Fitness Room: 90 Apparatus Bay: 0	Same as baseline
Fans	Main areas - 0.75 W/cfm Apparatus Bay - 0.75 W/cfm Misc. Spaces - 0.3 W/cfm	Main areas - HRV: 0.75 W/cfm - Recirculation Fan: 0.3 W/cfm Apparatus Bay - Exhaust fan: 0.75 W/cfm - Recirculation fan: 0.3 W/cfm Misc. Spaces - Exhaust fan: 0.3 W/cfm
Heat Recovery	None	HRV (55% efficiency) for typical area
Ventilation rate	Based on ASHRAE 62.1-2001 Meeting Room: 3 L/s/m ² Locker Room: 2.5 L/s/m ² Washroom: 25 cfm per wc Laundry: 1.6 L/s/m ² Corridor: 0.25 L/s/m ² Elec/Mech: 0.25 L/s/m ² Stairwell: 0 L/s/m ² Open Office: 0.7 L/s/m ²	

	Reference Building	Proposed Building
	Enclosed Office: 0.7 L/s/m ²	
	Workshop: 3 L/s/m ²	
	IT Room: 0.25 L/s/m ²	
	Lounge/Break Room: 3 L/s/m ²	
	Storage: 0.75 L/s/m ²	
	Dorm: 0.35 ACH or 7.5 L/s/person, whichever is greater	
	Fitness Room: 3 L/s/m ²	
	Apparatus Bay: 7.5 L/s/m ²	

4. RESULTS AND ANALYSIS

Figure 2 shows the energy end-use breakdown of the proposed and baseline buildings. The major end-uses are lighting, fan and heating energy. No lighting saving or fan energy saving is claimed compared to the baseline. To compensate for envelope thermal performance in the proposed building, an HRV is used in the main areas to reduce the heating energy. As shown in the result, the proposed building's space heating energy is 16% lower than the baseline.

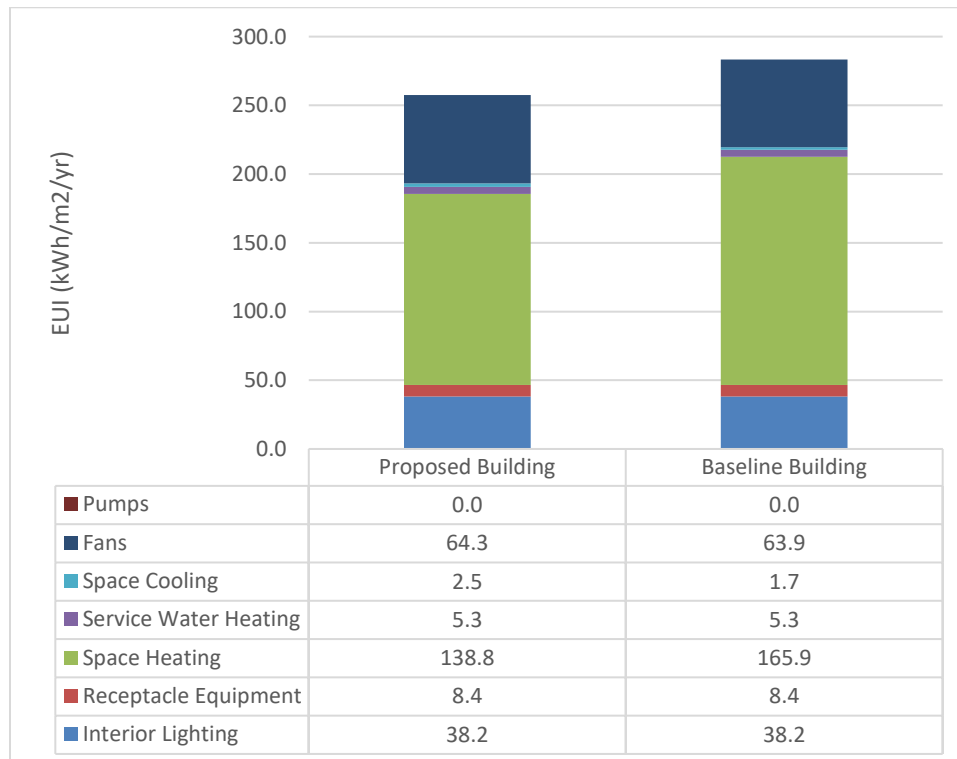


Figure 2: EUI Breakdowns of Proposed and Baseline Building

5. CONCLUSION

The proposed design complies with the NECB 2015 Building Energy Performance Compliance Path with 9% energy savings compared to the baseline model, primarily by using an HRV in the main areas.

Table 3: Energy Model Results

NECB 2015 Reference (kWh/m ² /year)	Proposed (kWh/m ² /year)	% Energy Savings
283	258	9%

END OF REPORT