

1 General

1.1 SUMMARY

1. This Section specifies the administrative and procedural requirements governing Allowances.
2. Type of Allowances include the following:
 1. Cash Allowances.

1.2 RELATED REQUIREMENTS

1. Other sections of the specification referring to this section, coordinate requirements of related sections and requirements.

1.3 DEFINITIONS

1. Cash Allowance: The words "PC Sum", "Prime Cost Sum", or "Expenditure Allowance" will be synonymous with the Term "Cash Allowance".
2. Contingency Allowance: Lump sum amounts for unforeseen services, products, or materials in addition to those specified.

1.4 SUBMITTALS

1. Submit proposals for purchase of products or systems included in Allowances, in the form specified for Change Orders.
2. Submit invoices or delivery slips to show actual quantities of materials delivered to site for use in fulfillment of each Allowance.

1.5 ADMINISTRATION

1. Each Allowance will be adjusted to actual cost as defined below and Change Order will amend Contract Price.
2. Progress payments for Work and material authorized under Allowances will be made in accordance with contract terms of payment.

1.6 CASH ALLOWANCE

1. Cash Allowances are lump sum amounts for materials, or materials and installation where quantity, quality, or design information is not known prior to Contract signing, and to cover costs for quality control, inspection, and testing.
2. Use Cash Allowance only as directed by Consultant for Owner's purposes, and only by Change Orders that indicate amounts to be charged to Allowance.
3. Materials Only: Change Orders authorizing use of funds from Cash Allowance for purchase of materials only shall include and provide payment for:
 1. Net cost of material.
 2. Applicable duties and taxes.
 3. Delivery to site.
 4. The following items do not form a part of Cash Allowance for purchase of materials, and shall be accounted for as a part of Contract Sum:
 1. Handling at site, including unloading, un-crating, storage and hoisting.
 2. Protection from damage by elements or otherwise.
 3. Labour for installation and finishing.
 4. Other expenses required to complete installation.
 5. Overhead and profit.
4. Materials and Installation: Change Orders authorizing use of funds from Cash Allowance for purchase of materials and installation shall include and provide payment for:

1. Net cost of material.
2. Applicable duties and taxes.
3. Delivery to site.
4. Handling at site, including unloading, un-crating, storage and hoisting.
5. Protection from damage by elements or otherwise.
6. Labour for installation and finishing.
7. Other expenses required to complete installation.
8. The following items do not form a part of Cash Allowance for purchase of materials and installation, and shall be accounted for as a part of Contract Sum:
 1. Overhead and profit.
5. Testing and Inspection: Change Orders authorizing use of funds from Cash Allowance for testing and inspections shall include and provide payment for:
 1. Cost of engaging testing agencies.
 2. Actual tests and inspections.
 3. Reporting of results.
 4. The following items do not form a part of Cash Allowance for testing and inspections.
 5. Incidental labour by Contractor required to assist testing agency.
 1. Costs for retesting if previous tests and inspections result in failure.
 2. Contractor will account for their incidental labour costs as a part of Contract Price.
6. Costs of services not required by Contract Documents are not included in Cash Allowance.
7. Credit unused amounts remaining in Cash Allowance to Owner by Change Order at Project closeout.

2 Products

2.1 PRODUCTS AND SYSTEMS

1. At earliest practical date after award of Contract, advise Consultant of date when final selection and purchase of each product or system described by an Allowance must be completed to avoid delaying Work.
2. At Consultant's request, obtain proposals for each Allowance for use in making final selections. Include recommendations that are relevant to performing Work.
3. Purchase products and systems selected by Consultant from designated supplier.

3 Execution

3.1 EXAMINATION

1. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

1. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related Work.

3.3 SCHEDULE OF ALLOWANCES

1. Contract Price includes Cash Allowance indicated below and is comprised of the following items:

Schedule of Cash Allowances		
Materials and Installation		
Emergency Generator Relocation		\$80,000.00
Door Hardware		\$50,000.00
Inspection and Testing		\$50,000.00
FF&E (Furniture, Fixtures & Equipment)		\$825,000.00
Signage		\$15,000.00
Welland Hydro		\$100,000.00
Collected amount of Cash Allowance is equal to:		\$1,120,000.00

3.4 SCHEDULING WORK COVERED BY ALLOWANCE

1. Comply with the following:
 1. Perform Work within Contract Time.
 2. Include Work in construction schedule.
 3. Consultant will supply Contractor with required documentation or information within time specified, or where such time is not specified, in sufficient time to permit construction schedule to be maintained.

3.5 PERFORMANCE OF WORK COVERED BY ALLOWANCES

1. Consultant will determine by whom and for what amounts Work covered by Allowances will be performed.
2. If not specified, Consultant will determine manner in which prices for Work covered by Allowances will be obtained.
3. When requested or specified, Contractor will assist the Consultant by identifying potential suppliers and Subcontractors and by obtaining prices for Work covered by Allowances.

3.6 CONTRACTOR'S RESPONSIBILITIES

1. Contractor's responsibilities for Work covered by Allowances shall be same as for other Work of this Contract.
2. On notification in writing of selection of supplier or Subcontractor by Consultant, Contractor will execute purchase agreement with designated supplier or enter into subcontract or amend existing subcontract with designated Subcontractor.

3.7 DETERMINATION OF ACTUAL COSTS

1. Actual cost of items included in an Allowance amount shall be determined by:
 1. Actual amount duly payable by Contractor to Subcontractor or suppliers, and
 2. Contractor actual cost of material and labour for Work performed by his own forces.
 3. Direct costs as specified in Supplementary Conditions and as listed above.
2. Trade discounts and refunds shall be credited to Owner.
3. Notwithstanding the foregoing, cash discounts, if any, on accounts paid by Contractor before net due. Contractor may retain date.

END OF SECTION

1 General

1.1 PROJECT START-UP MEETING

1. Schedule a project start-up meeting within fifteen (15) working days after date of commencement of the Contract and prior to commencement of activities at the Place of the Work.
2. Purpose: to review personnel assignments, responsibilities, and administrative and procedural requirements, including site safety plans.
3. Location: Hold project start-up meeting at project's site or as otherwise indicated.
4. Minutes: Consultant will record minutes, will chair the meeting, and distribute minutes to parties of record prior to the next scheduled meeting.
5. Attendees:
 1. Contractor's Representatives: Contractor's senior management, project manager, site superintendent, representatives of major Subcontractors, and others, as necessary.
 2. Consultant's Representatives: as determined by Consultant.
 3. Owner's Representatives: as determined by Owner.
6. Agenda:
 1. Introduction of Owner's, Consultant's and Contractor's representatives.
 2. Review of significant contractual responsibilities and administrative and procedural requirements.
 3. Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
 4. Review of Owner's site safety requirements.
 5. Review of Owner's site orientation requirements.
 6. Review of Subcontractor Proposed Substitutions.
 7. Scheduling and coordination of Work, including the following:
 1. Essential services to be maintained to existing building, during renovation Work throughout stages of the Work.
 2. Safe entry and egress to be maintained.
 3. Establishing emergency procedures.
 4. Verification of closures required.
 5. Verification of requirements for fire safety and construction safety to be maintained.
 6. Noise and dust control, with regard to normal building operations.
 7. Verification of site access, storage areas and parking relative to Contractor's forces.
 8. Scheduling of critical shutdowns and changeovers
 9. Scheduling of demolition Work.
 8. Appointment of official representative of participants in Work.
 9. Progress scheduling in accordance with Section 01 32 00 – Schedules.
 10. Schedule of submission of shop drawings, samples, and colour chips in accordance with Section 01 33 00 – Submittal Procedures.
 11. Requirements for temporary facilities, site sign, offices, storage sheds, utilities, and fences in accordance with Section 01 50 00 – Temporary Facilities and Controls.
 12. Delivery schedule of specified equipment in accordance with Section 01 32 00 – Schedules.
 13. Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, and administrative requirements.
 14. Submission of Record Documents in accordance with Section 01 78 39 – Project Record Documents.
 15. Submission of maintenance material and data in accordance with Section 01 78 23 – Operation and Maintenance Data.

16. Take-over procedures, acceptance, and warranties in accordance with Section 01 77 00 – Closeout Procedures.
17. Monthly progress claims, administrative procedures, photographs, and holdbacks.
18. Appointment of inspection and testing agencies or firms in accordance with Section 01 45 00 – Quality Control.
19. Insurances and transcript of policies.
20. Other business.

1.2 PRE-DEMOLITION MEETINGS

1. Schedule a pre-demolition meeting prior to any activities affecting the selective demolition of building and site components. This meeting may be concurrent with pre-construction meeting.
2. Purpose: to review methods and procedures related to selective demolition, safe Work practices, and identify materials retained by Owner, if any.
3. Location: Identify Constructor's, Owner's, or Consultant's Offices, or some other location.
4. Minutes: Consultant will record minutes, will chair the meeting, and distribute minutes to parties of record prior to the next scheduled meeting.
5. Attendees:
 1. Contractor's Representatives: Contractor's project manager, site superintendent, representatives of Subcontractors affecting or affected by demolition Work, and others as necessary.
 2. Consultant's Representatives: As determined by Consultant.
 3. Owner's Representatives: as determined by Owner.
6. Agenda:
 1. Inspect and discuss condition of existing construction affected by selective demolition.
 2. Review structural load limitations of existing structure.
 3. Review demolition plan prepared by Contractor's professional engineer where applicable to demolition.
 4. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 5. Review requirements of Work performed by other trades that rely on substrates exposed by selective demolition operations.

1.3 PRE-CONSTRUCTION MEETINGS

1. Schedule preconstruction meetings required by technical specification sections referring to this section a minimum of one (1) week before starting affected work.
2. Purpose: to discuss coordination and installation requirements for materials and assemblies installed by different sections of the work, and to confirm rough-ins, special installation requirements, clearances, material compatibility, protection of installed materials or assemblies, and similar issues.
3. Location: Contractor's site offices.
4. Minutes: Consultant will record minutes, will chair the meeting, and distribute minutes to parties of record prior to the next scheduled meeting.
5. Attendees:
 1. Contractor's Representatives: Contractor's senior management, project manager, site superintendent, representatives of Subcontractors affecting building envelope construction, and others, as necessary.
 2. Consultant's Representatives: as determined by Consultant.
 3. Owner's Representatives: as determined by Owner.
6. Agenda:

1. Introduction of Consultants supplier's, manufacturer's, Subcontractor's or other affected individual's concerns for constructability, compatibility, or coordination.
2. Review of proposed materials and methods of construction to address stated concerns, specification and drawing requirements, and any requirements for mock-ups or sample assemblies.

1.4 LEED® COORDINATION MEETINGS

1. Schedule a series of meetings attended by Contractor, Subcontractors and suppliers at key milestones, and occurring prior to construction closeout activities; meetings can be concurrent with regular progress meetings.
2. Purpose: To review progress against LEED® submittals and onsite activities performed during work on site.
3. Location: Same location as Construction Progress Meetings listed later in this Section.
4. Attendees:
 1. Contractor's Representatives: Contractor's LEED® Champion, project manager and site superintendent, and representatives of Subcontractors affected by LEED® project requirements, and others as necessary.
 2. Consultant's Representatives: As determined by Consultant.
 3. Owner's Representatives: as determined by Owner.
5. Minutes: Contractor will chair meeting and record actionable items in minutes for LEED® Coordination Meetings.
6. Agenda:
 1. Review of LEED® Checklist requirements and submissions received to date.
 2. Review of Owner's anticipated credits based on current submissions.
 3. Other business.

1.5 CONSTRUCTION PROGRESS MEETINGS

1. Schedule regular construction progress meetings during the course of the Work.
2. Purpose: to monitor construction progress, site safety performance, and to identify problems and action required for their solution, to expedite the Work.
3. Frequency: Every two (2) weeks, or as otherwise directed by Consultant.
4. Minutes: Contractor will record minutes, will chair the meeting, and distribute minutes to parties of record within 5 business days of the meeting.
5. Location: Contractor's site office.
6. Attendees:
 1. Contractor's Representatives: Contractor's project manager and site superintendent, and Subcontractors, suppliers and other parties involved in the Work when requested. Contractor's and Subcontractor's representatives shall be qualified and authorized to act on behalf of the party each represents.
 2. Consultant's Representatives: as determined by Consultant.
 3. Owner's Representatives: as determined by Owner.
7. Agenda:
 1. Review and approval of minutes of previous meeting.
 2. Review of items of significance that could affect progress.
 3. Review of LEED® project requirements and submittal documentation.
 4. Review of Work progress since previous meeting.
 5. Site observations, problems, conflicts.
 6. Problems which impede construction schedule.

7. Review of off-site fabrication delivery schedules.
8. Corrective measures and procedures to regain projected schedule.
9. Revision to construction schedule.
10. Progress schedule, during succeeding Work period.
11. Review submittal schedules: expedite as required.
12. Maintenance of quality standards.
13. Review proposed changes for affect on construction schedule and on completion date.
14. Review site safety and security issues.
15. Other topics for discussion as appropriate to current status of the Work.

1.6 COMMISSIONING MEETINGS

1. Coordinate requirements of commissioning meetings with Section 01 91 13 – General Commissioning Requirements and Section 01 81 13 – Sustainable Design Criteria.
2. Commissioning Kick-Off Meeting:
 1. Commissioning Agency (CxA) will schedule a commissioning kick-off meeting shortly after award of Contract; this meeting will be separate from the other meetings specified in this Section.
 2. Purpose: Outline the commissioning process and identify the roles and responsibilities of each team member in the commissioning process during the construction phase.
 3. Location: Determine preferred location of meeting, can be the CxA's offices or the Contractor's offices.
 4. Attendees: Contractor's representatives, affected Subcontractor's representatives, Consultant, Subconsultants, Owner and their operations and maintenance personnel.
 5. Agenda:
 1. Review specific equipment submittals for systems that will be commissioned to verify that equipment used to establish the Contract Price comply with the design intent.
 2. CxA will identify commissioning related milestones in the order they are to be completed; these commissioning milestones shall be incorporated into Contractor's Construction Schedule.
 6. Minutes: CxA will record minutes and distribute copies to attendees and other identified parties prior to the start of the first regularly schedule commissioning meeting.
3. Scheduled Commissioning Meetings:
 1. CxA will schedule regular commissioning coordination meetings throughout the construction phase, timing and duration will be determined at the first meeting.
 2. Purpose: To convey the importance of the commissioning process, to provide notice for upcoming commissioning milestones, and identify any outstanding issues or adjustments to systems or assemblies required to meet indicated performance values.
 3. Attendees: Contractor's representatives, affected Subcontractor's representatives, Consultant, Subconsultants, Owner and their operations and maintenance personnel.
 4. Agenda:
 1. Confirmation that Consultants have reviewed submittals and identify CxA's verification test procedures and system readiness checklists for the equipment that will be installed.
 2. Review the TAB reports to verify that all systems have been accurately balanced and are operating within the specified design parameters and identify any outstanding requirements or deficiencies.
 5. Minutes: CxA will record minutes and distribute copies to attendees and other identified parties prior to the start of the next regularly scheduled commissioning meeting.

1.7 WARRANTY MEETINGS

1. Warranty meetings shall be held between Substantial Performance of the Work and the completion of the Warranty period.
2. Purpose: to bring to Contractor's attention Contract Deficiencies identified during warranty period, determine action required for their correction, and monitor progress of Contract Deficiency correction.
3. Frequency: called by Owner on an as-needed basis.
4. Location: as agreed to between Owner and Contractor.
5. Minutes: Contractor will record minutes, will chair the meeting, and distribute minutes to parties of record prior to the next scheduled meeting.
6. Attendees: same as construction progress meetings.
7. Agenda:
 1. Review and approval of minutes of previous meetings.
 2. Review of progress of Contract Deficiency corrections.
 3. Identification of problems impeding Contract Deficiency correction.
 4. Review of outstanding Contract Deficiencies and year-end Warranty items.
 5. Other business.

2 Products

2.1 NOT USED

3 Execution

3.1 NOT USED

END OF SECTION

1 General

1.1 SUMMARY

1. This Section specifies requirements for supply, fabrication, factory finishing and delivery to the job site, and installation of shop manufactured casework indicated on the drawings including, but not limited to, the following:
 1. Decorative laminate finished casework and cabinets.
 2. Hardware forming a part of casework and cabinets fabricated by this Section.
 3. Decorative laminate finished countertops.
 4. Solid surfacing material countertops.
 5. Shelving.
 6. Shop finishing of casework, cabinets, and countertops.
 7. Structural supports incorporated into casework.

1.2 RELATED REQUIREMENTS

1. Other sections of the specification referring to this section, coordinate requirements of related sections and requirements.

1.3 REFERENCE STANDARDS

1. All reference standards specified herein imply the latest edition of the standard.
2. American National Standards Institute (ANSI):
 1. ANSI A208.2-2009, Medium Density Fiberboard (MDF)
3. American Society for Testing and Materials (ASTM International):
 1. ASTM D1037-12(2020), Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials
4. Canadian General Standards Board (CGSB):
 1. CAN/CGSB 19.13-M87, Sealing Compound, One Component, Elastomeric, Chemical Curing
5. Canadian Standards Association (CSA Group):
 1. CSA O121-17, Douglas Fir Plywood
 2. CSA O141-05 (R2019), Softwood Lumber
 3. CSA O151-17, Canadian Softwood Plywood
6. National Electrical Manufacturers Association (NEMA):
 1. ANSI/NEMA LD 3-2005, High-Pressure Decorative Laminates (HPDL)
7. North American Architectural Woodwork Standards (NAAWS) 4.0.

1.4 ADMINISTRATIVE REQUIREMENTS

1. Coordination: Architectural woodwork Subcontractor and the Contractor are jointly responsible for the following items:
 1. Coordinate delivery of casework components at a time when building and storage areas are sufficiently dry so that the casework will not be damaged by excessive changes in moisture content.
 2. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that interior casework can be supported and installed including, but not limited to, the following:
 1. Metal support brackets and fittings that are part of building structure.
 2. Plumbing, electrical fixtures and telephone equipment

1.5 SUBMITTALS

1. Provide required information in accordance with Section 01 33 00 – Submittal Procedures.
2. Action Submittals: Provide the following submittals before starting any work of this Section:
 1. Product Data: Submit product data for each type of product indicated including, but not limited to, the following:
 1. Cabinet hardware and accessories.
 2. Finishing materials and processes.
 3. Manufactured medium density fibreboard.
 4. High pressure decorative laminate and adhesive for bonding decorative laminate.
 5. Low pressure decorative laminate.
 6. Solid surfacing materials.
 2. Shop Drawings: Submit shop drawings indicating location of each item referenced to actual site dimensions, dimensioned plans and elevations, large scale details and thickness of materials, attachment devices, scribe strip locations, locations of exposed fastenings and other components as applicable to the work of this Section and as follows:
 1. Show details full size.
 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 3. Show locations and sizes of cut outs and holes for plumbing fixtures, faucets, and other items installed in casework.
 4. Submittals prior to fabrication; do not fabricate any work until required submittals are reviewed and accepted by the Consultant.
 3. Samples for Verification: Submit two (2) samples prior to fabrication of casework as follows; accepted samples will form the standard of acceptance for the remainder of the work:
 1. High Pressure Decorative Laminate Clad Panel Products:
 1. Laid-up on specified core material, 300 mm x 300 mm for each type, colour, pattern, and surface finish.
 2. Low Pressure Decorative Overlay (Melamine) Surfaced Panel Products:
 1. Laid-up on specified core material, 300 mm x 300 mm for each type, colour, pattern, and surface finish.
3. Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 81 13 – Sustainable Design Criteria.

1.6 PROJECT CLOSEOUT SUBMISSIONS

1. Operation and Maintenance Data: Submit copies of manufacturer's written maintenance information for inclusion in operations manual in accordance with Section 01 78 23 – Closeout Submittals; provide specific warning of any maintenance practice or material that may damage or disfigure finished Work.

1.7 QUALITY ASSURANCE

1. Qualifications: Provide proof of qualifications when requested by Consultant:
 1. Project Quality Standard: North American Architectural Woodwork Standards (NAAWS) published by the Architectural Woodwork Manufacturers Association of Canada, together with authorized additions and amendments will be used as a reference standard and forms part of this project specification, and as follows:
 1. Modifications made in this Section that change the requirements of the NAAWS will govern in case of conflict.

2. References to Custom or Premium Grade in this specification are as defined in the NAAWS; any item not given a specific quality grade will be Premium Grade as defined in the NAAWS.
 3. Provide a copy of the NAAWS for reference purposes on the job site.
 4. References in this specification to part and item numbers mean those parts and items contained within the NAAWS.
2. Installer: An experienced installer who has completed casework similar in material, design, and extent to that indicated and whose work has resulted in construction with a record of successful in-service performance.
3. Fabricator: A firm experienced in producing casework similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

1.8 DELIVERY STORAGE AND HANDLING

1. Delivery and Acceptance Requirements: Deliver woodwork materials only when building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period, as follows:
 1. Deliver, store, and handle casework in accordance with NAAWS.
 2. Delivered materials that are damaged in any way or do not comply with these specifications will be rejected by the Consultant; remove rejected materials from job site and replace with acceptable materials.
2. Storage and Handling: Store products in strict accordance with fabricator written instructions for storing and handling architectural woodwork.

1.9 SITE CONDITIONS

1. Site Measurements: Verify dimensions by site measurements before fabrication and indicate measurements on Shop Drawings where casework is indicated to fit walls and other construction; coordinate fabrication schedule with construction progress to avoid delaying the Work; locate concealed framing, blocking, and reinforcements that support woodwork by site measurements before being enclosed and indicate measurements on Shop Drawings.
2. Established Dimensions: Establish dimensions and proceed with fabricating casework without confirmed site measurements where site measurements cannot be made without delaying the Work; coordinate with the construction to ensure that actual dimensions correspond to established dimensions; allow for trimming and fitting.
3. Ambient Conditions: Maintain area or room in which casework is being installed at a uniform temperature and humidity for 24 hours prior to, during and after installation in accordance with NAAWS for relative humidity and moisture content; provide additional lighting to maintain a minimum of 430 lx on surfaces and areas where casework is being installed.

2 Products

2.1 PERFORMANCE REQUIREMENTS

1. Governing Standards: Products and installation described in this section are governed by exterior application and usage described in NAAWS 4.0, and the listed reference standards indicated in this Section and related requirements.

2.2 MATERIALS

1. Use clean stock for each type of woodwork and quality grade specified in accordance with NAAWS.

2. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 8% moisture content.
3. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage:
 1. Provide nonferrous metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance.
 2. Provide toothed steel or lead expansion sleeves for drilled-in-place anchors.
4. Lumber Materials: Provide lumber materials meeting requirements for moisture content and Premium Grade in accordance with NAAWS, and as follows:
 1. Non-Exposed Softwood: Fabricator's option, meeting requirements of CSA O141, kiln dried; dressed 4 sides.
5. Panel Materials: Provide panel materials meeting requirements for moisture content and Premium Grade in accordance with NAAWS, and as follows:
 1. Industrial Particleboard: To ANSI A208.1 Grade M-2 for interior use, minimum 720 kg/m³ density and Grade M-3, minimum 750 kg/m³ particleboard for countertops and shelves; clearly mark panels with grade mark in visible location, extruded particleboard having loose cores with voids will not be permitted; having no added urea formaldehyde; and as follows:
 1. Acceptable Products:
 1. Vesta Particleboard, Flakeboard.
 2. Purekor Platinum Particleboard, Panel Source International.
 3. Encore SDF Sustainable Particleboard, SierraPine Ltd.
 2. Medium Density Fibreboard (MDF): To ASTM D1037 and ANSI A208.2, Premium Grade for interior use, minimum 700 kg/m³ density: formaldehyde emissions shall be 0.30 ppm or less per 0.424m²/m³ of room volume:
 1. Acceptable Products:
 1. Medex and Medite II MDF, SierraPine Ltd.
 2. Flakeboard Premier MDF, Flakeboard.
 3. Softwood Plywood: To CSA O121 or CSA O151, cross-banded, sanded G2S, thickness as indicated.
6. Decorative Laminate Finishes: Grades and applications in accordance with NAAWS, and as follows:
 1. High Pressure Decorative Laminate (HPDL): To CAN/CSA A172 or ANSI/NEMA LD3 composed of phenolic resin impregnated Kraft paper filler stock for Class 1 Decorative Laminate of Grade required by woodwork quality standard, colour through, and as follows:
 1. Self-Edging Work: General Purpose Grade, HGS standard duty.
 2. Liner Sheet Work: Same as for self-edging work
 3. Backing Sheet Work: BKL backing material, thickness as recommended by manufacturer to prevent warpage of surfaces, sanded on one side; furniture finish, solid white colour.
 4. Basis-of-Design Products: Refer to Drawing A141 – Finishes Plan.
 5. Additional Acceptable Products Manufacturers:
 1. Panolam Inc.
 2. Formica Corporation.
 3. Wilsonart LLC.

2. Low Pressure Decorative Laminate (LPDL): minimum 0.5 mm low pressure decorative laminate (melamine) overlay, decorative paper, and phenolic resin impregnated kraft paper with fibre reinforcing inner layers.
 1. Basis-of-Design Products: Refer to Drawing A141 – Finishes Plan.
 2. Additional Acceptable Products Manufacturers:
 1. Panolam Inc.
 2. Formica Corporation.
 3. Wilsonart LLC.
3. Solid Surfacing Material: Homogeneous 25 mm solid sheets of filled plastic resin complying with material and performance requirements in CAN/ULC S102, food zone use passing NSF 51 sanitation requirements, without a pre-coated finish, and as follows:
 1. Acceptable Products:
 1. Avonite, Inc., Avonite
 2. DuPont Polymers, Corian.
 3. Formica Corporation, Surell.
 4. Wilsonart International, Gibraltar.
4. Edge finishing for doors, drawer fronts, shelves, and false fronts:
 1. HPDL to match face.
 2. LPDL to match face.
5. Adhesives:
 1. Decorative laminate: polyvinyl acetate or aliphatic resin in accordance with manufacturer's recommendation for curing under pressure for bonding to wood cores, water resistant type.
 2. Edge banding: Thermoplastic hot melt, synthetic resin suitable for applying thin veneer wood edge banding and film overlays.

2.3 CASEWORK HARDWARE

1. Casework Hardware: Provide cabinet hardware described in this Section in quantity required, with necessary screws, bolts, washers for complete installation, and as follows:
 1. Fasteners:
 1. Draw Bolt Fasteners: Mitre butt joint fastener, adjustable and requiring no special tools for installation, galvanized.
 2. Non-exposed Fasteners: Fabricator's choice consistent with quality level specified.
 3. Exposed Fasteners: Architectural appearance, material, finish, and fastener tool type as selected by Consultant; coordinate sample submittals before ordering materials.
 2. Pulls:
 1. Wire Pulls: ADOA approved stainless steel wire pulls with nominal 100 mm centres and back plates to prevent pull out, and as follows:
 1. Acceptable Products:
 1. CBH 220-101
 2. Häfele America Co. 115.61.601
 3. Hettich Canada LP Columbus 41, 1170 122 406320
 4. Richelieu, Collection BP33205170
 5. Stanley 4484 x 101
 3. Drawer Slides: Following list of drawer slides is provided to indicate general conformance requirements only; notify the Consultant where drawer width, height or intended use differs from that indicated in the general descriptions and the requirements of the manufacturer; coordinate sample submittals before ordering materials, and as follows:

1. Low Height Drawers (≤ 150 mm): $\frac{3}{4}$ extension, rail mount, length to suit drawer box, 406 mm maximum drawer width, 22 kg capacity, side mounting with positive stop and hold-in detent features, zinc finish, and as follows:
 1. Acceptable Products:
 1. Accuride 2037.
 2. Hettich Canada LP KA3434.
 3. Häfele Canada Inc.
 4. Knappe & Vogt 8150.
 2. High Height Drawers (≥ 150 mm, ≤ 305 mm): Full extension, length to suit drawer box; 406 mm maximum drawer width, 45 kg capacity, side mounting with positive stop, self closing, hold-in detent, and silencer features, zinc finish, and as follows:
 1. Acceptable Products:
 1. Accuride 3834.
 2. Hettich Canada LP KA5632.
 3. Häfele Canada Inc.
 4. Knappe & Vogt 8400.
4. Hinges:
 1. Typical Cabinet Doors: Concealed, euro-style hinge with cover caps; fully adjustable for overlay, depth, height and closing force; opening angle of 110° , self-closing feature; nickel plated steel construction; overlay and half overlay mounting, size, and profile to suit cabinet construction, and as follows:
 1. Acceptable Products:
 1. Julius Blum Canada Ltd., Modul and Expando Series.
 2. Hettich Canada LP, Interamat Soft 9943 Series.
 3. Häfele America Co., H-Series.
5. Shelf Rests:
 1. Stainless Steel Pins: Steel pin shelf supports:
 1. Acceptable Products:
 1. Richelieu, Product No. 2291180.

2.4 ACCESSORIES

1. Shelving and Rods:
 1. Shelving: Closet shelving manufactured from any of the panel materials specified above.
 2. Shelf Brackets: To BHMA A156.9, powder-coat finished steel.
 3. Rods: Metal rod, minimum 33 mm diameter, aluminum complete with end bracket supports.
2. Sealant: One (1) part silicone to CAN/CGSB-19.13, non-staining, mould, and mildew resistant, refer to Section 07 92 00 – Joint Sealants.
3. Steel Supports: Refer to Section 05 50 00 – Metal Fabrications.
4. Spacers: Rigid PVC to size and profile indicated.
5. Hardware: Bolts, nuts, washers, screws, etc., hot-dip heavy zinc-coated.
6. Light Valance: Fabricated from same materials as casework doors to dimensions indicated, fully support by continuous aluminum seat angles.

2.5 CASEWORK FABRICATION

1. Fabricate casework in accordance with requirements NAAWS as applicable and as modified by this Section and Drawings.

2. Casework for High-Pressure and Low-Pressure Decorative Laminate Finish:
 1. NAAWS Quality Grade Premium Locations: As indicated on Drawings.
 2. Exposed Exterior Parts:
 1. Core: MDF.
 2. Finish: HPDL as indicated in Finishes Legend on Drawings.
 3. Exposed Interior Parts:
 1. Core: MDF.
 2. Finish: LPDL as indicated in Finishes Legend on Drawings.
 4. Semi-Exposed Parts:
 1. Core: MDF
 2. Finish: Liner Grade HPDL as indicated in Finishes Legend on Drawings
 5. Concealed Parts:
 1. Core: Same as Semi-Exposed Parts.
 2. Finish: Backer Grade HPDL at option of fabricator for balanced finish.
 6. Edge Banding for Shelves: Finished on all four (4) edges and as follows:
 1. High Pressure Decorative Laminate for HPDL Finished Surfaces: Colour to match with surface finish.
 7. Edge Banding for Doors, Drawers and False Fronts: Finished on all four (4) edges and as follows:
 1. High Pressure Decorative Laminate for HPDL Finished Surfaces: Colour to match with surface finish.
 8. Edge Banding Adhesive: Thermoplastic hot melt, synthetic resin suitable for applying thin veneer wood edge banding and film overlays.
 9. Fabricate doors and drawer fronts using flush overlay; fabricate drawers in accordance with NAAWS requirements for Grade indicated.
3. Solid Surface Countertops: Install solid surface countertops using skilled trades specializing in the type of work indicated, cut solid surface accurately to conform to shape and dimensions required with exposed surfaces true, and as follows:
 1. Perform cutting and drilling not provided by supplier.
 2. Do not use impact or hammer drills; use only diamond drill bits.
 3. Carefully cut and fit edges and grind to a perfect fit in a manner that does not impair strength or appearance.
 4. Machine polish exposed edges; do not use waxes, sealers or coatings.
 5. Patching or other forms of concealment to cover defects in material or workmanship will not be permitted.
 6. Identify the rift or pattern direction on a concealed surface of each unit. Panels shall be cut generally parallel to the rift and panels shall be cut in the same direction.
 7. Backsplash to Countertop Transition: Square splash joint.
4. Construct casework using minimum core thickness for materials listed in this section; adjust thickness of shelves to allow for uniformly distributed loading of 90 kg with a concentrated load of 23 kg and length for maximum of L/140 deflection in full use:
 1. Assemble casework with flush butt hairline corners and joints; make cut outs for services on site during installation.
 2. Carefully fit, cope, or mitre joints and glue with no end wood visible on finished surfaces
 3. Make blocking, framing, web frames from solid lumber.
 4. Provide solid wood edge strips in doors and cases to receive hardware, rebate, and pressure glue to core.

5. Cut and adapt casework to receive hardware; install finishing hardware and fittings in shop, except that fittings that may be susceptible to damage during shipping and installation may be installed after casework is installed on site.
5. Glue, dowel, mortise, lock joint or dado casework; do not use staples; nailing and screws are acceptable; do not surface nail or screw through countertops:
 1. Set nail heads in finished surfaces; countersink screws and bolt; unless specifically detailed on Drawings as being exposed; fill holes with edge grain wood plugs to match colour and grain.

3 Execution

3.1 EXAMINATION

1. Visit site and note state of completion within various areas in which casework is being installed; verify that surfaces are ready to receive work of this Section and that other work is finished and painted before being built over or covered in any way by installed casework:
 1. Verify that areas in which casework is scheduled are finished and ready to accept work of this Section; with walls painted, ceilings finished, overhead services completed, tested, and accepted.
 2. Starting work will be considered as acceptance of conditions.

3.2 PREPARATION

1. Confirm access is sufficient for large pieces of casework, and that they can be transported easily and safely to final installation location.
2. Protect adjacent finished surfaces and materials from damage by work of this Section.
3. Back prime casework immediately after delivery to site.

3.3 INSTALLATION

1. Install fabricated woodwork plumb, level and true to locations indicated on Drawings and in accordance with NAAWS.
2. Anchor to floor, walls or ceiling using fastening devices and hardware consistent with materials being fastened into and quality of finish, and as follows:
 1. Do not use wood plugs.
 2. Do not use plastic plugs for ceilings or walls.
 3. Provide wall cleats fastened to wall blocking as required.
 4. Shim level and square in relation to adjoining surfaces.
 5. Scribe accurately to adjacent work.
 6. Provide allowance for finish flooring installation to base by related sections of work.
 7. Set on steel support framing; coordinate fabrication requirements with Section 05 50 00 – Metal Fabrications.
3. Scribe neatly and accurately to smooth snug fit with adjoining surfaces and materials to align work properly, mitre corners accurately.
4. Perform cutting, fitting, repairing in woodwork as required by other trades where their Work is connected to or part of this Work.
5. Cut out openings for mechanical and electrical fittings and fixtures; coordinate and cooperate with mechanical and electrical work and obtain required templates, cutting locations and dimensions.
6. Apply neat bead of sealant between plumbing fixtures countertops and adjoining walls and casework; seal edges of cut out core material before fixtures installed with moisture resistant compound.
7. Install any finishing hardware shipped loose.

8. Install solid surface countertop to casework units as follows:
 1. Install components plumb and level, in accordance with shop drawings and manufacturers written installation requirements.
 2. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
 3. Adhere under mount sinks to countertops using manufacturer's recommended adhesive and mounting hardware.
 4. Install backsplashes and end splashes as indicated on Drawings; adhere to countertops using manufacturer's standard colour matched silicone sealant.
9. Coordinate plumbing and electrical connections with Division 22 and Division 26.

3.4 CLOSEOUT REQUIREMENTS

1. Adjusting:
 1. Replace, rework, or refinish work that does not meet NAAWS requirements as directed by Consultant and at no additional cost to Owner.
 2. Adjust hardware and operating parts during and after installation to provide smooth and proper operation of casework components.
2. Cleaning:
 1. Clean casework, cabinets, countertops, shelves, and fixtures, and remove marks, scratches or marring on exposed and semi-exposed surfaces after work of this Section is complete and prior to Substantial Performance for the project.
3. Protection:
 1. Protect installed products and components from damage during construction.
 2. Protect surfaces from damage until date of Substantial Performance of the Work.

END OF SECTION

1 General

1.1 SUMMARY

- .1 This Section includes supply and installation of a self-adhering modified bitumen waterproofing for foundation walls, complete with primer, drainage board, and protection course required for a complete system installation.

1.2 RELATED REQUIREMENTS

- .1 Section 07 21 13: Board Insulation
- .2 Section 07 55 56.13: Hot-Rubberized Asphalt Protected Membrane Roofing
- .3 Section 31 23 33: Excavation, Trenching and Backfilling
- .4 Section 33 46 19: Underslab Drainage Systems

1.3 REFERENCE STANDARDS

- .1 American Society for Testing and Materials (ASTM):
 - .1 ASTM D412-06a(2013), Standard Test Method for Vulcanized Rubber and Thermoplastic Elastomers - Tension
 - .2 ASTM D882-12, Standard Test Method for Tensile Properties of Thin Plastic Sheet
 - .3 ASTM D1970/D1970M-15a, Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
 - .4 ASTM E96/E96M-15, Standard Test Methods for Water Vapour Transmission of Materials
 - .5 ASTM E154/E154M-08a(2013)e1, Standard Test Methods for Water Vapour Retarders Used in Contact with Earth Under Concrete Slabs, on Walls or as Ground Cover

1.4 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Action Submittals:
 - .1 Product Data:
 - .1 Submit copies of the most current technical data sheets, describing materials physical properties, and explanations about product installation, including installation techniques, restrictions, limitations and other manufacturer recommendations.
 - .2 Submit membrane manufacturer's standard details that will be utilized for this project, indicate changes that must be made to make the details project specific for review by the Consultant.
 - .2 Samples: Provide samples of all materials required for work of this Section.
 - .3 Safety Data Sheets: Submit WHMIS safety data sheets for inclusion with project record documents. Keep one copy of WHMIS safety data sheets on Site for reference by workers.

1.5 QUALITY ASSURANCE

- .1 Subcontractor executing work of this Section shall have a minimum of five (5) years continuous Canadian experience in successful application of bituminous sheet membrane waterproofing work of type as indicated on drawings and specified herein. Submit proof of experience upon Consultant's request.

- .2 All membrane waterproofing products to be manufactured by or, approved by one manufacturer, which includes but is not limited to the following:
 - .1 Primers,
 - .2 Mastics and membranes,
 - .3 Asphaltic protection boards,
 - .4 Composite drainage boards,
 - .5 Expansion joint membranes.
- .3 Work of this Section shall be executed by workers especially trained and experienced in this type of work. Have a full time, senior, qualified representative at the Site to direct the work of this Section at all times.
- .4 Subcontractor executing work of this Section shall ensure that manufacturer's representative shall inspect substrates prior to commencement of work of this Section, during application of bituminous sheet membrane waterproofing and upon completion of work of this Section.
- .5 Subcontractor executing work of this Section shall ensure that manufacturer's representative shall provide technical assistance to applicator and assist where required in correct application of bituminous sheet membrane waterproofing materials.
- .6 Submit copies of the membrane manufacturer's current ISO certification including the manufacturing of the membrane, primer, mastics, adhesives and asphaltic protection board.

1.6 PREINSTALLATION MEETING

- .1 Arrange a preconstruction meeting in accordance with Division 1 requirements.
- .2 Review requirements for waterproofing, including surface preparation specified under other Sections, substrate condition and pre-treatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.7 STORAGE, DELIVERY, HANDLING AND PROTECTION

- .1 Coordinate deliveries to comply with construction schedule and arrange ahead for strategic off the ground, under cover storage area. Do not load any area beyond the design limits.
- .2 Material shall be carefully checked, unloaded, stored and handled to prevent damage. Protect materials with suitable waterproof coverings.
- .3 Deliver and store waterproofing materials in the manufacturer's original containers and wrappers with seals intact.
- .4 Store solvent based materials in safe areas well away from open flames or excessive heat.
- .5 Do not permit materials to freeze. Store materials at temperatures above 10 deg C.
- .6 Do not permit traffic of any kind over unprotected waterproof membranes. Do not allow backfill to be placed against unprotected waterproof membranes. Apply drainage board/protection board as soon as possible after installation of membrane.

1.8 COMPATIBILITY

- .1 All waterproofing membranes materials must be provided by the same manufacturer to ensure compatibility between products used for the different applications identified in this Section.

1.9 PROJECT CONDITIONS

- .1 Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer.

- .2 Apply waterproofing to dry substrates, when relative humidity is less than 85%, and when surface and ambient temperatures are 4 deg C above dew point.
- .3 Do not apply waterproofing in snow, rain, fog or mist, or when such weather conditions are imminent during application and curing period.
- .4 Maintain adequate ventilation during application and curing of waterproofing materials.

1.10 WARRANTY

- .1 Warrant that the work of this Section shall remain free from leaks and from defects in materials and workmanship in accordance with the Contract Requirements, but for a period of five (5) years. Promptly make good defects within the warranty period without cost to the Owner.
 - .1 Warranty is inclusive for procedures to gain access to waterproofing membrane including removal and reinstallation of earthwork, protection board, drainage panels, and insulation.

2 Products

2.1 MANUFACTURERS

- .1 Compatibility: Verify that waterproofing systems identified in this Section are provided by a single manufacturer to ensure compatibility at intersections. Multiple manufacturers providing waterproofing systems on this project will not be accepted.
- .2 Provide a written declaration to the Consultant, from the waterproofing manufacturer, that the waterproofing materials and components are compatible, and that warranty period specified in paragraph 1.11 will be upheld at junctions between waterproofing systems required to waterproof the areas outlined in the Specifications and Drawings.
- .3 Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - .1 Henry Company
 - .2 Hydrotech
 - .3 Grace Construction Products
 - .4 W.R. Meadows

2.2 MATERIALS

- .1 Bituminous Sheet Membrane:
 - .1 Self adhesive sheet membrane, SBS modified bitumen complete with a cross laminated polyethylene film. Tested to CCMC 13297-R and contains the following properties:
 - .1 Thickness: 1.5 mm (60 mils) min.,
 - .2 Flexibility: Pass at -40 deg C to ASTM D1970,
 - .3 Vapour permeance: 2.8 ng/Pa.s.m² (0.05 perms) to ASTM E96,
 - .4 Tensile strength (membrane): 2.24 MPa to ASTM D412,
 - .5 Tensile strength (film): 34.5 MPa to ASTM D882,
 - .6 Elongation: 300% to ASTM D412,
 - .7 Puncture resistance: 222 N min. to ASTM E154.
 - .2 Basis of Design Product: Blueskin WP200 by Henry Company, or approved alternate by Hydrotech, W.R. Meadows or Grace Construction Products.

- .2 Surface Primer:
 - .1 Synthetic rubber based adhesive type, quick setting for all temperatures, and having the following properties:
 - .1 Colour: Blue,
 - .2 Weight: 0.8 kg/l,
 - .3 Solids by weight: 35%,
 - .4 Drying time (initial set): 30 minutes.
 - .2 Basis of Design Product: Blueskin Primer by Henry Company, or approved alternate by Hydrotech, W.R. Meadows or Grace Construction Products.
- .3 Liquid Membrane and Termination Sealant:
 - .1 Moisture cure, medium modulus polymer modified sealing compound having the following physical properties:
 - .1 Compatible with sheet air barrier, roofing and waterproofing membranes and substrate,
 - .2 Complies with ASTM C 920, Type S, Grade NS, Class 25,
 - .3 Elongation: 450 – 550%,
 - .4 Remains flexible with aging,
 - .5 Seals construction joints up to 25mm (1") wide.
 - .2 Basis of Design Product: HE925 BES Sealant by Henry Company, or approved alternate by Hydrotech, W.R. Meadows or Grace Construction Products.
- .4 Drainage Board:
 - .1 High impact polypropylene core board with polypropylene fabric attached, having the following physical properties:
 - .1 Flow Rate: 223L/min/m,
 - .2 Compressive Strength: 15,100 psf,
 - .3 Thickness: 10mm (3/8")
 - .2 Basis of Design Product: DB6200 by Henry Company, or approved alternate by Hydrotech, W.R. Meadows or Grace Construction Products.
- .5 Drainage Board Adhesive: Henry 230-21 Board Adhesive by Henry Company.
- .6 Drainage Board Accessories:
 - .1 Moulding Strip: Continuous 90mm (3-1/2") wide "Z" flashing strip to fit over exposed top edge of drain board.

3 Execution

3.1 EXAMINATION

- .1 Examine the vertical surfaces to which membrane is to be applied. Ensure that concrete has cured for at least 28 days, that all slabs slope to drains, that all surfaces are sufficiently smooth (plywood formed or wood float) and that surfaces to which membrane is to be applied are clean of waxy or oily substances, dust, dirt or other extraneous materials or any substance which might impair bond.

- .2 Do not apply membrane to damp or frosty surfaces. Ensure that all items penetrating the membrane, such as pipes, conduits, drains, and the like, are in place and rigidly fastened.
- .3 Report any defects of any conditions which might impair the performance of the membrane. Do not apply the membrane until defects have been corrected.
- .4 Commencement of work of this Section implies acceptance of surfaces and conditions.
- .5 Ensure that any required skim/mud slabs are placed in ample time and at correct levels.

3.2 PREPARATION

- .1 Priming:
 - .1 Apply primer in strict accordance with manufacturer's recommended rate.
 - .2 Prime only areas which shall be covered with bituminous sheet membrane waterproofing in same working day.
 - .3 Reprime areas contaminated with dust or, not covered with membrane within 24 hours.
 - .4 Allow minimum 30 minute open time.
- .2 Joint and Crack Treatment:
 - .1 All cracks in concrete 1.5mm to 3mm (1/16" to 1/8") wide are to be pre-treated with a 1.5 mm (60 mil) coating of liquid membrane 50 mm (2") wide centred on the crack. Alternately, apply a 150 mm (6") wide strip of waterproofing membrane centred over crack. Provide 75 mm (3") end laps.
 - .2 Horizontal to vertical inside corner transition areas are to be pre-treated with a liquid membrane fillet extending 19 mm (3/4") vertically and horizontally from the corner. Apply a minimum 229 mm (9") strip of waterproofing membrane centred at the joint.
 - .3 All outside corners are to be pre-treated with a minimum 229 mm (9") strip of waterproofing membrane centred at the joint.
 - .4 Where three or more planes come into contact reinforce with cut sections of waterproofing membrane reinforcing sheet as per manufacturer's instructions.

3.3 INSTALLATION - BITUMINOUS SHEET MEMBRANE WATERPROOFING

- .1 Installation of bituminous sheet membrane waterproofing shall be in strict accordance with manufacturer's written instructions.
- .2 Corner Detailing:
 - .1 Form 19mm (3/4") fillet of liquid membrane at all inside corners and cover with minimum 305mm (12") wide sheet membrane strip centered on corner prior to installation of bituminous sheet membrane waterproofing.
 - .2 Apply minimum 305mm (12") wide sheet membrane strip centered on all outside corners prior to installation of bituminous sheet membrane waterproofing.
- .3 Horizontal Surfaces:
 - .1 Apply bituminous sheet waterproofing membrane from low point to high point so that laps shed water.
 - .2 Stagger all end laps and overlap all seams minimum 75 mm (3").
 - .3 Provide double thickness of bituminous sheet waterproof membrane over construction joints and cracks up to 3mm (1/8") wide.
 - .4 Roll membrane in its entirety immediately following placement to ensure continuous adhesion to slab.

- .5 Tie-in under floor bituminous sheet membrane waterproofing with bituminous sheet membrane waterproofing system applied to walls, overlapping existing a minimum 457 mm (18"). Seal junction with continuous liquid membrane, minimum 3mm (1/8") thick and 25mm (1") wide.
- .6 Seal all "T" joints and sheet membrane terminations with liquid membrane, minimum 3mm (1/8") thick and 25mm (1") wide.
- .4 Vertical Surfaces:
 - .1 Apply bituminous sheet membrane waterproofing vertically in full lengths.
 - .2 Stagger all end laps and overlap all seams minimum 75mm (3").
 - .3 Provide double thickness of bituminous sheet waterproofing membrane over construction joints and cracks up to 3mm (1/8") wide.
 - .4 Roll membrane in its entirety immediately following placement to ensure continuous adhesion to walls.
 - .5 Install securement bars at horizontal terminations, edges with liquid membrane.
 - .6 Tie-in bituminous sheet membrane waterproofing with existing waterproofing system, overlapping existing a minimum 305mm (12"). Seal junction with continuous liquid membrane, minimum 3mm (1/8") thick and 25mm (1") wide.
 - .7 Seal all "T" joints and sheet membrane terminations with liquid membrane, minimum 3mm (1/8") thick and 25mm (1") wide.
- .5 Protrusions:
 - .1 Apply bituminous sheet membrane waterproofing to within 25mm (1") of base of protrusion. Apply liquid membrane around protrusion, minimum 3mm (1/8") thick and minimum 75mm (3") on to sheet membrane.
- .6 Drains:
 - .1 Apply collar of membrane to drains, collar to extend minimum 6" beyond drain opening.
 - .2 Apply full coverage of bituminous sheet waterproofing membrane over the collar. Cut out drain opening so that the membrane extends under the clamping ring.
 - .3 Place a continuous bead of liquid membrane between the membrane waterproofing and clamping ring.
- .7 Repairs:
 - .1 Inspect bituminous sheet waterproofing membrane thoroughly and make any repairs before covering.
 - .2 Patch tears and inadequately lapped seams with bituminous sheet membrane waterproofing. Slit "fishmouths" and repair with bituminous sheet membrane waterproofing extending min 150 mm (6") in all directions of slit.
 - .3 Seal all repairs with liquid membrane.

3.4 INSTALLATION - DRAINAGE BOARD

- .1 Align and hang drainage up to foundation wall. Position bottom edge of drainage board to be in moderate contact with weeping tile system.
- .2 Secure drainage board to foundation wall with board adhesive. Apply adhesive using saw tooth notched trowel having 3mm (1/8") notches or apply a 6mm (1/4") diameter bead on 150mm (6") centres in a serpentine pattern.

- .3 Align and install termination strip along top edge with nails spaced 305mm (12") o/c and seal with termination sealant.
- .4 Align and install moulding strip over completed top edge detail.
- .5 Overlap end laps, pull back loose fabric to expose drain core and position core of second panel over the overlap flange of first panel.
- .6 Bend drain board to create inside corners and cut board to create outside corners, provide 75mm (3") of extra fabric to wrap corner.
- .7 Stagger or offset joints of drain board sheets.
- .8 Place all subsequent sheets in an overlapping single fashion.
- .9 Backfill bottom edge in conjunction with weeping tile system.

3.5 FIELD QUALITY CONTROL

- .1 An independent inspection and testing company appointed and paid for by the Owner will carry out inspection and testing in accordance with the General Conditions.
- .2 Arrange site meeting with inspection company representative three weeks prior to commencement of work of this Section on Site. Obtain inspector's instructions and procedures to be followed.
- .3 Co-operate with the inspector and afford all facilities necessary to permit full inspection of the work of this Section and testing of materials prior to their use. Act immediately on instructions given by the inspector.

END OF SECTION

1 General

1.1 SUMMARY

1. This Section specified requirements for the supply and installation of aluminum siding and soffit including accessories and trims for a complete system installation.

1.2 RELATED REQUIREMENTS

1. Other sections of the specification referring to this section, coordinate requirements of related sections and requirements.

1.3 REFERENCE STANDARDS

1. American Architectural Manufacturers Association (AAMA)/Fenestration & Glazing Industry Alliance (FGIA):
 1. AAMA 509-22, * Voluntary Test and Classification Method for Drained and Back Ventilated Rainscreen Wall Cladding Systems
 2. AAMA 2603-22, *Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix)
 3. AAMA 2604-22, *Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix)
 4. AAMA 2605-22, *Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix)
2. American Society for Testing and Materials International (ASTM International):
 1. ASTM E84-24, Standard Test Method for Surface Burning Characteristics of Buildings Materials
 2. ASTM E136-24c, Standard Test Method for Behaviour of Materials in a Vertical Tube Furnance at 750°C
 3. ASTM E2768-11(2018), Standard Test Method for Extended Duration Surface Burning Characteristics for Building Materials (30 min Tunnel Test)
3. Underwriters Laboratories Canada (ULC):
 1. CAN/ULC S102:2018, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies
 2. CAN/ULC S114:2018, Standard Test Method for Determination of Non-Combustibility in Building Materials
 3. CAN/ULC-S135-04, Standard Test Method for the Determination of Combustibility Parameters of Building Materials Using an Oxygen Consumption Calorimeter (Cone Calorimeter).

1.4 ADMINISTRATIVE REQUIREMENTS

1. Pre-Construction Meetings: Conduct a pre-construction meeting at Project site in accordance with Section 01 31 19 – Project Meetings attended by the Contractor, Subcontractor, Consultant, materials supplier(s), and other relevant personal before commencement of Work for this Section to review methods and procedures related to aluminum siding and soffit installation requirements and coordination with other work of the project.
2. Coordination: Coordinate installation with flashing and other adjoining construction to ensure proper sequencing.

1.5 SUBMITTALS

1. Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
2. Action Submittals: Provide the following submittals before starting any work of this Section:
 1. Product Data: Submit manufacturer's product data for each type of product specified.
 2. Shop Drawings: Submit shop drawings showing assembly and installation details, method of sealing and flashing, building connection attachments, provision for thermal movement, fabrication details and static release loads and static release forces.
 3. Samples for Verification: Submit samples for verification for each type, colour, texture, and pattern required, and as follows:
 1. Siding and Soffit: 300 mm long by actual width.
 2. Accessories and Trims: 300 mm long by actual width.
3. Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 81 13 – Sustainable Design Criteria.

1.6 PROJECT CLOSEOUT SUBMISSIONS

1. Operation and Maintenance Data: Submit copies of manufacturer's written maintenance information for inclusion in operations manual in accordance with Section 01 78 23 – Operation and Maintenance Data; provide specific warning of any maintenance practice or material that may damage or disfigure finished Work.

1.7 QUALITY ASSURANCE

1. Qualifications: Provide proof of qualifications when requested by Consultant:
 1. Source Limitations: Obtain each type, color, texture, and pattern of aluminum siding and soffit, including related accessories, through one source from a single manufacturer.

1.8 DELIVERY, STORAGE AND HANDLING

1. Delivery and Acceptance Requirements: Deliver packaged materials in original containers with labels intact until time of use.
2. Storage and Handling Requirements: Store materials on elevated platforms, under cover, and in a dry location.

1.9 SITE CONDITIONS

1. Ambient Conditions: Proceed with siding installation only if substrate is completely dry and if existing and forecasted weather conditions permit siding to be installed in accordance with manufacturer's written instructions.

1.10 WARRANTY

1. Manufacturer's Warranty: Warranty: Provide manufacturer's standard fifteen (15) years warranty against defects in material or workmanship starting from the date of Substantial Performance of the Work.

2 Products

2.1 MANUFACTURERS

1. Basis-of-Design Products: Products named in this Section were used as the basis-of-design for the project; manufacturers listed as additional Acceptable Products and that offer similar products may be incorporated into the work of this Section, provided they meet the performance requirements established by the named products.

2. Additional Acceptable Products Manufacturers: Subject to compliance with requirements specified in this Section, use any of the following listed manufacturers' products in accordance with Section 01 62 00 – Product Options provided required product data and shop drawing are submitted before starting any work of this Section:
 1. Metal Uniq by Gentek or similar by Agway Metals or VicWest
3. Substitutions: Additional manufacturers offering similar products to Acceptable Products Manufacturers listed above may be incorporated into the work provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with Section 01 25 00 – Substitutions Procedures.

2.2 PERFORMANCE REQUIREMENTS

1. Design and construct soffit system so that completed installation is air, vapour and moisture resisting from interior and exterior.
2. Maximum deflection not to exceed L/180 under system own weight plus wind and suction loads acting normal to the plane in accordance with the Building Code Climatic Data, wind load 1:50 years.
3. Provide movement of components without causing buckling, failure of joint seals, undue stress on fasteners when subject to seasonal temperature range, from - 40°C to +50°C, and preceding noted wind and suction loads.
4. Include expansion joints to accommodate movement in soffit system and between soffit system and building structure, where these movements are caused by deflection of building structure. Accommodate these movements, without permanent distortion, damage to infills, racking of joints, breakage of seals, or water penetration.
5. Provide for positive drainage to the exterior of all water entering or condensation occurring within the system.

2.3 MATERIALS

1. Extruded Aluminum Siding and Soffit: V-Groove planks extruded aluminum 6063 T5, and as follows:
 1. Finish: Woodgrain finish.
 2. Colour: Colour selected by Consultant from manufacturer's standard range.
 3. Gloss: 30 ± 5.
 4. Thickness: 1.57 mm base metal thickness.
 5. Profile: Nominal 100 mm V-Groove X 7315 mm plank.
 6. Basis-of-Design Products: Longboard Architectural Products, Smooth Plank.

2.4 ACCESSORIES

1. Girts, Hat Channel, and Z-Bars: Minimum 18 ga. spaced at 406 mm o/c.
2. Siding Accessories: Provide starter strips, edge trim, corner cap, and other items as required by aluminum siding and soffit manufacturer for building configuration in accordance with AAMA 1402, and as follows:
 1. Provide accessories made from same material as adjacent siding, unless noted otherwise.
 2. Provide accessories matching color and texture of adjacent siding, unless noted otherwise.
3. Flashing: Provide metal flashings as specified in Section 07 62 00 – Sheet Metal Flashing and Trim at window and door heads and where indicated.
4. Elastomeric Joint Sealant: Single component urethane joint sealant in accordance with Section 07 92 00 – Joint Sealants.
5. Fasteners: Use manufacturer's recommended aluminum fasteners. Where fasteners are exposed to view, use prefinished aluminum fasteners in colour to match items being fastened.

6. Insect Screening: 1.4 mm x 1.6 mm aluminum wire mesh.

2.5 FABRICATION

1. Prepare surfaces, pre-treat and coat components in accordance with AAMA 2604 and AAMA 2605 Quality Standards and applicable standards for the coating material specified.
2. Wrap and package coated components using methods suitable for transit and covered site storage without damage.

3 Execution

3.1 EXAMINATION

1. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of siding; proceed with installation only after unsatisfactory conditions are corrected.

3.2 PREPARATION

1. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION

1. Install aluminum siding and soffit in accordance with manufacturer's written installation instructions and reviewed shop drawings and as applicable to products and applications indicated unless more stringent requirements apply, and as follows:
 1. Center concealed fasteners without binding siding to allow for thermal movement.
 2. Overlap joints to shed water away from direction of prevailing wind.
2. Install joint sealants as specified in Section 07 92 00 – Joint Sealants to provide a weathertight installation.
3. Where aluminum siding contacts dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.

3.4 CLOSEOUT ACTIVITIES

1. Repairing: Remove damaged, improperly installed, or otherwise defective siding materials and replace with new materials in accordance with specified requirements.
2. Cleaning: Clean finished surfaces in accordance with manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION

1 General

1.1 SUMMARY

1. This Section specifies requirements for supply and installation stick-built aluminum framed storefronts, entrance framing, and swing doors.

1.2 RELATED REQUIREMENTS

1. Other sections of the specification referring to this section, coordinate requirements of related sections and requirements.

1.3 REFERENCE STANDARDS

1. American Society for Testing and Materials (ASTM International):
 1. ASTM B209/B209M-21a, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
 2. ASTM B221-21, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
 3. ASTM B308/B308M-20, Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles
 4. ASTM B429/B429M-20, Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube
2. Canadian Standards Association (CSA Group):
 1. CSA G40.20-13/G40.21-13 (R2023), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel
 2. CSA W59.2:24, Welded Aluminum Construction

1.4 DEFINITIONS

1. Equal Dimensions: Calculated dimensions for entrance system assemblies indicating equal modules aligning with in-place structural elements followed by even division of the space between structural elements; this means that entrance system materials are evenly spaced between adjacent structural members, not necessarily evenly spaced across the entire wall assembly.

1.5 ADMINISTRATIVE REQUIREMENTS

1. Pre-Construction Meeting: Conduct a pre-construction meeting in accordance with Section 01 31 19 – Project Meetings on site to review methods and procedures related to glazed aluminum storefront systems including, but not limited to, the following:
 1. Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 2. Review location and alignment of vertical and horizontal elements as they relate to the aesthetic criteria indicated on the Drawings, and the technical requirements indicated on the shop drawings.

1.6 SUBMITTALS

1. Provide required information in accordance with Section 01 33 00 – Submittal Procedures.
2. Action Submittals: Provide the following submittals before starting any work of this Section:
 1. Product Data: Submit product data including construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated.
 2. Shop Drawings: Submit shop drawings detailing fabrication and assembly for aluminum framed entrance and storefront systems including plans, elevations, sections, details, and attachments to other work and the following:

1. Details of provisions for system expansion and contraction and for draining moisture occurring within the system to the exterior.
 2. Hardware schedule and operating hardware types, functions, quantities, and locations.
 3. Connections to adjacent air barrier membranes.
 4. Isometric drawing indicating joinery, anchorage, flashing and drainage provisions.
 5. Samples for Verification: Submit samples for verification of each type of exposed finish required in manufacturer's standard sizes for verification of colours selected for the Project.
3. Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 81 13 – Sustainable Design Criteria.

1.7 PROJECT CLOSEOUT SUBMISSIONS

1. Operation and Maintenance Data: Submit manufacturer's written instructions for cleaning of aluminum finishes and maintenance of operational hardware; include name of original installer and contact information in accordance with Section 01 78 23 – Operation and Maintenance Data.

1.8 QUALITY ASSURANCE

1. Qualifications: Provide proof of qualifications when requested by the Consultant:
 1. Installer: Use personnel experienced with the materials specified, with work of similar complexity to that indicated for the project, and who are acceptable to manufacturer.

1.9 SITE CONDITIONS

1. Site Measurements: Verify actual locations of structural supports for aluminum framed entrance and storefront systems by site measurements before fabrication and indicate measurements on Shop Drawings.
2. Established Dimensions: Establish dimensions and proceed with fabricating aluminum framed entrance and storefront systems where site measurements cannot be made without delaying the Work; coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.10 WARRANTY

1. Manufacturer Warranty: Provide manufacturer's standard two (2) years warranty against defects in material or workmanship and twenty (20) year warranty against failure of finishes not attributable to normal weathering starting from the date of Substantial Performance of the Work.

2 Products

2.1 ACCEPTABLE PRODUCTS AND MANUFACTURERS

1. Basis-of-Design Products: Products named in this Section were used as the basis-of-design for the project; manufacturers listed as additional Acceptable Products and that offer similar products may be incorporated into the work of this Section, provided they meet the performance requirements established by the named products.
2. Additional Acceptable Products Manufacturers: Subject to compliance with requirements specified in this Section, use any of the following listed manufacturers' products in accordance with Section 01 62 00 – Product Options provided required product data and shop drawing are submitted before starting any work of this Section:
 1. Alumicor
 2. Kawneer
 3. Oldcastle

3. Substitutions: Additional manufacturers offering similar products to Acceptable Products Manufacturers listed above may be incorporated into the work provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with Section 01 25 00 – Substitutions Procedures.

2.2 PERFORMANCE REQUIREMENTS

1. Provide aluminum framed systems, including anchorage, capable of withstanding, without failure, the effects of the following:
 1. Structural loads.
 2. Thermal movements.
 3. Movements of supporting structure including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
 4. Dimensional tolerances of building frame and other adjacent construction.
2. Failure of performance requirements will be considered to include, but not be limited to, the following:
 1. Deflection exceeding specified limits.
 2. Thermal stresses transferred to building structure.
 3. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
 4. Noise or vibration created by wind and thermal and structural movements.
 5. Loosening or weakening of fasteners, attachments, and other components.
 6. Sealant failure.
 7. Failure of operating units to function properly.
3. Design Criteria:
 1. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient temperatures, accounting for surface temperatures of materials due to both solar heat gain and nighttime sky heat loss:
 1. Temperature Change (Range):
 1. Exterior Ambient: -40°C to +35°C.
 2. Interior Ambient: +16°C to +29°C.
 3. Adjust calculations to account for colour treatments or coatings on curtain wall framing members.
 2. Allow for thermal movement with no buckling of frame members, stress on glass, glazing edge seal failure, sealant failure, excess stress on curtain wall framing, anchors and fasteners, or reduction of performance.
 2. Condensation Resistance: Design thermal break to limit frosting and condensation on interior of window metal surfaces to not over 5% of area when conditions are:
 1. Exterior Air Temperature: -32°C.
 2. Interior Air Temperature: 22°C ±1.2°C.
 3. Interior Relative Humidity: N/A.
 3. Air Infiltration: Design system for maximum air leakage of 0.03 L/m² of fixed wall area when tested in accordance with ASTM E283 at a minimum static air pressure differential of 300 Pa.
 4. Water Penetration Under Static Pressure: Design system for zero water penetration when tested in accordance with ASTM E331 at a minimum differential static pressure of 20% of positive design wind load, but not less than 475 Pa.
 5. Average Thermal Conductance: Design system having average insulation factor of not more than 2.6 W/m²•K when tested in accordance with AAMA 1503.
 6. Wind Loads: 0.43 kPa, 1/50 year occurrence in accordance with the Ontario Building Code.
 7. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to $1/175$ of clear span for spans up to 4100 mm, and to $1/240$ of clear span plus 6 mm or spans greater than 4100 mm.
2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding an amount that reduces glazing bite to less than 75% of design dimension and that reduces edge clearance between framing members and glazing or other fixed components to less than 3 mm.
3. Limit length of cantilever deflection to $2/175$ length of the cantilevered member where framing members overhang an anchor point.

2.3 MATERIALS

1. Materials recommended by manufacturer for type of use and finish indicated, and as follows:
 1. Sheet and Plate: In accordance with ASTM B209/B209M, and NSI H35.1 AA1100-H14, or AA5005-H32 or H34, anodizing quality.
 2. Extruded Bars, Rods, Profiles, and Tubes: In accordance with STM B221, and ANSI H35.1 AA6063-T5 or T6, anodizing quality.
 3. Extruded Structural Pipe and Tubes: In accordance with ASTM B429/B429M, and ANSI H35.1 AA6061-T6 or AA6063-T6, anodizing quality.
 4. Structural Profiles: In accordance with ASTM B308/B308M, anodizing quality.
 5. Welding Rods and Bare Electrodes: CSA W59.2.
2. Steel Reinforcement: Coat steel with manufacturer's standard corrosion resistant primer applied immediately after surface preparation and pre-treatment, and as follows:
 1. Rolled Sheet or Strip: CSA G40.20/G40.21.
 2. Structural Shapes, Plates and Bars: CSA G40.20/G40.21.
3. Brackets and Reinforcements: Manufacturer's standard high strength aluminum with non-staining, nonferrous shims for aligning system components.
4. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials, and as follows:
 1. Use self-locking devices where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration.
 2. Reinforce members as required to receive fastener threads.
 3. Use only concealed fasteners, unless use of exposed fasteners has been accepted in writing by the Consultant.
 4. Finish exposed portions to match framing system.
 5. Use slip joint linings, spacers, and sleeves at movement joints of material and type recommended by manufacturer.
5. Anchors: Three-way adjustable anchors that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
6. Concealed Flashing: Manufacturer's standard corrosion resistant, non-staining, non-bleeding flashing compatible with adjacent materials.
7. Framing Gaskets: As recommended by manufacturer for joint type.
8. Framing Sealants: As recommended by manufacturer for joint type.
9. Transition Membranes: manufacturer's full length recommended membrane adhering to frame profile to provide continuous air/vapour retarder to adjacent wall construction:

2.4 ENTRANCE FRAMES

1. Manufacturer's extruded aluminum glazed doors for manual swing operation, reinforced as required to withstand traffic conditions.
2. Exterior Door Type:

1. Construction: Medium stile, thermally broken frame sections.
2. Dimensions: Nominal 55 mm deep with 130 mm wide vertical rails; 130 mm wide top rail; and 165 mm bottom rail, to accommodate triple insulating glazing unit (IGU) as specified in Section 08 80 00 – Glazing.
3. Glazing Method: Square stops for sealed glazing, with non-removable glazing stops on outside of door.
4. Basis-of-Design Products: Kawneer, 350T Insulpour Thermal Entrance.

2.5 STOREFRONT FRAMES

1. Manufacturer's standard extruded aluminum framing members of thickness required and reinforced as required to support imposed loads.
2. Frame Type:
 1. Construction: Composite thermally broken, with glass mounted front of frame.
 2. Dimensions: Nominal 65 mm face x 150 mm deep total frame profile, with glazing throat to accommodate triple insulating glazing unit (IGU) as specified in Section 08 80 00 – Glazing.
 3. Glazing Method: Flush glazed from exterior
 4. Installation Method: Single span, storefront.
 5. Basis-of-Design Products: Kawneer, 1600UT System 1 Curtain Wall.

2.6 DOOR HARDWARE

1. Manufacturer's heavy-duty hardware units in sizes and types as required to meet entrance use as indicated on Drawings, with the following opening force limitations:
 1. Egress Doors: Maximum 135 N to set door in motion and not more than 70 N to open door to minimum required width.
 2. Accessible Interior Doors: Maximum 20 N to operate door through entire range of movement.
 3. Latches and Exit Devices: Not more than 70 N required to release latch.
 4. Provide door hardware in accordance with Section 08 71 00 – Door Hardware and Door Hardware Schedule indicated on the Drawings.

2.7 GLAZING SYSTEMS

1. Glass: Specified in Section 08 80 00 – Glazing.
2. Glazing Gaskets: Manufacturer's standard sealed corner pressure glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
3. Standard Glazing Sealants: As recommended by manufacturer for joint type.

2.8 ACCESSORIES

1. Sprayed Insulation: As indicated in Section 07 21 19 – Foamed-in-Place Insulation.
2. Bituminous Paint: Cold applied asphalt mastic paint containing no asbestos, formulated for minimum 0.762 mm thickness per coat.

2.9 FABRICATION

1. Form aluminum shapes before finishing.
2. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish; remove weld spatter and welding oxides from exposed surfaces by de-scaling or grinding.
3. Fabricate framing member components first, have the following characteristics when fully assembled:
 1. Sharp and straight profiles, free of defects or deformations.
 2. Accurately fitted joints with ends coped or mitred.
 3. Drainage to allow water entering joints, condensation occurring within framing members, and moisture migrating within the system to flow to the exterior.

4. Physical and thermal isolation of glass and glazing from framing members.
5. Accommodations for thermal and mechanical movements of glass and 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.
4. Fabricate storefront framing components using shear block system, screw spline system or head-and-sill receptor system with shear blocks at intermediate horizontal members to accommodate storefront loading requirements.
5. Reinforce door frames as required to support loads imposed by door operation and for installing hardware, and as follows:
 1. Provide compression weather stripping at fixed stops at exterior doors.
 2. Provide silencers at stops to prevent metal-to-metal contact at interior doors; install three silencers on strike jamb of single door frames and two silencers on head of frames for pairs of doors.
6. Reinforce entrance frames as required for installing hardware, and as follows:
 1. Provide sliding weather stripping retained in adjustable strip mortised into door edge at pairs of exterior doors.
 2. Provide weather sweeps applied to door bottoms at exterior doors.
7. Factory install hardware to the greatest extent possible; cut, drill, and tap for factory installed hardware before applying finishes.
8. Clearly mark components to identify their locations in Project in accordance with shop drawings after fabrication.

2.10 ALUMINUM FINISHES

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Black Anodized Finish: Exposed aluminum surfaces shall be Aluminum Association (AA) Architectural Class I, AA-M10C21A44, to match Kawneer clear anodized #29.

3 Execution

3.1 EXAMINATION

1. Examine areas for compliance with requirements for installation tolerances and other conditions affecting performance of work.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION - GENERAL

1. Install storefront and entrance framing in accordance with manufacturer's written instructions using materials free from damage and having tightly fitting joints to produce hairline joints free of burrs and distortion, rigidly secured to prevent movement within joints.
2. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration; seal joints watertight except where required to allow for drainage of water from within framing system.
3. Protect aluminum against contact with concrete and dissimilar metals by painting contact surfaces with primer, by applying sealant or tape, or installing nonconductive spacers as recommended by manufacturer for this purpose.
4. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

5. Set continuous sill members and flashing in full sealant bed to produce weather tight installation.
6. Install components plumb and true in alignment with established lines and grades, without warp or rack.
7. Install insulation materials in accordance with Section 07 21 19 – Foamed-in-Place Insulation, framing manufacturer's requirements, and Consultant's requirements for a continuously insulated enclosure.
8. Install perimeter joint sealants in accordance with Section 07 92 00 – Joint Sealants, to produce weather tight installation.
9. Install glass in accordance with Section 08 80 00 – Glazing.

3.3 INSTALLATION – ENTRANCES

1. Install entrance framing to produce smooth operation and tight fit at contact points.
2. Install exterior entrance framing to produce tight fit at weather stripping and weather tight closure.
3. Install field applied surface mounted hardware in accordance with hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.4 ERECTION TOLERANCES

1. Install aluminum framed systems in accordance with the following maximum tolerances:
2. Location and Plane: Limit variation from true location and plane to 3 mm in 3660 mm; 6 mm over total length.
3. Alignment:
4. Limit offset from true alignment to 1.5 mm where surfaces meet in line.
5. Limit offset from true alignment to 0.8 mm where surfaces meet at corners
6. Diagonal Measurements: Limit difference between diagonal measurements to 3 mm.

3.5 CLOSEOUT ACTIVITIES

1. Adjusting:
 1. Adjust operating hardware for smooth operation in accordance with hardware manufacturers' written instructions.
 2. Adjust closers designated as accessible for people with disabilities to provide a 3 second closer sweep period for doors to move from a 70° open position to 75 mm from latch measured to the leading door edge.

END OF SECTION

1 General

1.1 SUMMARY

1. This Section includes requirements for supply and installation of commercial door hardware for the following:
 1. Swinging doors.
 2. Other doors to the extent indicated.
 3. Cylinders for doors specified in other Sections.
 4. Low energy swing door operators.
 5. Electrified door hardware.

1.2 RELATED REQUIREMENTS

1. Other sections of the specification referring to this section, coordinate requirements of related sections and requirements.

1.3 REFERENCE STANDARDS

1. All reference standards specified herein imply the latest edition of the standard.
2. American National Standards Institute (ANSI)/Builders Hardware Manufacturers Association (BHMA):
 1. ANSI/BHMA A156 Series
 2. ANSI/BHMA A156.18-2020, Materials and Finishes
 3. ANSI/BHMA A156.19-2019, Power Assist and Low Energy Power Operated Doors
 4. ANSI/BHMA A156.115-W-2006, Hardware Preparation in Wood Doors with Wood or Steel Frames
 5. ANSI/ICC A117.1-2017, Standard for Accessible and Usable Buildings and Facilities
3. Builders Hardware Manufacturers Association (BHMA):
 1. The BHMA Certified Products Directory (CPD)
4. Door and Hardware Institute (DHI):
 1. DHI-A115.1G, Installation Guide for Doors and Hardware
 2. Sequence and Format for the Hardware Schedule
5. National Fire Protection Association (NFPA):
 1. NFPA 80-2022, Standard for Fire Doors and Other Opening Protectives
 2. NFPA 101-2021, Life Safety Code®
6. Underwriters Laboratories of Canada (ULC):
 1. UL 228-2008, Standard for Door Closers-Holders, With or Without Integral Smoke Detectors
 2. UL 437-2013, Standard for Key Locks

1.4 ADMINISTRATIVE REQUIREMENTS

1. Pre-Installation Meeting: Arrange a pre-construction meeting in accordance with Section 01 31 19 – Project Meetings attended by Contractor, Subcontractor, Consultant, Owner, and Hardware Consultant to discuss the following:
 1. Keying Conference: Conduct keying conference at Project site and incorporate decisions into final keying schedule after reviewing door hardware keying system including the following:
 1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 2. Preliminary key system schematic diagram.

3. Requirements for key control system.
 4. Address for delivery of keys.
2. Electrified Hardware Conference: Conduct pre-installation conference at project site and review methods and procedures related to electrified door hardware including the following:
 1. Review and discuss electrical roughing in and other preparatory work performed by other trades.
 2. Review sequence of operation for each type of electrified door hardware.
 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 4. Review required testing, inspecting, and certifying procedures.
2. Coordination: Obtain and distribute templates for doors, frames, and other work specified to be factory prepared for installing door hardware and coordinate with shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware in accordance with indicated requirements, and as follows:
 1. Coordinate with Division 26 – Electrical for type of wire required for electronic hardware, schedule for installation, and connection to electronic hardware.
 2. Coordinate layout and installation of recessed pivots and closers and cast in anchoring inserts into floor construction.
 3. Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices, access control system, security system, and building control system.
3. Coordinate the work of all trades, including glass and glazing, masonry, and electrical requirements covered in manufacturer's details and appropriate sections of the specifications, and as follows:
 1. Coordinate with electrical contractor to provide 120V, 60 cycle, single phase 15 Amp or 30 Amp service depending on quantity of operators, and as follows:
 1. Coordinate with electrical contractor for provision of service to each operator from junction box for multiple operators.
 2. Coordinate with electrical contractor shall provide electrical conduit and wiring from specified controls to operators as outlined on manufacturer's drawings.

1.5 SUBMITTALS

1. Provide required information in accordance with Section 01 33 00 – Submittal Procedures.
2. Action Submittals: Provide the following submittals before starting any work of this Section:
 1. Product Data: Submit product data indicating installation details, material descriptions, dimensions of individual components and profiles, and finishes.
 2. Shop Drawings: Submit shop drawings indicating details of electrified door hardware including the following:
 1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer installed and site installed wiring, and as follows:
 1. System schematic.
 2. Point-to-point wiring diagram.
 3. Riser diagram.
 4. Elevation of each door.
 2. Detail interface between electrified door hardware and fire alarm, access control, security, and building control system.
 3. Theory of operation for electrified hardware groups.
 4. Prepare drawings specifically for the project and submit in hard copy and CAD format:
 1. Photocopied drawings and hand reproduced drawings are not acceptable.

2. Submit separate elevations and interconnect drawings for each different electrified hardware group.
3. Hardware Schedule: Submit door hardware schedule prepared by or under the supervision of qualified Architectural Hardware Consultant (AHC), detailing fabrication and assembly of door hardware.
4. Keying Schedule: Submit keying schedule prepared by or under the supervision of qualified Architectural Hardware Consultant (AHC), detailing Owner's final keying instructions for locks, including schematic keying diagram and index each key set to unique door designations.
3. Informational Submittals: Provide the following submittals when requested by the Consultant:
 1. Certificates: Submit product certificates signed by manufacturer of door hardware certifying that products submitted comply with requirements for labelled fire doors, for types and sizes of doors used for the Project.
 2. Source Quality Control Submittals: Submit proof of participation in DHI Continuing Education Program and apply AHC stamp to completed door hardware schedule.
4. Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 81 13 – Sustainable Design Criteria.

1.6 PROJECT CLOSEOUT SUBMISSIONS

1. Operation and Maintenance Data: Provide copies of manufacturer's written maintenance information for inclusion into the operations and maintenance information in accordance with Section 01 78 23 – Operation and Maintenance Data. Indicate components that require specific handling to avoid damage to the finished Work.
2. Spare Parts and Tools: Submit unique parts and tools for maintaining hardware systems in accordance with Section 01 78 43 – Spare Parts.

1.7 QUALITY ASSURANCE

1. Regulatory Requirements:
 1. Building Code Compliance: Conform to ULC and Building Code requirements, as applicable to hardware, for labelled or rated doors and frames, and for exiting, operation and function.
 2. Manufacturing Compliance: Use only products listed in the BHMA Certified Products Directory (CPD) for hardware of this Project.
2. Qualifications: Provide proof of qualifications when requested by Consultant:
 1. Supplier: Use a door hardware supplier having warehousing facilities in Project's vicinity and employing at least one permanent staff member who is a fully certified and licensed Architectural Hardware Consultant (AHC), participating in the DHI Continuing Education Program, who will be responsible for the preparation of the door hardware schedule submittal, and as follows:
 1. Door hardware supplier shall be available during the course of the Work to consult with Contractor, Consultant, and Owner about door hardware and keying.
 2. Door hardware supplier shall have completed projects with electrified door hardware similar in material, design, and extent to that indicated for this project, and who has the capability of preparing data for electrified door hardware, including shop drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this project.
 2. Installer: Installer shall have completed door hardware similar in material, design, and extent to that indicated with a record of successful in-service performance for the last three (3) years.

1.8 DELIVERY, STORAGE AND HANDLING

1. Delivery and Acceptance Requirements: Deliver hardware items in original factory containers, clearly labelling contents, and scheduled use for this project, and as follows:
 1. Inventory door hardware on receipt and provide secure lock up for door hardware delivered to Project site.
 2. Store hardware in a clean, well illuminated (500 lux minimum) securely locked storage room accessible only to authorized personnel.
2. Storage and Handling Requirements: Store hardware items on shelves; not on floors, separated and packaged as a group for each individual door with the door number, and list of items for that door on each package related to the door hardware schedule, and include basic installation instructions with each item or package, and as follows:
 1. Maintain an itemized inventory list of each item, updated on a daily basis, to show items in storage and items installed.
 2. Deliver keys to manufacturer of key control system.

1.9 WARRANTY

1. Provide written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
2. Failures include, but are not limited to, the following:
 1. Structural failures including excessive deflection, cracking, or breakage.
 2. Faulty operation of operators and door hardware.
 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 4. Other failures not resulting from normal usage.
3. Warranty Period: From date of Substantial Performance, and as follows:

Hardware Type	Warranty Term
Locks, latches, and cylinders	Two (2) years
Closers	Ten (10) years
Hinges	Lifetime
Panics	One (1) year
Miscellaneous	One (1) year
Electrical Hardware:	Five (5) years

2 Products

2.1 MANUFACTURERS

1. Acceptable Products Manufacturers: Subject to compliance with requirements specified in this Section, use any of the following listed manufacturers' products in accordance with Section 01 62 00 – Product Options provided required product data and shop drawing are submitted before starting any work of this Section
2. Substitutions: Only those products / brands listed in the attached door hardware schedule are acceptable and should be used to form a bid price. No unsolicited products will be considered. If acceptable alternates are listed here those too can be used to form a bid price provided, they are exactly the same as the specified item. If no alternates are listed, no alternate products are acceptable.

2.2 PERFORMANCE REQUIREMENTS

1. Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated, and generally comply with the following provisions:
 1. Accessibility requirements in accordance with ANSI 117.1.
 2. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
 3. Door Closers: Maximum opening force requirements as follows:
 1. Interior Hinged Doors: Nominal 20 N applied perpendicular to door.
 2. Fire Doors: Minimum opening force allowable by Authorities Having Jurisdiction.
 4. Thresholds: Maximum 13 mm high; bevel raised thresholds with a slope of maximum 1:2.
 5. Latches, Locks, and Exit Devices: Nominal 65 N to release the latch, and shall not require the use of a key, tool, or special knowledge for operation.
 6. Delayed Egress Locks: Lock releases within 15 seconds after applying 90 N force.
 7. Door Closers: Nominal 130 N to set door in motion and nominal 65 N to open door to minimum required width.

2.3 MATERIALS

1. Materials and Finishes: Materials and finishes matching scheduled hardware, meeting requirements of BHMA A156.18, and performance required for installation.

2.4 ACCESSORIES

1. Automatic Swing Door Operators: Provide concealed electromechanical swing door operator, consisting of electromechanical swinging door operator and electronic control in conformance with ANSI A156.19, aluminum header, connecting hardware, and power on/off switch and safety sensor.
 1. Substitutions: Only those products / brands listed in the attached door hardware schedule are acceptable and should be used to form a bid price. No unsolicited products will be considered. If acceptable alternates are listed here those too can be used to form a bid price provided, they are exactly the same as the specified item. If no alternates are listed, no alternate products are acceptable.
2. Stainless Steel Threshold at Fire Rated Doors: Provide brushed finish stainless steel threshold at all fire rated doors as indicated on drawings.
 1. Substitutions: Only those products / brands listed in the attached door hardware schedule are acceptable and should be used to form a bid price. No unsolicited products will be considered. If acceptable alternates are listed here those too can be used to form a bid price provided, they are exactly the same as the specified item. If no alternates are listed, no alternate products are acceptable.

2.5 KEYING

1. Keying: Provide manufacturer's standard cores and finish face to match lockset.
2. Keying System: Provide a keying system in accordance with the following requirements:
 1. Master Key System: Cylinders are operated by a change key and a master key.
3. Keys: Provide nickel-silver keys in accordance with the following:
 1. Stamping: Permanently inscribe each key with a visual key control number and notation stating, "DO NOT DUPLICATE".
 2. Quantity: In addition to one extra blank key for each lock, provide the following:
 1. Cylinder Change Keys: Three
 2. Master Keys: Five

3 Execution

3.1 EXAMINATION

1. Examine doors and frames, with installer present, for compliance with requirements for installation tolerances, labelled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
2. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

1. Prepare steel doors and frames in accordance with DHI A115 Series.
2. Prepare wood doors in accordance with DHI A115-W Series.

3.3 INSTALLATION

1. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required in accordance with governing regulations:
 1. Standard Steel Doors and Frames: DHI's Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames.
 2. Standard Wood Doors: DHI WDHS.3, Recommended Locations for Architectural Hardware for Wood Flush Doors.
2. Install each door hardware item in accordance with manufacturer's written instructions.
3. Coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 – Finishes where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way.
4. Install surface mounted items only when finishes have been completed on substrates involved, and as follows:
 1. Set units level, plumb, and true to line and location.
 2. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 3. Drill and countersink units that are not factory prepared for anchorage fasteners.
 4. Space fasteners and anchors according to industry standards.
5. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings; verify location with Consultant, and as follows:
 1. Configuration: Provide one power supply for each door opening.
6. Thresholds:
 1. Set thresholds for acoustical doors in full bed of sealant in accordance with requirements specified in Section 07 92 00 – Joint Sealants.
 2. Set threshold for fire rated doors in full bed of epoxy adhesive.
7. Key Control System: Place keys on markers and hooks in key control system cabinet, as determined by final keying schedule.

3.4 SITE QUALITY CONTROL

1. Independent Architectural Hardware Consultant: Owner may engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
2. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted, and as follows:

1. Testing: Consists of Dynamic, static and system tests.
2. Dynamic tests shall be conducted to before terminating devices to ensure door mechanics, sensors and locking devices mechanically functions correctly and free of grounds and shorts.
3. Static tests shall be conducted before interconnecting devices to ensure all equipment functions correctly when energized.
4. System tests shall be conducted to test system fully and to include fire alarm integration.

3.5 CLOSEOUT REQUIREMENTS

1. Adjusting:
 1. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and in accordance with referenced accessibility requirements:
 1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
 2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
 3. Door Closers: Adjust sweep period so that, from an open position of 70°, the door will take at least 3 seconds to move to a point 75 mm from the latch, measured to the leading edge of the door.
 2. Six Month Adjustment: Approximately six months after date of Substantial Performance, perform the following:
 1. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
 2. Consult with and instruct Owner's personnel on recommended maintenance procedures.
 3. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.
2. Cleaning: Clean adjacent surfaces soiled by door hardware installation and as necessary to restore proper function and finish.
3. Protection: Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.
4. Demonstrating: Engage a factory authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes.

3.6 DOOR HARDWARE SCHEDULE

1. Refer to appended door hardware schedule and coordinate with drawing's door and hardware schedule.

END OF SECTION

DOOR HARDWARE

08 71 00



PROJECT:

Niagara Regional Police
NG911

ARCHITECT:

AECOM

50 Sportsworld Crossing Road
Suite 290
Kitchener, ON

Prepared By: Chad Connors

Date: October 23, 2024

Revised: November 12, 2024

Issued for tender Jan. 14, 2025

Issued for Addendum #1 – Feb. 5, 2025

Architectural Hardware Finishes

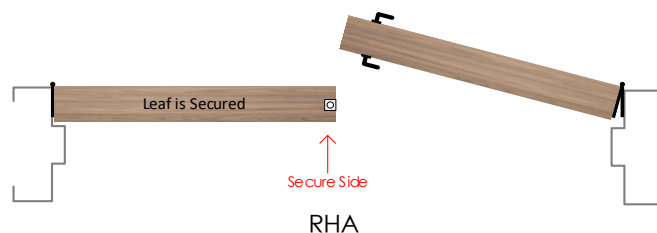
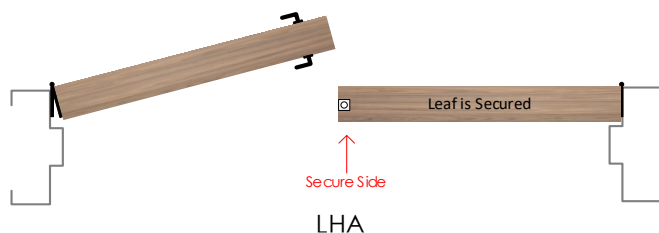
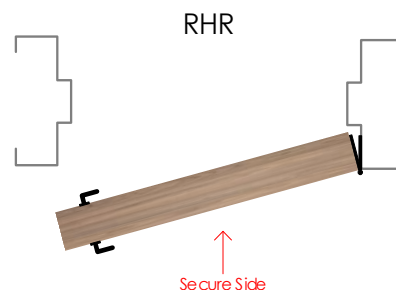
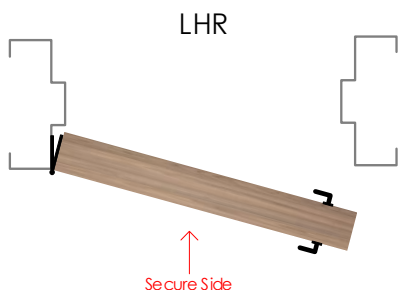
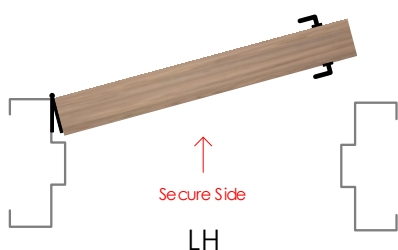
	Steel	Stainless Steel	Brass/Bronze	Aluminum	Paint/Powder Coat	US/CAN
Clear Anodized				628	689	US28
Satin Nickel	646		619	670		US15
Polished Nickel	645		618	669		US14
Satin Stainless Steel		630				US32D
Polished Stainless Steel		629				US32
Satin Chrome	652		626	702		US26D
Polished Chrome	651		625	672		US26
Satin Brass	633		606	667	678	US4
Polished Brass	632		605	666	677	US5
Satin Bronze	639		612	668	680	US10
Oil Rubbed Bronze	640		613	703	695	US10B
Flat Black / Anodized Black	631		622	671	693	US19

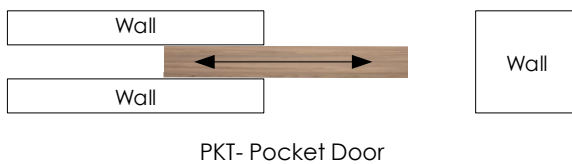
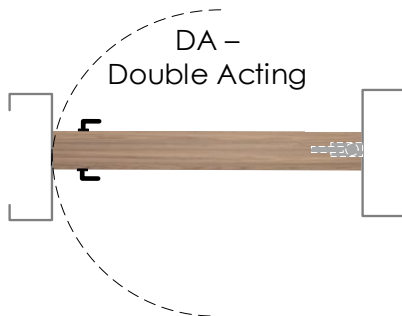
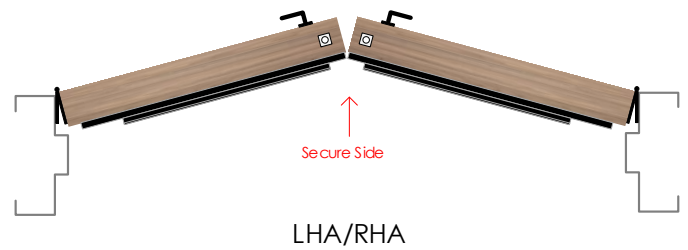
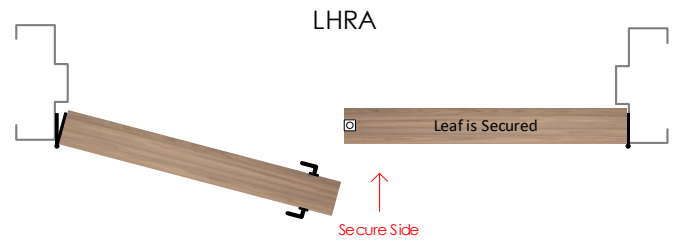
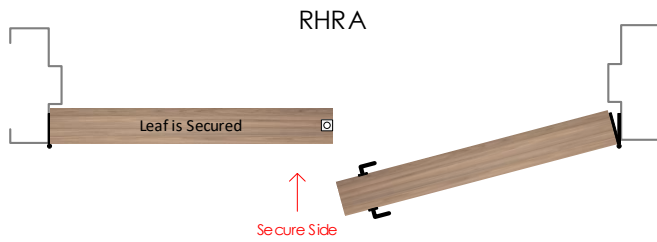
Door Handing's

Abbreviations

RH = Right Hand	RHA = Right Hand Active	SS = Single Slider
LH = Left Hand	LHA = Left Hand Active	BP = Bi-Parting Slider
RHR = Right Hand Reverse	RHA/LHA = Right & Left Hands Active	BF = Bi-Folding Slider
LHR = Left Hand Reverse	RHRA/LHRA = Right & Left Hand Reverse Active	TS = Telescopic Slider
RHRA = Right Hand Reverse Active	DA = Double Acting	PKT = Pocket Slider
LHRA = Left Hand Reverse Active	DE = Double Egress	

NOTE: The handing of a swing door is determined by placing yourself on the secured or keyed side of the door.





Products & Alternatives

NOTE: Only those products / brands listed here are acceptable and should be used to form a bid price. No unsolicited products will be considered. If acceptable alternates are listed here those too can be used to form a bid price provided, they are exactly the same as the specified item. If using an alternate product to form a price it is the bidder's responsibility to ensure that product is identical in every way to the specified item. If no alternates are listed, no alternate products are acceptable.

Product Type	Product#	Manufacturer	Alternate Manufacturer 1	Alternate Manufacturer 2
Hinge	CB1900R	Best	McKinney	Ives
Flush Bolt	F65	Standard Metal	Gallery	
Power Transfer	EPT-10	Von Duprin	Securitron	Precision
Lockset	L9000	Schlage	Sargent	Dormakaba
Exit Device	98	Von Duprin	Sargent	Precision
Electric Strike	1500	HES	RCI	Von Duprin
Overhead Stop	100S	Glynn Johnson	Sargent	ABH
Door Closer	4040XP	LCN	Sargent	Dormakaba
Auto Door Operator	ED100 / ED250	Dormakaba	Besam	
Actuator	325	Camden		
Restroom Control Kit	CX-WC13AXFM	Camden		
Emergency Control kit	CX-WEC10K2	Camden		
Door Pull	3012	Standard Metal	CBH	NGP
Push Bar	6000	Standard Metal	CBH	NGP
Kick Plate	K10A	Standard Metal	CBH	NGP
Floor Stop	S101	Standard Metal	CBH	NGP
Coat Hook	P148	Standard Metal	CBH	NGP
Smoke / Sound Seal	W-66	KN Crowder	CBH	NGP
Weatherstrip	W-23	KN Crowder	CBH	NGP
Astragal	W-25	KN Crowder	CBH	NGP
Door Sweep	W-24S	KN Crowder	CBH	NGP
Relay	CX-33	Camden		

Symbols



- Door has a fire rating and all associated hardware must have a fire label to suit. Must comply with local requirements.



- Door is automatic and is equipped with an auto operator. Door must meet local barrier free codes



- Door has an electrical requirement and requires power to be brought to the appropriate location above the door or to the latch, for either security or barrier free applications. Refer to security & electrical drawings for further information.



- Door requires security card access. Refer to security / electrical drawings for further information.

Abbreviations

Door:

HMD = Hollow Metal Door
IHMD = Insulated Hollow Metal Door
ALD = Aluminum Door
SSD = Stainless Steel Door
ISSD = Insulated Stainless Steel Frame
STL = Steel Door
IC-ALD = Insulated Clad Aluminum Door
SCWD = Solid Core Wood Door
HCWD = Hollow Core Wood Door
FGD = Frameless Glass Door
FRP = Fiberglass Reinforced Plastic Door
OHD = Overhead Door

Frame:

HMF = Hollow Metal Frame
ALF = Aluminum Frame
Cased Open HMF = Cased Open Hollow Metal Frame
SSF - Stainless Steel Frame
STL = Steel Frame
WDF = Wood Frame
Cased Open WDF = Cased Open Wood Frame
Cased Open Drywall = Cased Open Drywall

Fire Ratings:

0 HR – Zero Hour Fire Rating / Smoke Barrier
20 MIN – 20 Minute Fire Rating
¾ HR – 45 Minute Fire rating
1 ½ HR – 90 Minute Fire Rating
2 HR – 120 Minute Fire Rating
3 HR – 180 Minute Fire Rating

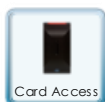
Disclaimer

Weblinks:

Weblinks do change from time to time as manufacturers move around their websites, please inform us if you have a none functioning weblink.

HARDWARE SCHEDULE

Confirm IC (interchangeable core) requirements with owner – large format versus small format.
Project written as large format.












Heading# 1

Opening Information					
Opening Type:	Pair	Opening Size:	2 - 965 x 2134 x 45	STC Rating	None
Door Material:	IHMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	D101a	Location:	Exterior	From	Vestibule 101	Handing:	RHRA

By Hardware Supplier					
6	Heavy Weight Butt Hinge	CB1961R NRP 127 x 114	626 / US26D / Satin Chrome	Best	
2	Flush Bolts	F65UL	626 / US26D / Satin Chrome	Standard Metal	
1	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin	
1	Storeroom Latch Retraction Exit Device	QEL9847NL-OP	626 / US26D / Satin Chrome	Von Duprin	
1	Rim IC Cylinder	20-057	626 / US26D / Satin Chrome	Schlage	
2	Offset Door Pull	3012-2	626 / US26D / Satin Chrome	Standard Metal	
1	Push Bar	6034-2	626 / US26D / Satin Chrome	Standard Metal	
2	Overhead Stop	104S	630 / US32D / Satin Stainless Steel	Glynn Johnson	
1	Door Closer	4040XP-RWPA	689 / US28 / Painted Aluminum	LCN	
1	Threshold	CT-74 x 1930	719 Milled Aluminum	KN Crowder	
1	Weatherstrip	W-23 1/1930 x 2/2134	628 / US28 / Clear Anodized	KN Crowder	
1	Astragal Set	W-25 2/2134	628 / US28 / Clear Anodized	KN Crowder	
2	Door Sweep	W-24S x 965	628 / US28 / Clear Anodized	KN Crowder	
By Automatic Operator Supplier					

1	Auto Door Operator	ED250-SA-4x6-SGL-PUSH-NH 38-19	628 / US28 / Clear Anodized	Dormakaba	
2	Actuator	325-S/42	630 / US32D / Satin Stainless Steel	Camden	
1	Relay	CX-33		Camden	
By Security Supplier					
1	Card Reader / Keypad	By Security Provider		MFG	
1	Request to Exit	By Security Provider		MFG	
2	Door Contact	By Security Provider		MFG	
1	Power Supply	By Security Provider		MFG	
1	Access Controller	By Security Provider		MFG	
By Owner					
1	Permanent IC Core		626 / US26D / Satin Chrome	MFG	

Notes:

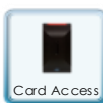
- 120VAC is required at the head of the door for all barrier free door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.
- Electrician to confirm wire locations with auto door operator supplier prior to pulling wires.

Method of Operation

Ingress: Valid card/keypad authorization retracts the exit device latch allowing ingress. Alternatively, the actuator can engage the auto door operator after valid card/keypad authorization retracts the exit device latch.

Egress: Push exit device push pad for egress, while the request to exit sensor alerts security of an authorized exit. Alternatively, the actuator can engage the auto door operator.

.....End of Heading.....



Heading# 2

Opening Information					
Opening Type:	Pair	Opening Size:	2 - 965 x 2134 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	D101b	Location:	Vestibule 101	From	Corridor 117	Handing:	RHRA

By Hardware Supplier







6	Heavy Weight Butt Hinge	CB1961R NRP 127 x 114	626 / US26D / Satin Chrome	Best	
2	Flush Bolts	F65UL	626 / US26D / Satin Chrome	Standard Metal	
1	Dust Proof Strike	F68	626 / US26D / Satin Chrome	Standard Metal	
1	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin	
1	Storeroom Latch Retraction Exit Device	QEL9847NL-OP	626 / US26D / Satin Chrome	Von Duprin	
1	Rim IC Cylinder	20-057	626 / US26D / Satin Chrome	Schlage	
2	Offset Door Pull	3012-2	626 / US26D / Satin Chrome	Standard Metal	
1	Push Bar	6034-2	626 / US26D / Satin Chrome	Standard Metal	
2	Overhead Stop	104S	630 / US32D / Satin Stainless Steel	Glynn Johnson	
1	Door Closer	4040XP-RWPA	689 / US28 / Painted Aluminum	LCN	
1	Weatherstrip	W-23 1/1930 x 2/2134	628 / US28 / Clear Anodized	KN Crowder	
1	Astragal Set	W-25 2/2134	628 / US28 / Clear Anodized	KN Crowder	
2	Door Sweep	W-24S x 965	628 / US28 / Clear Anodized	KN Crowder	

By Automatic Operator Supplier

1	Auto Door Operator	ED250-SA-4x6-SGL-PUSH-NH 38-19	628 / US28 / Clear Anodized	Dormakaba	
2	Actuator	325-S/42	630 / US32D / Satin Stainless Steel	Camden	
1	Relay	CX-33		Camden	

By Security Supplier

SPYDER SC

1	Card Reader	By Security Provider		MFG	
1	Request to Exit	By Security Provider		MFG	
2	Door Contact	By Security Provider		MFG	
1	Power Supply	By Security Provider		MFG	
1	Access Controller	By Security Provider		MFG	
By Owner					
1	Permanent IC Core		626 / US26D / Satin Chrome	MFG	

Notes:

- 120VAC is required at the head of the door for all barrier free door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.
- Electrician to confirm wire locations with auto door operator supplier prior to pulling wires.

Method of Operation

Ingress: Valid card authorization retracts the exit device latch allowing ingress. Alternatively, the actuator can engage the auto door operator after valid card authorization retracts the exit device latch.

Egress: Push exit device push pad for egress, while the request to exit sensor alerts security of an authorized exit. Alternatively, the actuator can engage the auto door operator.

.....End of Heading.....



Heading# 3

Opening Information					
Opening Type:	Single	Opening Size:	965 x 2134 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	D102	Location:	Corridor 117	To	Universal W/C 102	Handing:	LH

By Hardware Supplier					
3	Standard Weight Butt Hinge	CB1900R 127 x 114	652 / US26D / Satin Chrome	Best	
1	Storeroom Lockset	L9080-17B x 23-030	626 / US26D / Satin Chrome	Schlage	
1	Electric Strike	1500C (fail safe)	630 / US32D / Satin Stainless Steel	HES	
2	Kick Plate	K10A 203 x 927	626 / US26D / Satin Chrome	Standard Metal	
1	Floor Stop	S101	626 / US26D / Satin Chrome	Standard Metal	
1	Smoke / Sound Seal	W-66 x 5233	Black	KN Crowder	
1	Door Sweep	W-24S x 965	628 / US28 / Clear Anodized	KN Crowder	
1	Coat Hook	P148	626 / US26D / Satin Chrome	Standard Metal	
By Automatic Operator Supplier					
1	Auto Door Operator	ED100-SA-4x6-SGL-PULL-NH 38-19	628 / US28 / Clear Anodized	Dormakaba	
1	Restroom Control Kit	CX-WC13AXFM	630 / US32D / Satin Stainless Steel	Camden	
1	Emergency Call System	CX-WEC10K2	630 / US32D / Satin Stainless Steel	Camden	
By Owner					
1	Permanent IC Core	By Owner	626 / US26D / Satin Chrome	MFG	

Notes:

- 120VAC is required at the head of the door for all barrier free door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.
- Electrician to confirm wire locations with auto door operator supplier prior to pulling wires.

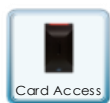
Method of Operation

Ingress: Push door for manual ingress. Alternatively, the actuator can engage the auto door operator. Once inside the washroom the 'push to lock' actuator will engage the electric strike and disable the outside actuator. The outside actuator will change colour to indicate the washroom is in use.

Egress: Turn lever for manual egress. Alternatively, the actuator can engage the auto door operator.

.....End of Heading.....

Addendum #1 – Fire rating removed from doors D103A & D103B



Heading#

4

Opening Information					
Opening Type:	Single	Opening Size:	965 x 2134 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

2	Total Openings							
1	Door#	D103A	Location:	Corridor 117	To	Call/Dispatch 103	Handing:	RH
1	Door#	D103B	Location:	Corridor 117	To	Call/Dispatch 103	Handing:	LH

By Hardware Supplier					
6	Standard Weight Butt Hinge	CB1900R 127 x 114	652 / US26D / Satin Chrome	Best	
2	Storeroom Lockset	L9080-17B x 23-030	626 / US26D / Satin Chrome	Schlage	
2	Electric Strike	1500C	630 / US32D / Satin Stainless Steel	HES	
4	Kick Plate	K10A 203 x 927	626 / US26D / Satin Chrome	Standard Metal	
2	Floor Stop	S101	626 / US26D / Satin Chrome	Standard Metal	
2	Smoke / Sound Seal	W-66 x 5233	Black	KN Crowder	
2	Door Sweep	W-24S x 965	628 / US28 / Clear Anodized	KN Crowder	
By Automatic Operator Supplier					
2	Auto Door Operator	ED100-SA-4x6-SGL-PULL-NH 38-19	628 / US28 / Clear Anodized	Dormakaba	
4	Actuator	325-S/42	630 / US32D / Satin Stainless Steel	Camden	
2	Relay	CX-33		Camden	
By Security Supplier					
2	Card Reader	By Security Provider		MFG	
2	Request to Exit	By Security Provider		MFG	
2	Door Contact	By Security Provider		MFG	
2	Power Supply	By Security Provider		MFG	
2	Access Controller	By Security Provider		MFG	
By Owner					

2	Permanent IC Core	By Owner	626 / US26D / Satin Chrome	MFG	
---	-------------------	----------	----------------------------	-----	---

Notes:

- 120VAC is required at the head of the door for all barrier free door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.
- Electrician to confirm wire locations with auto door operator supplier prior to pulling wires.

Method of Operation

Ingress: Valid card authorization releases the electric strike allowing ingress. Alternatively, the actuator can engage the auto door operator after valid card authorization releases the electric strike.

Egress: Turn the lever for egress, while the request to exit sensor alerts security of an authorized exit. Alternatively, the actuator can engage the auto door operator.

.....End of Heading.....

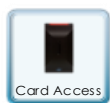
Heading# 5

Opening Information					
Opening Type:	Single	Opening Size:	965 x 2134 x 45	STC Rating	None
Door Material:	IHMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	D103C	Location:	Exterior	From	Call/Dispatch 103	Handing:	RHR

By Hardware Supplier					
3	Heavy Weight Butt Hinge	CB1961R NRP 127 x 114	626 / US26D / Satin Chrome	Best	
1	Classroom Exit Device	98L x 996L-17-R/V	626 / US26D / Satin Chrome	Von Duprin	
1	Rim IC Cylinder	20-057	626 / US26D / Satin Chrome	Schlage	
1	Overhead Stop	104S	630 / US32D / Satin Stainless Steel	Glynn Johnson	
1	Door Closer	4040XP-RWPA	689 / US28 / Painted Aluminum	LCN	
1	Threshold	CT-74 x 965	719 Milled Aluminum	KN Crowder	
1	Weatherstrip	W-23 1/965 x 2/2134	628 / US28 / Clear Anodized	KN Crowder	
1	Door Sweep	W-24S x 965	628 / US28 / Clear Anodized	KN Crowder	
By Owner					
1	Permanent IC Core	By Owner	626 / US26D / Satin Chrome	MFG	

.....End of Heading.....



Heading#

5A

Opening Information					
Opening Type:	Single	Opening Size:	965 x 2134 x 45	STC Rating	None
Door Material:	IHMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	D112	Location:	Patio 118	From	Kitchen 112	Handing:	RHR

By Hardware Supplier					
3	Heavy Weight Butt Hinge	CB1961R NRP 127 x 114	626 / US26D / Satin Chrome	Best	
1	Classroom Exit Device	98L x 996L-17-R/V	626 / US26D / Satin Chrome	Von Duprin	
1	Rim IC Cylinder	20-057	626 / US26D / Satin Chrome	Schlage	
1	Overhead Stop	104S	630 / US32D / Satin Stainless Steel	Glynn Johnson	
1	Door Closer	4040XP-RWPA	689 / US28 / Painted Aluminum	LCN	
1	Threshold	CT-74 x 965	719 Milled Aluminum	KN Crowder	
1	Weatherstrip	W-23 1/965 x 2/2134	628 / US28 / Clear Anodized	KN Crowder	
1	Door Sweep	W-24S x 965	628 / US28 / Clear Anodized	KN Crowder	
By Security Supplier					
2	Card Reader	By Security Provider		MFG	
1	Magnetic Lock	By Security Provider		MFG	
1	Pull Station	By Security Provider		MFG	
1	Door Contact	By Security Provider		MFG	
1	Power Supply	By Security Provider		MFG	
1	Access Controller	By Security Provider		MFG	
By Owner					
1	Permanent IC Core	By Owner	626 / US26D / Satin Chrome	MFG	

Method of Operation

Ingress: Valid card authorization releases the magnetic lock allowing ingress (Exit device to be in passage mode). In the event of a power loss, exit device to be in storeroom mode to secure the opening.

Egress: Valid card authorization releases the magnetic lock allowing egress. Loss of power or fire alarm will release the magnetic lock allowing egress. In the event of an emergency, the pull station will release the magnetic lock allowing egress.

.....End of Heading.....

Addendum #1 – Fire rating removed from doors D104 & D105. Door closer deleted.



Heading#

6

Opening Information					
Opening Type:	Single	Opening Size:	965 x 2134 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

2	Total Openings							
1	Door#	D104	Location:	Corridor 117	To	Trainer 104	Handing:	LH
1	Door#	D105	Location:	Corridor 117	To	Q.A. 105	Handing:	RH

By Hardware Supplier					
6	Standard Weight Butt Hinge	CB1900R 127 x 114	652 / US26D / Satin Chrome	Best	
2	Office Lockset	L9050-17B x 23-030	626 / US26D / Satin Chrome	Schlage	
4	Kick Plate	K10A 203 x 927	626 / US26D / Satin Chrome	Standard Metal	
2	Floor Stop	S101	626 / US26D / Satin Chrome	Standard Metal	
2	Smoke / Sound Seal	W-66 x 5233	Black	KN Crowder	
2	Door Sweep	W-24S x 965	628 / US28 / Clear Anodized	KN Crowder	
By Owner					
2	Permanent IC Core	By Owner	626 / US26D / Satin Chrome	MFG	





-----End of Heading-----

Heading#

6A

Opening Information					
Opening Type:	Single	Opening Size:	965 x 2134 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

3	Total Openings							
1	Door#	D108	Location:	Corridor 117	To	Quiet 108	Handing:	LH
1	Door#	D113A	Location:	Corridor 117	To	Multipurpose Room 113	Handing:	RH
1	Door#	D113B	Location:	Corridor 117	To	Multipurpose Room 113	Handing:	LH

By Hardware Supplier					
9	Standard Weight Butt Hinge	CB1900R 127 x 114	652 / US26D / Satin Chrome	Best	
3	Office Lockset	L9050-17B x 23-030	626 / US26D / Satin Chrome	Schlage	
3	Door Closer	4040XP	689 / US28 / Painted Aluminum	LCN	
6	Kick Plate	K10A 203 x 927	626 / US26D / Satin Chrome	Standard Metal	
3	Floor Stop	S101	626 / US26D / Satin Chrome	Standard Metal	
3	Smoke / Sound Seal	W-66 x 5233	Black	KN Crowder	
By Owner					
3	Permanent IC Core	By Owner	626 / US26D / Satin Chrome	MFG	

-----End of Heading-----

Heading# 7

Opening Information					
Opening Type:	Single	Opening Size:	965 x 2134 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	D107	Location:	Call/Dispatch 103	To	Administrator 107	Handing:	LH

By Hardware Supplier					
3	Standard Weight Butt Hinge	CB1900R 127 x 114	652 / US26D / Satin Chrome	Best	
1	Office Lockset	L9050-17B x 23-030	626 / US26D / Satin Chrome	Schlage	
2	Kick Plate	K10A 203 x 927	626 / US26D / Satin Chrome	Standard Metal	
1	Floor Stop	S101	626 / US26D / Satin Chrome	Standard Metal	
1	Smoke / Sound Seal	W-66 x 5233	Black	KN Crowder	
1	Coat Hook	P148	626 / US26D / Satin Chrome	Standard Metal	
By Owner					
1	Permanent IC Core	By Owner	626 / US26D / Satin Chrome	MFG	

.....End of Heading.....

Heading# 8

Opening Information					
Opening Type:	Single	Opening Size:	965 x 2134 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

2	Total Openings							
1	Door#	D109	Location:	Corridor 117	To	W W/C 109	Handing:	RH
1	Door#	D110	Location:	Corridor 117	To	M W/C 110	Handing:	LH

By Hardware Supplier					
6	Standard Weight Butt Hinge	CB1900R 127 x 114	652 / US26D / Satin Chrome	Best	
2	Privacy Set w/ Indicator	L9040-17B x OS-OCC	626 / US26D / Satin Chrome	Schlage	
2	Door Closer	4040XP	689 / US28 / Painted Aluminum	LCN	
4	Kick Plate	K10A 203 x 927	626 / US26D / Satin Chrome	Standard Metal	
2	Floor Stop	S101	626 / US26D / Satin Chrome	Standard Metal	
2	Smoke / Sound Seal	W-66 x 5233	Black	KN Crowder	
2	Door Sweep	W-24S x 965	628 / US28 / Clear Anodized	KN Crowder	
2	Coat Hook	P148	626 / US26D / Satin Chrome	Standard Metal	

.....End of Heading.....

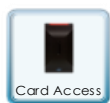
Heading# 9

Opening Information					
Opening Type:	Single	Opening Size:	965 x 2134 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	D111	Location:	Corridor 117	To	Janitor D111	Handing:	LH

By Hardware Supplier					
3	Standard Weight Butt Hinge	CB1900R 127 x 114	652 / US26D / Satin Chrome	Best	
1	Storeroom Lockset	L9080-17B x 23-030	626 / US26D / Satin Chrome	Schlage	
1	Door Closer	4040XP	689 / US28 / Painted Aluminum	LCN	
2	Kick Plate	K10A 203 x 927	626 / US26D / Satin Chrome	Standard Metal	
1	Floor Stop	S101	626 / US26D / Satin Chrome	Standard Metal	
1	Smoke / Sound Seal	W-66 x 5233	Black	KN Crowder	
1	Door Sweep	W-24S x 965	628 / US28 / Clear Anodized	KN Crowder	
By Owner					
1	Permanent IC Core	By Owner	626 / US26D / Satin Chrome	MFG	

.....End of Heading.....



Heading#

10

Opening Information					
Opening Type:	Single	Opening Size:	965 x 2134 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	3/4 HR

3	Total Openings							
1	Door#	D114	Location:	Corridor 117	To	Mech. 114	Handing:	RH
1	Door#	D115	Location:	Corridor 117	To	Elec/UPS 115	Handing:	LH
1	Door#	D116	Location:	Corridor 117	To	IT Room 116	Handing:	RH

By Hardware Supplier

9	Standard Weight Butt Hinge	CB1900R 127 x 114	652 / US26D / Satin Chrome	Best	
3	Storeroom Lockset	L9080-17B x 23-030	626 / US26D / Satin Chrome	Schlage	
3	Electric Strike	1500C	630 / US32D / Satin Stainless Steel	HES	
3	Door Closer	4040XP	689 / US28 / Painted Aluminum	LCN	
6	Kick Plate	K10A 203 x 927	626 / US26D / Satin Chrome	Standard Metal	
3	Floor Stop	S101	626 / US26D / Satin Chrome	Standard Metal	
3	Smoke / Sound Seal	W-66 x 5233	Black	KN Crowder	
3	Door Sweep	W-24S x 965	628 / US28 / Clear Anodized	KN Crowder	

By Security Supplier

3	Card Reader	By Security Provider		MFG	
3	Request to Exit	By Security Provider		MFG	
3	Door Contact	By Security Provider		MFG	
3	Power Supply	By Security Provider		MFG	
3	Access Controller	By Security Provider		MFG	

By Owner

3	Permanent IC Core	By Owner	626 / US26D / Satin Chrome	MFG	
---	-------------------	----------	----------------------------	-----	--

Method of Operation

SPYDER SC

Ingress: Valid card authorization released the electric strike allowing ingress.

Egress: Turn the lever for egress, while the request to exit sensor alerts security of an authorized exit.

.....End of Heading.....

End of Door Hardware Schedule

1 General

1.1 SUMMARY

1. This Section specifies the requirements for the supply and installation of resilient flooring and accessories including, but not limited to, the following:
 1. Resilient Tile Materials:
 1. Luxury vinyl tile.
 2. Resilient Sheet Materials:
 1. Static dissipative vinyl flooring.
 3. Resilient Accessories:
 1. Resilient wall base.

1.2 RELATED REQUIREMENTS

1. Other sections of the specification referring to this section, coordinate requirements of related sections and requirements.

1.3 REFERENCE STANDARDS

1. All reference standards specified herein imply the latest edition of the standard.
2. American Association of Textile Chemists and Colorists (AATCC):
 1. AATCC 134-2019, Test Method for Electrostatic Propensity of Carpets
3. American Society for Testing and Materials (ASTM International):
 1. ASTM F150-06(2018), Standard Test Method for Electrical Resistance of Conductive and Static Dissipative Resilient Flooring
 2. ASTM F1066-23, Standard Specification for Vinyl Composition Floor Tile
 3. ASTM F1344-21a, Standard Specification for Rubber Floor Tile
 4. ASTM F1861-21, Standard Specification for Resilient Wall Base
 5. ASTM F2170-19a, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in Situ Probes
4. National Fire Protection Association (NFPA):
 1. NFPA 255-2006, Standard Method of Test of Surface Burning Characteristics of Building Materials
5. Underwriters Laboratories of Canada (ULC):
 1. CAN/ULC S102.2:2018, Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies

1.4 ADMINISTRATIVE REQUIREMENTS

1. Coordination: Close spaces to traffic during flooring installation and until time period after installation recommended in writing by manufacturer; install flooring and accessories after other finishing operations, including painting and ceiling construction have been completed.

1.5 SUBMITTALS

1. Submit requested materials in accordance with Section 01 33 00 – Submittal Procedures.
2. Action Submittals: Provide the following submittals before starting any work of this Section:
 1. Product Data: Submit product data for each type of product specified.
 2. Samples for Verification: Submit samples for verification of each different specified product for verification of colour and pattern in manufacturer's standard sample size.

3. Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 81 13 – Sustainable Design Criteria.

1.6 PROJECT CLOSEOUT SUBMISSIONS

1. Operation and Maintenance Data: Submit manufacturer's written instructions for maintenance and cleaning procedures, include list of manufacturers recommended cleaning and maintenance products, and name of original installer and contact information in accordance with Section 01 78 23 – Operation and Maintenance Data.
2. Maintenance Materials: Provide extra materials that match installed products; packaged with protective covering for storage, and identified with labels describing contents in accordance with requirements of Section 01 78 43 – Spare Parts as follows:
 1. Tile Materials: 2% of total installation with a minimum of one (1) box of each colour and type.
 2. Resilient Base and Accessories: 5% of total installation with a minimum of 2400 mm length of each colour and type.

1.7 QUALITY ASSURANCE

1. Qualifications: Provide proof of qualifications when requested by Consultant:
 1. Source Limitations: Obtain each type, colour, and pattern of flooring or accessories specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.
2. Certifications: Provide proof of the following during the course of the Work:
 1. Compatibility Certificate: Provide letter from floorcoverings adhesive manufacturers stating that Products proposed for use on the Project are compatible with floorcoverings substrates, floorcoverings preparation and floorcovering specified throughout Division 09 – Finishes.

1.8 DELIVERY, STORAGE, AND HANDLING

1. Delivery and Acceptance: Deliver flooring and installation accessories to site in manufacturer's original, unopened cartons and containers, bearing names of product and manufacturer, project identification, and shipping and handling instructions.
2. Storage and Handling: Store products in dry spaces protected from the weather, with ambient conditions maintained between manufacturer's recommended temperature range, and as follows:
 1. Do not stack tile goods over four cartons high and distribute cartons evenly over floor area to prevent overloading of structure.
 2. Keep water-based adhesives from freezing.
 3. Store rolls upright in accordance with manufacturer's instructions.

1.9 SITE CONDITIONS

1. Ambient Conditions Maintain temperature and ventilation in work area using permanent heating system, and portable supply and exhaust fans in accordance with manufacturer's requirements, and as follows:
 1. Move products and accessories into spaces where they will be installed a minimum of 72 hours before installation.
 2. Maintain a minimum temperature of 18°C after installation to prevent damage to resilient materials.
 3. Do not install products and accessories on substrates colder than ambient air temperature.
 4. Install products and accessories when they are at the same temperature as the space where they are installed.

1.10 WARRANTY

1. Manufacturer's Warranty: Provide manufacturer's standard one (1) year warranty against defects in material or workmanship starting from the date of Substantial Performance of the Work.

2 Products

2.1 MATERIALS

1. Basis-of-Design Products: Products named in this Section were used as the basis-of-design for the project; manufacturers listed as additional Acceptable Products and that offer similar products may be incorporated into the work of this Section, provided they meet the performance requirements established by the named products.
2. Substitutions: Additional manufacturers offering similar products to Acceptable Products Manufacturers listed above may be incorporated into the work provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with Section 01 25 00 – Substitutions Procedures.

2.2 PERFORMANCE REQUIREMENTS

1. Regulatory Requirements: Provide products that meet requirements of CAN/ULC S102.2 as applicable for required flame spread ratings; labelled and listed by Underwriters Laboratories of Canada (ULC), or another testing and inspecting agency acceptable to Authority Having Jurisdiction.
2. Provide static dissipative resilient flooring as a complete system having accessories, adhesive, copper grounding strips and maintenance finish supplied by one manufacturer and providing the following static performance requirements:
 1. Dissipative Flooring:
 1. Resistivity Range: of 1×10^6 to $1 \times 10^9 \Omega$ tested in accordance with ESD STM7.
 2. Static Generation: Less than 100 volts when tested in accordance with AATCC-134.
 3. Static decay of 5000 volts to 0 in less than 0.2 seconds in accordance with Federal Test Method 4046-101C.

2.3 MATERIALS

1. Luxury Vinyl Tile (LVT-1):
 1. Colour: Genuine Oak.
 2. Thickness: 3.0 mm overall thickness.
 3. Size: Nominal 150 mm x 1220 mm.
 4. Basis-of-Design Products: Tarkett North America, Event+ Series Luxury.
2. Solid Vinyl Tile – Static Dissipative (SD-1):
 1. Colour: Moonstone.
 2. Thickness: 2.0 mm overall thickness.
 3. Size: 615 mm x 615 mm.
 4. Static Dissipation Range: Having a resistance of $1 \times 10^6 \leq R \leq 10^8 \Omega$ in accordance with IEC 61340-4-1 and ESD STM7.1.
 5. Basis-of-Design Products: Forbo Flooring Systems, Colorex SD, or American Biltrite - Electrotile.

2.4 ACCESSORIES

1. Transition Profiles:
 1. Resilient Flooring to Sealed Concrete (TR-3): Transition profile with sloped exposed surface and integrated perforated tapered anchoring leg, brushed chrome anodized aluminum finish, and as follows:

2. Resilient Flooring to Exterior (TR-4): To be selected by Consultant.
3. Resilient Flooring to Static Resilient Flooring (TR-5): T-Shaped brushed chrome anodized aluminum profile with 14 mm wide visible surface, 1 mm thick beveled exposed surface and 3 mm anchoring leg, and as follows:
 1. Basis-of-Design Products: Schlüter Systems, VINPRO-T, Brushed Chrome Anodized.
2. Resilient Wall Base (RB-1): To ASTM F1861, and as follows:
 1. Type and Group: Type TP, Group 1.
 2. Colour:
 1. At Resilient Flooring and Sealed Concrete: 63 Bedrock.
 2. At Tile: To match tile base TB-1 and TB-2.
 3. At Tile Carpeting: To match RB-1 at all carpet areas.
 3. Height: 102 mm.
 4. Thickness: Nominal 3.2 mm.
 5. Length: Manufacturer's standard maximum length.
 6. Basis-of-Design Products: Tarkett, Type TS, Thermoset Rubber, BaseWork 4", 63 Bedrock (toeless).
3. Trowellable Levelling and Patching Compounds: Latex modified, portland cement-based formulation provided or approved by resilient product manufacturer for applications indicated; Gypsum based materials will not be accepted for use on this project.
4. Adhesives: Solvent free, water-resistant primer and adhesive as recommended by flooring or resilient accessory manufacturer to suit resilient products specified and substrate materials and conditions, and as follows:
 1. Rubber Base Adhesive: Contact adhesive recommended by resilient base manufacturer.

3 Execution

3.1 EXAMINATION

1. Examine substrates, areas, and conditions affecting work are in accordance with manufacturer's requirements.

3.2 PREPARATION

1. Comply with product manufacturer's written installation instructions for preparing substrates indicated to receive resilient products specified.
2. Prepare floors in accordance with Section 09 05 61 – Common Work Results for Flooring Preparation to surface profile required by flooring manufacture.
3. Broom and vacuum clean substrates immediately before installing products specified.
4. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.

3.3 INSTALLATION

1. Comply with resilient manufacturer's written installation instructions.
2. Unroll flooring and allow stabilizing before cutting and fitting in accordance with manufacturer's installation instructions.
3. Layout tile flooring as follows:
 1. Lay tile with joints [parallel] to building lines or as indicated on drawings to produce a symmetrical tile pattern.
 2. Install tile flooring so that perimeter tile width is minimum ½ full size.
4. Static Dissipative Installation System:

1. Adhesive: Static dissipative, water-based resin as recommended by flooring manufacturer to obtain required performance requirements.
2. Grounding Strips: 50 mm wide x maximum length copper ground connection strips as recommended by flooring manufacturer to obtain required performance requirements.
5. Layout resilient base as follows:
 1. Fit joints tight and vertical.
 2. Joints along one plane shall be at minimum 7000 mm spacing, at inconspicuous locations.
 3. Mitre internal corners, groove, and shape back side of base to fit around external corners and exposed ends.
 4. Install resilient wall base on solid backing. Adhere tightly to wall surfaces.
 5. Scribe and fit to door frames and other obstructions.
 6. Install outside corners prior to installation of straight sections.
 7. Install straight and level to variation of plus or minus 3 mm over 3000 mm straight edge.
 8. Do not stretch base during installation.
 9. Shave back of base where necessary to produce snug fit to substrate.

3.4 CLOSEOUT REQUIREMENTS

1. Cleaning:
 1. Remove adhesive and other surface blemishes using cleaner recommended by flooring manufacturer.
 2. Sweep or vacuum work surfaces thoroughly.
 3. Do not wash flooring until after time period recommended by flooring manufacturer.
 4. Damp mop floor to remove marks and soil.
 5. Clean flooring in accordance with manufacturers written recommendations.
 6. Clean and strip protective floor finish applied after completing installation only if required to restore polish finish and if recommended by flooring manufacturer.
 7. Reapply polish to floor surfaces to restore protective floor finish in accordance with flooring manufacturer's written recommendations.
 8. Coordinate with Owner's maintenance program and provide listing of materials required to maintain resilient flooring.
2. Protection:
 1. Protect flooring against mars, marks, indentations, and other damage arising from construction operations and placement of equipment and fixtures during the remainder of construction period using protection methods recommended in writing by flooring manufacturer, and as follows:
 1. Apply protective floor finish or sealer, as appropriate to the specified materials, coordinate selection of floor polish or sealer with Owner's long term maintenance service.
 2. Use only commercially available product acceptable to flooring manufacturer and provide list of products used as a part of maintenance instructions specified for this Section.
 3. Confirm with manufacturer that Owners preferred floor polish or sealer is compatible with manufacturers recommended commercial flooring installation maintenance procedures; notify Consultant where Owner's preferred products are not compatible with manufacturers recommendations.
 2. Protect resilient wall base from scratches, gouges, scuff marks and other damage from time initial surface protection application, until final inspection.

END OF SECTION

1 General

1.1 SUMMARY

1. This Section specifies requirements for supply and installation of access flooring system consisting of a series of modular, removable, interchangeable panels on an elevated support system.

1.2 RELATED REQUIREMENTS

1. Other sections of the specification referring to this section, coordinate requirements of related sections and requirements.

1.3 REFERENCE STANDARDS

1. Ceilings and Interior Systems Construction Association (CISCA):
 1. Recommended Test Procedures for Access Floors, 2007 Edition
2. Underwriters Laboratories Canada (ULC):
 1. CAN/ULC S102:2019 (R2024), Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies
 2. CAN/ULC S102.2:18 (R2024), Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies
 3. CAN/ULC S135-04 AMD1 R16, Standard Test Method for the Determination of Combustibility Parameters of Building Materials Using an Oxygen Consumption Calorimeter (Cone Calorimeter)

1.4 ADMINISTRATIVE REQUIREMENTS

1. Pre-Construction Meetings: Conduct pre-construction meeting to verify project requirements and any unique conditions affecting installation, manufacturer's installation instructions and manufacturer's warranty requirements attended by Contractor, Subcontractor, and other Subcontractor's affected by work of this Section, access flooring manufacturer's representative and Consultant in accordance with Section 01 31 19 – Project Meetings.
2. Coordination: Coordinate with adjacent work and verify that concrete floors are acceptable for installation of specified materials; coordinate location of under floor mechanical and electrical work and as follows:
 1. Mark pedestal locations on subfloor by use of a grid based on actual pedestal modules to enable mechanical and electrical work to proceed without interfering with access flooring pedestals.
 2. Proceed with installation only after completion of other work within affected areas.
3. Scheduling: Order materials and provide site verified dimensions for preparation of shop drawings in sufficient time to allow for manufacturer's fabrication lead time and project installation requirements.

1.5 SUBMITTALS

1. Provide required information in accordance with Section 01 33 00 – Submittal Procedures.
2. Action Submittals: Provide the following submittals before starting any work of this Section:
 1. Product Data: Submit manufacturer's printed product literature and installation instructions, specifications and data sheet indicating specific materials used for work of this Section.
 2. Shop Drawings: Submit measured shop drawings indicating layout of the work including starting point of installation and details of component panels and pedestals using verified site dimensional relationships to adjoining work and installation tolerances; sizes and details of components; anchorage methods; edge and fascia details; elevations differences; gasketing, floor finishes, and location of connection to building grounding electrode.

3. Informational Submittals: Provide the following submittals when requested by the Consultant:
 1. Certificates: Submit product certificates signed by manufacturer certifying that materials supplied for the project comply with specified performance characteristics, design criteria and physical requirements.
 2. Delegated Design Submittals: Submit data on earthquake resistance in the form of structural computations signed and sealed by a qualified professional engineering including, but not limited to, structural computations, material properties and other information indicating that access flooring system will withstand earthquake loads indicated.
 3. Source Quality Control Submittals: Submit test reports; certified by an independent testing laboratory having a minimum of five years' experience testing access floor components in accordance CISCA Recommended Test Procedures, certifying that component parts perform as specified by the manufacturer.
4. Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 81 13 – Sustainable Design Criteria.

1.6 PROJECT CLOSEOUT SUBMISSIONS

1. Operation and Maintenance Data: Submit manufacturer's written instructions for repair and cleaning procedures; include name of original installer and contact information in accordance with Section 01 78 23 – Operation and Maintenance Data.
2. Spare Parts and Tools: Submit unique parts and tools in accordance with Section 01 78 43 – Spare Parts, and as follows:
 1. Spare Parts:
 1. Provide two (2) pallets of spare floor panels without floor covering nine (9) spare pedestals, associated stringers and accessory components for maintenance use.
 2. Store spare parts where directed by Owner.
 3. Package spare parts with protective covering and identified with labels describing contents.
 2. Tools:
 1. Provide four (4) floor panel lifting devices and wall mounting bracket for lifting device standard with access floor manufacturer.
 2. Hang floor panel lifting device mounting bracket in location directed by Owner; set lifting device into bracket.

1.7 QUALITY ASSURANCE

1. Qualifications: Provide proof of qualifications when requested by Consultant:
 1. Manufacturer: Obtain access flooring from a single source and from a single manufacturer, with panels clearly and permanently marked on underside with panel type and concentrated load rating, tested in accordance with CISCA standards for access flooring.
 2. Zinc Whiskers Protection: Provide steel components coated with electrostatic, baked on corrosion resistant coatings; galvanized coatings will not be acceptable.
 3. Installer: Use manufacturer approved installer having experience with similar installations and complexity.
 4. Delegated Design Professional: Use a professional engineer, registered in the province of the Work and familiar with installations of similar scope and complexity to design under structure support systems and panels to carry design loads indicated.
 5. Design: Provide access floor system designed to support loads and configurations indicated; consisting of modular and removable panels supported by an adjustable height under structure support system; with individual panels capable of being removed by one person using manufacturer's standard lifting device; including all required accessories, quantities and finished floor height necessary for a complete and functional installation.

1.8 SITE CONDITIONS

1. Site Measurements: Verify dimensions by site measurements before fabrication and indicate measurements on shop drawings where access flooring system is indicated to fit between or around walls, columns and other construction contiguous with access flooring; coordinate fabrication schedule with construction progress to avoid delaying the Work; indicate site measurements on shop drawings.
2. Ambient Conditions: Install access flooring system after spaces are fully enclosed, and area of installation is operating under permanent building ambient temperature and humidity.

2 Products

2.1 MANUFACTURERS

1. Acceptable Products Manufacturers: Subject to compliance with requirements specified in this Section, use any of the following listed manufacturers' products in accordance with Section 01 62 00 – Product Options provided required product data and shop drawing are submitted before starting any work of this Section:
 1. ASM Modular Systems Inc.
 2. Camino Modular Systems Inc.
 3. Tate Access Floors.
2. Substitutions: Additional manufacturers offering similar products to Acceptable Products Manufacturers listed above may be incorporated into the work provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with Section 01 25 00 – Substitutions Procedures.

2.2 PERFORMANCE REQUIREMENTS

1. Structural Performance for Panels: Provide access flooring panels capable of withstanding the following loads and stresses within limits and under conditions indicated, as determined by testing manufacturer's current standard products in accordance with referenced procedures in CISCA Recommended Test Procedures for Access Floors:
 1. Design Load Performance: Provide access flooring systems supported on actual under structure system components capable of withstanding a minimum design load of 1100 kg; signifying that panels will support a concentrated load placed on a 6.5 cm² area at any location in the panel without yielding and having a safety factor of 2 without failing; failure is defined as the point at which access flooring system will not take any additional load.
 2. Uniform Load Performance: Provide access flooring systems supported on actual under structure system components capable of supporting a nominal uniform load of 31.15 kN/m².
 3. Rolling Load Performance: Provide access flooring systems capable of withstanding rolling loads of the following magnitude applied to non-perforated panels, with a combination of local and overall deformation not to exceed nominal 1.0 mm after exposure to rolling load over CISCA Path A or B, whichever path produces the greatest top surface deformation, and as follows:
 1. Wheel 1 Rolling Load: Nominal 360 kg for 10 Passes using 75 mm diameter x 46 mm wide wheel.
 2. Wheel 2 Rolling Load: Nominal 270 kg for 10,000 Passes using 250 mm diameter x 100 mm wide wheel.
 4. Impact Load Performance: Provide access flooring systems capable of withstanding an impact load of 68 kg dropped from a height of 915 mm onto a 6.5 cm² area using a round or square indenter to any location on the panel.
 5. Panel Drop Test: Provide panel capable of being dropped face up onto to a concrete slab from a height of 915 mm that continues to meet all load performance requirements as previously defined after completion of test.

6. Panel Cut Out: Provide panel having 200 mm diameter cut out capable of withstanding ultimate load of 680 kg without failure applied anywhere on panel.
 7. Flammability of Finishes: Provide access flooring system having a flame spread rating of 5; fuel contribution of 10 and smoke development of 15 when tested in accordance with CAN/ULC S102 and CAN/ULC S102.2.
 8. Combustibility of Support Components and Panels: Provide access floor panels qualifying as non-combustible when tested in accordance with CAN/ULC S135.
2. Structural Performance for Pedestal Assemblies: Provide pedestal assemblies capable of withstanding the following loads and stresses within design limits and conditions indicated in accordance with CISCA testing criteria:
 1. Pedestal Axial Load Performance: Provide pedestal assemblies, without panels or other supports in place, capable of withstanding a 22 kN axial load per pedestal.
 2. Pedestal Overturning Moment Performance: Provide pedestal assemblies, without panels or other supports in place, capable of withstanding an overturning moment of 113 Nm per pedestal applied horizontally at top of pedestal when secured to subfloor.
 3. Provide a means of levelling and locking the assembly at a selected height and that requires deliberate action to change height setting and prevents displacement as a result of vibration.
 4. Ultimate Load Carrying Capacity: Not less than twice design strength.
 3. Stringers: Provide stringer components capable of withstanding the following loads and stresses within design limits and conditions indicated:
 1. Stringer Concentrated Load Performance: Provide stringers, without panels in place, capable of withstanding a concentrated load of 890 N at center of span with a permanent set not to exceed 0.25 mm in accordance with CISCA testing criteria.
 2. Stability: Assembly to remain completely braced and rigid after a maximum of eight abutting panels are removed.
 4. Grounding: Provide direct positive contact to components for safe continuous electrical grounding of entire access flooring system to achieve a maximum panel to under structure resistance of not more than 10 ohms.
 5. Static Electricity Control: Provide resistance range for flooring materials from a minimum of 0.5 mega ohms to a maximum of 20,000 mega ohms, with maximum electrical resistance measured from top of panel to grounded subfloor; exposed metal will not be allowed at the wearing surface of the floor.
 6. Earthquake Load Performance: Provide access flooring capable of withstanding a lateral seismic force (Fp) in seismic zone applicable to this Project, in accordance with requirements provincial Building Code and Authority Having Jurisdiction.

2.3 SYSTEM DESCRIPTION

1. Panels: Provide panels that are fully interchangeable except those altered to meet special installation conditions, and as follows:
 1. Panel Type: Corrosion protected steel panel with light weight cementitious core.
 2. Module Size: 610 mm x 610 mm.
 3. Top of Panel Finish: Factory applied carpet tile as specified in Section 09 68 13 – Tile Carpeting.
 4. Underside and Edge Panel Finish: Baked on, static deposited, corrosion resistant epoxy finish, colour selected from manufacturer's standard range.
2. Pedestals: Manufactured from corrosion resistant steel, all welded construction with adjustable height range to suit finished floor height and pedestal base adhesive or mechanical fastener, forming a part of manufacturer's standard access flooring system.

3. Stringers: Manufactured from corrosion resistant steel, mechanically fastened to pedestal to provide positive electrical contact; connection based on gravity or spring action are not acceptable and forming a part of the manufacturer's standard access flooring system.
4. Accessories: Provide premanufactured components meeting manufacturer's system requirements in configurations and locations as indicated on Drawings, and as follows:
 1. Power, Voice and Data Service Modules: high-capacity receptacle boxes with knockouts, duplex receptacles, voice and data interface plates, having grommets and hinged lid to suit floor finish requirements.
 2. Cable Tray: Premanufactured drop in cable tray forming a part of access flooring manufacturer's standard system.
 3. Steps: Premanufactured steps and handrails forming a part of access flooring manufacturer's standard system having fascia plate, perimeter supports, grommets and other components required for a complete installation.
 4. Vertical Closures (Fascia): Provide manufacturer's standard metal closure plates with factory applied finish where under floor cavity is not enclosed by abutting walls or other construction.
 5. Perimeter Support: Provide manufacturer's standard method for supporting panel edge and form transition between access flooring and adjoining floor covering at same level as access flooring.

2.4 FINISHES

1. Apply finishes in factory after products are fabricated.
2. Protect finishes on exposed surfaces with protective covering before shipment.
3. Factory Primed Concealed Surfaces: Protect concealed aluminum surfaces that will be in contact with plaster, concrete or masonry surfaces, and dissimilar metals when installed using shop applied zinc-molybdate primer to contact surfaces, minimum dry film thickness of 0.05 mm.

3 Execution

3.1 EXAMINATION

1. Verify that concrete sealers (if used) are compatible with pedestal adhesives before starting installation of access flooring systems.
2. Verify that subfloor is dry and free of any surface irregularities that could reasonably be anticipated to adversely affect access flooring system appearance or performance before starting installation of access flooring systems.

3.2 INSTALLATION

1. Install components in accordance with access flooring system manufacturer's written instructions including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
2. Pedestals and Stringers:
 1. Arrange pedestal assemblies to meet grid spacing required.
 2. Secure base plate to concrete floor with mechanical fasteners after adhesive has cured.
 3. Install additional pedestal assemblies where grid pattern is disturbed by columns, walls, ramps, openings, and steps, and at cut outs that impair floor load capacity.
 4. Install stringers rigidly brace floor pedestals four ways.
3. Floor Panels:
 1. Install floor panels solidly on pedestals, level to maximum variation over entire floor of 1:2000.
 2. Install step tread panels similar to floor panels, securely fixed.
 3. Seal site cuts with plastic angles or channels; exposed cut edges will not be permitted.

4. Fascia Panels:
 1. Install fascia panels at exposed sides step risers where indicated.
 2. Secure panels to continuous angles mechanically secured to structural floor and to edge of floor panels.
 3. Install metal trim at intersection of fascia panels and access floor and at abutting floors, walls and columns.
5. Railings:
 1. Extend railing posts through floor panels to structural floor below, set into and secure to flanged fittings bolted to structural floor.
 2. Bolt posts in position at floor panels with retaining floor collar.
 3. Install railings at walls set into flanged fittings bolted to walls.
 4. Electrically insulate railings from, or directly ground to, access flooring system.
6. Provide electrical grounding connectors and arrange for connection by Division 26 – Electrical.
7. Adjust floor panel system for smooth, quiet operation.

3.3 SITE QUALITY CONTROL

1. Manufacturer's Site Services:
 1. Manufacturer's representative shall review work of this Section involving handling, installation, protection and cleaning, and submit written reports in acceptable format to verify compliance of work with manufacturer's written installation instructions and shop drawings.
 2. Provide manufacturer's site services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 3. Schedule site visits to review work at following stages:
 1. After delivery and storage of products, and when preparatory work affecting this Section is complete, before installation begins.
 2. Twice during progress of work; at 25% and 60% complete.
 3. At completion of work, after cleaning is completed.
 4. Submit written reports within three (3) working days of review to Consultant.

3.4 CLOSEOUT ACTIVITIES

1. Cleaning: Perform cleaning after installation to remove construction and accumulated environmental dirt as required by Section 01 74 23 – Final Cleaning, and as follows:
 1. Clean surfaces after installation using manufacturer's recommended cleaning procedures using only manufacturer recommended cleaning products.
 2. Remove surplus materials, rubbish, tools and equipment barriers and dispose of legally off site.
2. Protection: Protect access floor in accordance with manufacturer's instructions, using 19 mm plywood with taped (duct tape) joints, until Substantial Performance of the Work to prevent damage to finished surfaces.

END OF SECTION

1 General

1.1 SUMMARY

1. This Section specifies requirements for labour, materials, tools and other equipment, services and supervision required for surface preparation and site painting of exposed exterior and interior items and surfaces to the requirements of the Master Painter's Institute (MPI) Specifications Manual.
2. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections, and as follows:
 1. Surface preparation of substrates includes cleaning, small crack repair, patching, caulking, and making good surfaces and areas.
 2. Surface preparation and prime painting surfaces for wall coverings before installation in accordance with wall covering manufacturer's recommended preparation requirements.
 3. Prime painting and back-priming of surfaces except where pre-primed with an MPI approved primer under other Sections of work.
3. Paint exposed and semi-exposed items and surfaces, except where Specifications indicate that the surface or material is not painted or is to remain natural, and as follows:
 1. Paint item or surface same as similar adjacent materials or surfaces where item or surface is not specifically mentioned.
 2. Consultant will select from standard colours and finishes available where a colour of finish is not indicated.
 3. Painting includes site painting of exposed bare and covered conduit, pipes and ducts including colour coding, hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory applied final finish.
 4. Painting of semi-concealed areas such as inside of light troughs and valances, behind grilles, and projecting edges above and below sight lines
 5. Floating Ceilings: Paint walls for full height above floating ceiling.
 6. Stencil painting of patterns, lines, letters, or symbols indicated on Drawings.
 7. Painting and finishing of exposed to view elevator equipment and components including doors and door frames unless pre-finished.
 8. Painting of exposed to view mechanical heating, ventilating and plumbing services, and equipment such as ducts, sprinkler piping, and electrical work to extent specified unless prefinished.
 9. Provision of safe and adequate ventilation as required over and above temporary ventilation supplied by Contractor, where toxic, volatile, or flammable materials are being used.
 10. Touch-ups and site painting necessary to complete work shown, scheduled, or specified.

1.2 RELATED REQUIREMENTS

1. Other sections of the specification referring to this section, coordinate requirements of related sections and requirements.

1.3 REFERENCE STANDARDS

1. All reference standards specified herein imply the latest edition of the standard.
2. American Society for Testing Materials (ASTM International):
 1. ASTM D16-19, Standard Terminology for Paint, Related Coatings, Materials, and Applications
 2. ASTM E84-21a, Standard Test Method for Surface Burning Characteristics of Building Materials
 3. ASTM F1869-16a, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

3. Canadian Standards Association (CSA Group):
 1. CSA A23.1:19/A23.2:19, Concrete Materials and Methods of Concrete Construction
4. Canadian General Standards Board (CGSB):
 1. CGSB 1 Series of Standards contained in the MPI Manual Description of Products, for products forming a part of the specified systems
 2. CAN/CGSB 85.10-99, Protective Coatings for Metals
 3. CAN/CGSB 85.100-93, Painting
1. The Master Painters Institute (MPI):
 1. New Surfaces: Architectural Painting Specification Manual
2. The Society for Protective Coatings (SSPC):
 1. Coating Materials Guidelines
 2. Surface Preparation Guidelines
 3. Application, Inspection and Quality Control Guidelines

1.4 DEFINITIONS

1. Gloss Levels: Standard coating terms defined by MPI Manual apply to products of this Section as follows, and used on Drawings to designate required gloss levels for indicated areas:

Gloss Level 1 (G1):	A traditional matte finish – flat with a gloss max. 5 units at 60° max and 10 units at 85°.
Gloss Level 2 (G2):	A high side sheen flat – ‘a velvet-like’ finish with a gloss max. of 10 units at 60° and 10 – 35 units at 85°.
Gloss Level 3 (G3):	A traditional ‘eggshell-like’ finish with a gloss of 10 – 25 units at 60° and 10 – 35 units at 85°.
Gloss Level 4 (G4):	A ‘satin-like’ finish with a gloss of 20 – 35 units at 60° and a min. of 35 units at 85°.
Gloss Level 5 (G5):	A traditional semi-gloss finish with a gloss of 35 – 70 units at 60°.
Gloss Level 6 (G6):	A traditional gloss finish with a gloss of 70 – 85 units at 60°.
Gloss Level 7 (G7):	A high gloss finish with a gloss of more than 85 units at 60°.

2. Service Areas: Rooms or areas dedicated to fire suppression, plumbing, heating, and ventilation, building integration systems, electrical and communications equipment including the following:
 1. Mechanical Rooms and Closets.
 2. Electrical Rooms and Closets.
 3. Telecommunications Rooms and Closets.
 4. Other rooms or areas containing equipment and systems that provides services to the building.
 5. Exterior areas with exposed pipe, ductwork or conduit providing services to the building.
3. Unfinished Items and Surfaces: Do not paint prefinished items, concealed surfaces (except for back-priming), finished metal surfaces, operating parts, including the following:
 1. Prefinished Items: May include the following factory finished components:
 1. Architectural woodwork.
 2. Acoustical wall panels.
 3. Metal lockers.
 4. Unit kitchens.
 5. Finished mechanical and electrical equipment.

6. Light fixtures.
2. Concealed Surfaces: May include walls or ceilings in the following areas considered as inaccessible spaces:
 1. Furred areas.
 2. Ceiling plenums.
 3. Pipe spaces.
 4. Duct shafts.
3. Finished Metal Surfaces: May include the following:
 1. Anodized aluminum.
 2. Stainless steel.
 3. Chromium plate.
 4. Copper and copper alloys.
 5. Bronze and brass.
4. Operating Parts: May include moving parts of operating equipment and the following:
 1. Valve and damper operators.
 2. Linkages.
 3. Sensing devices.
 4. Motor and fan shafts.
5. Mechanical Ducts or Pipes: May include the following:
 1. PVC or aluminum clad insulated pipes or ducts.
6. Labels: May include the following:
 1. ULC, CSA or other code required labels.
 2. Equipment name, identification, performance rating, or nomenclature plates.

1.5 ADMINISTRATIVE REQUIREMENTS

1. Pre-Installation Meeting: Conduct meeting at Project site in accordance with requirements of Section 01 31 19 – Project Meetings, attended by the Contractor's personnel, the Consultant including mechanical and electrical engineers, the mechanical and electrical Subcontractor, and the painting Subcontractor to discuss:
 1. Mechanical and electrical painting.
 2. Special surface effects.
 3. Coordination of work with work of other Sections.
 4. Protection of finishes.
 5. Acceptability of substrates.
 6. Quality of materials being used for the project.
2. Coordination: Coordinate requirements of this Section with other components of the Work of the Project as follows:
 1. Condition of Substrates: Coordinate correction of defects and deficiencies in substrates that may adversely affect painting work, except for minimal work specified in this section and preparation of surfaces to receive paint and finishes under this section of work, with trades responsible for installation of deficient substrates:
 1. Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates.
 2. Provide information to work of other Sections about characteristics of finish materials to ensure use of compatible primers when requested.

2. Coordination with Other Coating Systems: Coordinate with other coating systems such as intumescent fireproofing coatings, high build coatings and similar materials, and account of work performed by this Section with products specified in other coating specification Sections.
3. Non-Architecturally Exposed Structural Steel Surface Preparation: Coordinate surface preparation and shop priming of non-architecturally exposed structural steel, steel deck, and metal fabrications, metal doors, frames and windows including fittings as specified under those respective sections for type of primer forming a part of the painting system specified in this section and as follows:
 1. Specification sections having steel or metal components requiring applied finishes will prime steel with coatings specified in this section.
 2. Touch-up primer and apply finish coatings specified for steel or metal components.
 3. Failure to coordinate correct shop priming of steel construction will result in the Consultant giving instructions for removal of shop applied primer, and the Contractor assessing costs to the responsible trades.
4. Mechanical and Electrical Finishing: Coordinate requirements for painting and identification of mechanical piping and ducting, and electrical conduits with trades responsible for that part of the work as follows:
 1. Obtain quantity or length of materials requiring applied finishes, and identify which colour is required on each surface from mechanical or electrical contractor.
 2. Prepare surfaces and apply coating systems specified, in colours required for each surface.
 3. Mechanical and electrical contractors will be responsible for application of secondary markings and identification labels.
3. Scheduling: Schedule painting work before installation of miscellaneous hardware, surface fittings, fastenings, fixtures, and trim by other paint applicators including the hanging of doors and installation of door hardware:
 1. Remove, store, and reinstall items that have been installed before start of work of this Section.
 2. Schedule work of this Section with the Contractor to allow for:
 1. Disruption of work of this section by other trades
 2. Disruption of work to other trades by this section
 3. Schedule phased work with the Contractor.
 4. Do not apply final coat of paint until Consultant has had the opportunity to review and adjust tint under actual lighting conditions.

1.6 SUBMITTALS

1. Provide required information in accordance with Section 01 33 00 – Submittal Procedures.
2. Action Submittals: Provide the following submittals before starting any work of this Section:
 1. Product Data: Submit list of all painting materials used for the Work to the Consultant for review prior to ordering materials for each paint system indicated, including primers, and as follows:
 1. Material List: An inclusive list of required coating materials indicating each material and cross reference specific coating, finish system, and application; identify each material by manufacturer's catalogue number and classification.
 2. Base Information: Confirmation of manufacturer's ability to supply paint in a variety of base tints, specific to the range of colours being used on this project; indicate colour of base tint used and amount of colourant added to establish Scheduled colours.
 3. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.

2. Samples: Provide stepped samples, defining each separate coat, including primers using representative colours required for the project; label each sample for location and application, and as follows:
 1. Samples for Initial Selection: Provide samples for each type of finish coat material specified; Consultant will provide colour chips for surfaces being coated after colour selection.
 2. Drawdown Samples: Provide three (3) drawdown sample charts (cards) for each type, texture and colour of finish specified for verification purposes before ordering paint materials:
 1. Apply paint sample in layers to Opacity Charts, by The Leneta Company until paint colour appearance over black and white areas is identical, or the specified level of opacity for translucent products has been achieved.
 2. Apply paint to Opacity-Display Charts in an even coat as soon as possible after mixing; apply enough layers to make painted area completely opaque, or to the required level of opacity for translucent products.
 3. Order paint only for drawdown cards accepted by Consultant.
 4. Final colour selection is by Consultant.
 5. Resubmit until accepted by Consultant.
 6. Consultant will provide colour chips if alternate colours are selected for rejected cards.
 3. Samples for Verification: When requested by the Consultant, provide samples for each colour and material, with texture to simulate actual conditions, on representative samples of the actual substrate as follows:
 1. Ferrous Metal: 100 mm square or 200 mm long samples of flat metal for each colour and finish.
 2. Painted Gypsum Board: 200 mm long or square samples for each colour and material.
3. Informational Submittals: Provide the following submittals when requested by the Consultant:
 1. Certification: Submit certification reports for paint products indicating that they meet or exceed low VOC and coloured base requirements listed in this Section.
 2. Purchase Orders: Retain purchase orders, invoices, and other documents for verification of compliance with specification and design requirements.
4. Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 81 13 – Sustainable Design Criteria.

1.7 PROJECT CLOSEOUT SUBMISSIONS

1. Operation and Maintenance Data: Submit copies of paint manufacturer's written maintenance information for inclusion in the operations manual in accordance with Section 01 78 23 – Operation and Maintenance Data including specific warning of any maintenance practice or materials that may damage or disfigure the finished Work.
2. Maintenance Materials: Deliver maintenance materials to Owner in quantities indicated and in accordance with Section 01 78 43 – Spare Parts that match products installed; packaged with protective covering for storage, and identified with labels describing contents and building location and as follows:
 1. Paints and Coatings: Minimum of four (4)-4L containers of field colours and four (4)-1 L containers of each accent colour, and all remnants.

1.8 QUALITY ASSURANCE

1. Qualifications: Provide proof of qualifications when requested by Consultant:

1. Applicator: Use a firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance, and as follows:
 1. Having a minimum of three (3) years proven satisfactory experience; show proof of qualifications when requested by Consultant.
 2. Provide a list of the last three comparable jobs including, name and location, specifying authority, start and completion dates and cost amount of the painting work when requested.
 3. Use only qualified journeymen who have a Tradesman Qualification Certificate of Proficiency for painting and decorating work.
 4. Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with trade regulations.
2. Supplier: Obtain primers for each coating system from the same manufacturer as the finish coats and as follows:
 1. Use only paint manufacturers and products as listed under the Approved Products section of the MPI Manual Architectural Painting Specification Manual.
 2. Use only paint manufacturers and products as listed under the Approved Products section of the MPI Manual Architectural Painting Specification Manual as modified by performance requirements listed in this Section.

1.9 DELIVERY, STORAGE AND HANDLING

1. Delivery and Acceptance Requirements: Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
 1. Product name or title of material.
 2. Product description (generic classification or binder type).
 3. Manufacturer's stock number and date of manufacture.
 4. Contents by volume, for pigment and vehicle constituents.
 5. Thinning instructions.
 6. Application instructions.
 7. Colour name and number.
 8. VOC content and sustainable labelling agency identified.
2. Storage and Handling Requirements: Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 7°C, in accordance with the following:
 1. Maintain storage containers in a clean condition, free of foreign materials and residue.
 2. Protect from freezing.
 3. Keep storage area neat and orderly.
 4. Remove oily rags and waste daily.
 5. Maintain toxic, volatile, explosive, or flammable materials in a safe environment:
 1. Provide adequate fireproof storage lockers for solvents, drop clothes, rags, and other flammable materials.
 2. Post warning signs, such as NO SMOKING, NO OPEN FLAMES.
 3. Prevent the release of volatile organic compounds (VOC) into the atmosphere.
 4. Prevent fire hazards and spontaneous combustion.
 5. Prevent hazardous spills.
 6. Store materials that constitute a fire hazard (paints, solvents, and drop clothes, etc.) in suitable closed and rated containers and removed from the site on a daily basis.
 7. Comply with requirements of authorities having jurisdiction concerning the use, handling, storage, and disposal of hazardous materials.

6. Provide one (1) 9 kg ABC fire extinguisher with all temporary heating equipment, and in close proximity to where paint and coating materials are being stored.

1.10 SITE CONDITIONS

1. Ambient Conditions: Maintain relative humidity at less than 85%, temperatures at least 3°C above dew point, and as follows:
 1. Temperature: Maintain temperature of surfaces and surrounding air between the following temperatures for a minimum of 24 hours before, during and after application or until paints and coatings are fully cured, whichever is greater:
 1. Waterborne paints and coatings: 10° to 32°C.
 2. Solvent thinned paints and coatings: 7° to 35°C.
 3. Maintain temperatures during application and until materials are fully cured.
2. Surfaces Conditions:
 1. Maintain surfaces free from snow, rain, fog, or mist, dampness or wetness that could impair bond; painting may continue during inclement weather if surfaces and areas are enclosed and heated within temperature limits specified above in this Section during application and drying periods.
 2. Maintain surfaces at less than maximum moisture content indicated below; test wood and plaster surfaces using a properly calibrated electronic moisture meter:
 1. Plaster and Gypsum Board: 12% maximum moisture content.

2 Products

2.1 MANUFACTURERS

1. Basis-of-Design Products: Products named in this Section were used as the basis-of-design for the project; manufacturers listed as additional Acceptable Products and that offer similar products may be incorporated into the work of this Section, provided they meet the performance requirements established by the named products.
2. Additional Acceptable Products Manufacturers: Subject to compliance with requirements specified in this Section, use any of the following listed manufacturers' products in accordance with Section 01 62 00 – Product Options provided required product data and shop drawing are submitted before starting any work of this Section:
 1. Benjamin Moore and Co. Limited.
 2. Cloverdale Industrial Protective Coatings.
 3. Dulux Paints.
 4. Para Paints.
 5. PPG Canada Inc., Architectural Finishes.
 6. SICO Inc.
 7. Sherwin-Williams LLC.
3. Substitutions: Additional manufacturers offering similar products to Acceptable Products Manufacturers listed above may be incorporated into the work provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with Section 01 25 00 – Substitutions Procedures.

2.2 PERFORMANCE REQUIREMENTS

1. Proprietary Colour Codes: Colour and colour matching is a performance requirement for the project and will be administered as follows:

1. Use of manufacturer's proprietary colour codes is not intended to imply that listed manufacturer's are used to the exclusion of products of other manufacturers listed as Acceptable Products within this Section, or MPI Approved Product listing where Acceptable Products listing is not included.
2. Tinting by other named manufacturers listed as Acceptable Products or within the MPI Approved Product listing is permitted.
2. Quality of Materials: Use only manufacturer's top-line or premium series products when multiple listings from the same manufacturer occur within MPI Approved Product Categories and specific Acceptable Products are not included under the scheduled MPI Architectural Systems Listings in this Section; paint material containers not displaying manufacturer's product identification will not be acceptable:
 1. Provide materials from the same manufacturer within the specified MPI Architectural Systems or Acceptable Products listings.
 2. Provide materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents) in accordance with the MPI Approved Product listing, as a minimum; include additional requirements of this Section for base tint and colourant limitations.
 3. Provide other materials (linseed oil, shellac, thinners) not specifically listed of the highest quality product of an approved manufacturer listed in the MPI Manual and that are compatible with other coating materials.
3. Environmental Performance: Listing of Acceptable Products and manufacturers in this Section is based on product listings that have provided proof of the following performance requirements for paints and coating systems:
 1. Use only paints and coatings that have low or ultra-low VOC content tint bases and colourants to the greatest extent possible, and as follows:
 1. Materials must not be formulated or manufactured with formaldehyde, halogenated or aromatic solvents, and heavy metals such as mercury, lead, cadmium, and chromium.
 2. Materials must have a flash point of 61.0°C or greater.
 3. Paints and coatings must not contain VOC's in excess of limits required by sustainable design requirements.
 4. Clearly label containers with Green SEAL sustainable labelling mark required for LEED® submissions.
 5. Use paint materials that have good flowing and brushing properties, and that dry or cure free of blemishes or sags.
 2. Use paint bases that require no more than 90 grams/L of colourant to achieve the scheduled colours; manufacturers that offer ultra low or no VOC content colourants will be given preference.
 3. Use paint bases that when combined with colourant do not exceed 100 g/L VOC; no exceptions where VOC compliance requirements are provided in this Section.
 4. Paints that readily scuff, burnish, varnish or oxidize on contact after manufacturer's recommended curing period will not be acceptable for use on this project.
4. Material Compatibility: Provide primers and finish coat materials that are compatible with one another and with substrates required for conditions of service and application, as demonstrated by manufacturer based on testing and site experience:
 1. Use paint materials that have good flowing and brushing properties, and that dry or cure free of blemishes or sags.
 2. Provide paints and coatings that meet flame spread and smoke developed ratings designated by local Code requirements and Authority Having Jurisdiction.

2.3 EQUIPMENT

1. Painting and Decorating Equipment:

1. Use decorating equipment that meets or exceeds best trade standards for type of product and application.
2. Use spray painting equipment of capacity suited to the type and consistency of paint or coating being applied; kept clean and in good working order.

2.4 MIXING AND TINTING

1. Colours: Match colours listed on Drawings.
2. Multiple Paint Base Tints: Use only paint systems that offer multiple tint bases that minimize addition of colourants; transparent bases will not be accepted as an acceptable tint base where manufacturer listings within the MPI Approved Products listing have multiple listings.
3. Mixing: Provide ready mixed paints; re-mix paints immediately prior to and during application to maintain colour and gloss uniformity:
 1. Mix paste, powder or catalyzed paints or coatings in strict accordance with manufacturer's written instructions.
 2. Perform all colour tinting operations before delivery to site; limit amount of colourant added to base tint as indicated in this Section.
 3. Add thinner, where allowed by manufacturer, of type and quantity in accordance with paint manufacturer's recommendations.

3 Execution

3.1 CONDITION OF SURFACES

1. 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.
2. Thoroughly examine and test substrates for conditions adversely affecting application of coatings prior to commencement of work of this section:
 1. Report in writing to the Contractor indicating measures required to correct affected work of this section, and informing other Sections responsible for the condition of substrates of requirements for correcting defects and deficiencies:
 1. Notify responsible substrate trade contract installer of conditions that become apparent after application of first coat of paint requiring corrective action.
 2. Starting of finish painting of defective surfaces, such as gypsum board, will indicate acceptance of substrate and costs of repairing defects will be borne by the paint applicator of this Section including repainting of entire defective surface; touch-up painting will not be allowed.
 2. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 3. Notify Consultant about anticipated problems when using the materials specified over substrates primed by others.
 4. Start of painting will be construed as acceptance of surfaces and conditions within a particular area.

3.2 PREPARATION OF SURFACES

1. Provide a minimum lighting level of 325 Lux on surfaces where paint or coatings are being applied; and supply temporary heat and ventilation, scaffolding and platforms, and housekeeping services as required to complete the work of this Section, and as follows:
 1. Maintain adequate continuous ventilation and sufficient heating facilities to maintain ambient air and substrate temperatures as indicated above in this Section.
 2. Provide supplemental ventilating and heating equipment if existing system is inadequate to meet minimum requirements.

2. Prepare substrate surfaces in accordance with MPI Manual requirements including but not limited to remaining items listed in this article.
3. Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted:
 1. Provide surface applied protection before surface preparation and painting where removal is impractical or impossible because of size or weight of the item.
 2. Reinstall items removed using workers skilled in the trades involved after completing painting operations in each space or area.
4. Remove oil and grease then clean substrates of substances that could impair bond of the various coatings before applying paint or other surface treatments:
 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
 2. Clean and prepare surfaces according to manufacturer's written instructions for each particular substrate condition and as specified.
5. Provide barrier coats over incompatible primers or remove and re-prime substrate where paint applicator for this Section failed to coordinate use of MPI Manual recommended primers and surface preparation techniques.
6. Clean ungalvanized ferrous metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances using solvent or mechanical cleaning methods that comply with SSPC recommendations appropriate to surface and exposure location:
 1. Blast steel surfaces clean as recommended by paint system manufacturer.
 2. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 3. Touch up bare areas and shop applied prime coats that have been damaged; wire brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as shop coat.
7. Clean galvanized surfaces with non-petroleum-based solvents so surface is free of oil and surface contaminants, mechanically remove pre-treatment materials from galvanized sheet metal fabricated from coil stock.
8. Mix and prepare paint materials according to manufacturer's written instructions:
 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 2. Stir material before application to produce a mixture of uniform density.
 3. Stir as required during application to maintain consistent tint density.
 4. Do not stir surface film into material, remove surface film and strain material before using.
 5. Use only thinners approved by paint manufacturer and only within recommended limits.
 6. Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied.
 7. Tint undercoats to match the colour of the finish coat; but provide sufficient differences in shade of undercoats to distinguish each separate coat.
9. Protect adjacent surfaces and areas from painting operations and damage by drop cloths, shields, masking, templates, or other suitable protective means.
10. Correct, refinish, or replace any damage caused by failure to provide adequate protection to adjacent surfaces.
11. Sand, clean, dry, etch, neutralize, or test all surfaces using adequate illumination, ventilation, and temperature requirements in accordance with manufacturer's written instructions and the MPI Manual.

3.3 APPLICATION

1. Apply paint according to manufacturer's written instructions, use applicators and techniques best suited for substrate and type of material being applied, and in accordance with MPI Manual Premium Grade finish requirements, except where additional requirements have been specified.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. The term exposed surfaces include areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place; extend coatings in these areas as required, to maintain system integrity and provide desired protection, and as follows:
 1. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces.
 2. Paint surfaces behind permanently fixed equipment or furniture with prime coat only before final installation of equipment.
 3. Paint interior surfaces of ducts with a flat, non-specular black paint where visible through registers or grilles.
 4. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 5. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
 6. Finish interior of wall and base cabinets and similar site-finished casework to match exterior.
 7. Sand lightly between each succeeding coating of enamel or varnish.
5. Apply first coat to surfaces that have been cleaned, pre-treated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration, and as follows:
 1. Apply paint and coatings within an appropriate time frame after cleaning where environmental conditions encourage flash rusting, rusting, contamination, or the manufacturer's paint specifications require earlier applications.
 2. The number of coats and film thickness required are the same regardless of application method, except that dark tinted colours will require a minimum of four (4) coats with an additional clear urethane or water based light industrial type of coating applied in high traffic areas.
 3. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.
 4. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
 5. Omit primer over metal surfaces that have been shop primed and touch-up painted.
 6. Apply additional coats until paint film is of uniform finish, colour, and appearance if undercoats, stains, or other conditions show through final coat of paint, giving special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 7. Allow sufficient time between successive coats to permit proper drying.
 8. Do not recoat surfaces until paint has dried to where it feels firm and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.
6. Apply paints and coatings by brush, roller, spray, or other application methods according to manufacturer's written instructions and as follows:
 1. Application methods:

1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required and as follows:
 1. Apply paint using brush or roller unless Consultant has given written acceptance for use of spray equipment and methods.
 2. The Consultant may at any time prohibit the use of spray painting for such reasons as carelessness, poor masking, or protective measures, drifting paint fog, disturbance to other trades or failure to obtain a dense, even, opaque finish.
 3. Back roll sprayed surface progressively.
2. Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness recommended by the manufacturer.
3. Sand and dust between each coat to provide an anchor for next coat and to remove defects visible from a distance up to 1220 mm.
7. Hollow Metal Doors and Frames: Sand to remove blemishes and fill surface dimples, prime using coating compatible with finishes.

3.4 MECHANICAL AND ELECTRICAL PAINT APPLICATION

1. Painting of mechanical and electrical work, including hangers and supports is limited to items exposed in service areas.
2. Paint mechanical items including the following:
 1. Un-insulated metal piping; interior and exterior.
 2. Un-insulated plastic piping; interior and exterior.
 3. Pipe hangers and supports, interior and exterior.
 4. Tanks that do not have factory-applied final finish.
 5. Visible portions of internal surfaces of metal ducts without liner, behind air inlets and outlets
 6. Duct, equipment, and pipe insulation having paintable service jacket or other paintable jacket material; do not paint PVC or aluminum clad insulated ducts.
 7. Mechanical equipment that is indicated to have a factory primed finish for site painting which may include the following:
 1. Exterior items: Louvers and grilles, air handling units, mechanical ductwork, metal chimney stacks, goosenecks, roof jacks and roof vents.
 2. Interior items: Un-insulated valves, valve handles, boilers, fan guards, heat exchangers, cold fluid tanks, hot fluid tanks, integral pump bases, water chiller units, pumps, brine tanks, air handling units and plenums.
8. Painting and colour coding is required on substrates in colours as listed in Division 20 – Mechanical Support for system identification.
3. Paint electrical items including the following:
 1. Switchgear.
 2. Panel boards.
 3. Electrical Conduit and cable; interior and exterior
 4. Electrical equipment which is required to be prefinished in coded colours in accordance with electrical colour coding requirements specified in Division 26 – Electrical.
 5. Painting and colour coding is required on substrates in colours as listed in Division 26 – Electrical for system identification.
4. Locations:
 1. Painting and colour coding is required at locations specified below in this Section, on substrates and by methods indicated.

2. Exposed in Services Areas: Includes but is not limited to, rooms and areas containing equipment relating to mechanical systems, sprinkler systems, electrical systems, boiler and heating systems, air handling systems, and similar rooms.
 3. Exposed in Finished Areas: Includes all other rooms not listed above; mechanical and electrical work will be left exposed as an architectural feature in areas where there are no ceilings.
 4. Semi-Concealed Spaces: Includes all non-exposed but accessible spaces behind ceilings, walls, and floors, including exposed spaces that will be semi-concealed at some future time.
 5. Permanently Concealed Spaces: Includes all non-exposed and permanently inaccessible spaces behind ceilings, walls, and floors, including exposed spaces which will be permanently concealed at some future time.
 6. Exposed to Exterior: Includes all exposed exterior locations.
5. Methods:
1. Painting and colour coding by methods specified below, are required on substrates and at locations indicated below in this Section.
 2. Method P1 Full Colour Coding for Mechanical Piping and Equipment:
 1. Primary Colour Coding: Paint substrates in their entirety in required primary colour for each type of service in accordance with Colour Coding Requirements. Use applicable 3 coat finish system.
 3. Method P2 Intermittent Colour Coding for Mechanical Piping:
 1. Paint System: Use one coat semi-gloss enamel or machinery enamel, suitable for type of substrate and surface temperature.
 2. Primary Colour Coding: Apply paint in required primary colours for each type of service in accordance with Colour Coding Requirements specified in Division 22 – Plumbing, Mechanical Systems Identification.
 4. Method P3 Full Painting in Un-coded Colours:
 1. Paint substrates in their entirety. Use applicable 3 coat finish system.
 2. Except as otherwise specified below, make colours the same as wall or ceiling background colours.
 3. Where interior mechanical and electrical work will be left exposed as an architectural feature, for bidding purposes, colour scheme will include a maximum of 2 colours with approximately 50% deep colour tones, excluding colours for mechanical piping which require primary colour coding as specified under Method P1.
 4. Where exterior mechanical and electrical work requires painting, for bidding purposes, colour scheme will include a maximum of 2 colours with approximately 50% deep colour tones, excluding colours for mechanical piping which require primary colour coding as specified under Method P1.
 5. Method P4 No Painting and Colour Coding:
 1. Painting and colour coding are not required.
 6. Paint natural gas piping painted yellow in interior and exterior locations; whether concealed, semi-concealed or exposed; do not apply other colour applied to gas piping, except as stated for banding identification only or where piping is pre-coloured.

3.5 FINISHING

1. Refer to Drawing A141 – Finishes Plan for room paint finishes, and as follows:
 1. Paint wall surfaces using Gloss Level (Matte equivalent to Dulux Dizmund Matte).
 2. Paint ceiling surfaces using Gloss Level G1.
 3. Paint doors, frames and trim using Gloss Level G5.
 4. Confirm with Consultant where Gloss Level is not indicated before ordering materials.

3.6 CLOSEOUT REQUIREMENTS

1. Adjusting: Clean and re-install all hardware items that were removed before painting operations were undertaken, ensuring that tagged or labelled items are returned to the exact position from which they were removed and as follows:
 1. Clean, prime and re-paint all bolts, nuts, and fasteners after torqueing or re-tightening following specified paint finish.
 2. Remove protective coverings and warning signs as soon as possible after operations cease.
 3. Protect freshly painted surfaces from paint droppings and dust to approval of Consultant. Avoid scuffing newly applied paint.
 4. Restore areas used for storage, cleaning, mixing, and handling of paint to clean condition as approved by Consultant.
2. Cleaning: Perform final cleaning in accordance with Section 01 74 23 - Final Cleaning, and as follows:
 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 it in accordance with requirements of authorities having jurisdiction.
 4. Clean equipment and dispose of wash water or solvents, and other cleaning and protective materials (rags, drop cloths, masking papers, and etcetera), paints, thinners, paint removers and strippers in accordance with the safety requirements of authorities having jurisdiction.
3. Protection: Protect newly painted exterior surfaces from rain and snow, condensation, contamination, dust, salt spray and freezing temperatures until paint coatings are completely dry and as follows:
 1. Allow for curing periods that exceed 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.

3.7 EXTERIOR PAINT SCHEDULE

1. Paint exterior surfaces in accordance with the MPI Manual painting systems listed in this Section.
2. EXT 2.1 – Asphalt Surfaces (Zone/Traffic Marking For Exterior Drive and Parking Areas, Game Lines, Etc.):
 1. EXT 2.1B – Alkyd Zone/Traffic Marking.
3. EXT 5.3 – Galvanized Metal (Doors, Frames, Railings, Misc. Steel, Pipes, Overhead Decking, Eavestroughs (gutters), Downpipes, Ducts, Etc.):
 1. EXT 5.3C – Epoxy (over epoxy primer) (High Contact/Traffic)
 2. EXT 5.3H – Latex (over w.b. galvanized primer) (Low Contact/Traffic).

3.8 INTERIOR PAINT SCHEDULE

1. Paint interior surfaces in accordance with the MPI Manual painting systems listed in this Section.
2. INT 5.3 – Galvanized Metal (Doors and Frames):
 1. INT 5.3N – Institutional Low Odour / VOC (over w.b. galvanized primer, G5, (High Contact/Traffic Areas):

1. MPI #134 – Primer, Galvanized, Water Based.
2. MPI #147 – Latex, Interior, Institutional Low Odor/VOC.
3. INT 6.3 – Dressed Lumber (Telecommunication Panel):
 1. INT 6.3S – Fire Retardant, Clear, S.B.:
 1. MPI #62 - Fire Retardant Coating, Interior, Clear (ULC/ULC Approved).
4. INT 9.2 – Plaster and Gypsum Board (Gypsum Wallboard, Drywall, “Sheet Rock” Type Material, and Texture Finishes, Etc.):
 1. INT 9.2M – Institutional Low Odour/VOC (over w.b. primer sealer, low VOC primer) G1, Ceilings:
 1. MPI #149 – Primer Sealer, Interior, Institutional Low Odor/VOC.
 2. MPI #143 – Latex, Interior, Institutional Low Odor/VOC.
 2. INT 9.2M – Institutional Low Odour/VOC (over w.b. primer sealer, low VOC primer) G3, Walls:
 1. MPI #149 – Primer Sealer, Interior, Institutional Low Odor/VOC.
 2. MPI #145 – Latex, Interior, Institutional Low Odor/VOC.

3.9 COLOUR SCHEDULE

1. PT-1 Dulux, Silver Feather, DLX1002-1 (Main Paint Colour).
2. PT-2 Dulux, Morning Song, DLX1034-1 (Accent at Corridor).
3. PT-3 Dulux, Misty Surf, DLX1034-4 (Accent at Corridor).
4. PT-4 Dulux, Zombie, X1010-7 (Doors and Frames).

END OF SECTION

1 General

1.1 Section includes

- .1 This section covers requirements for the design and installation of a turnkey solution, including complete Engineering, Permitting, Coordination, Procurement, Construction, Start-up, and Commissioning of a net-metered rooftop 20 kW AC Photovoltaic (PV) system at Niagara Regional Police Services 911 Backup Dispatch, located at 5 Lincoln Street, Welland, Ontario. These specifications in conjunction with plans provide performance requirements and illustrate design intent. The PV system shall be mounted onto the building's roof by way of a ballasted system as detailed in the Structural drawings of this contract. Anchored racking and roof penetrations are not permitted.
- .2 The contractor shall hire a PV system provider to provide a full system based on this specification and associated references as part of this contract.
- .3 Included herein is a PV system simulation report performed in Helioscope intended to provide minimum baseline performance with the following performance parameters:
 - .1 Annual production, measured in MWhr per year.
 - .2 Specific Energy Output, measured in kWhr per kWp.
- .4 The Photovoltaic (PV) system shall include, but not limited to:
 - .1 PV modules;
 - .2 PV module mounting system;
 - .3 Rapid shutdown system;
 - .4 PV inverters;
 - .5 Step down transformer;
 - .6 Disconnect switches;
 - .7 Utility Net-Metering;
 - .8 Monitoring system; and
 - .9 All interconnected wiring and devices up to and including the building electrical distribution system tie in point indicated in the contract drawings.

1.2 Related requirements

- .1 Contract Drawings including Single Line Diagrams (SLD) and Control Schematic Drawings.
- .2 Division 01

- .3 Section 07 27 16 – Air Barrier Membrane
- .4 Section 07 52 16 – SBS Modified Bituminous Membrane Roofing
- .5 Section 26 05 00 – Basic Electrical Materials and Methods
- .6 Section 26 05 19 – Low Voltage Conductors
- .7 Section 26 05 26 – Grounding and Bonding
- .8 Section 26 20 00 – Electrical Service and Distribution
- .9 Section 26 08 00 – Distribution Transformers
- .10 Section 26 09 13 – Low Voltage Switchgear and Switchboards
- .11 Section 26 27 26 – Wiring Devices
- .12 Section 26 32 00 – Genset Connection Boxes and Load Banks
- .13 Section 26 32 02 – Diesel Gensets (Large)
- .14 Section 26 32 05 – Genset Enclosures
- .15 Section 26 33 53 – Large Capacity Uninterruptible Power Supply Units
- .16 Section 26 43 00 – Surge Protective Devices
- .17 All sections of Divisions 1 to 26 inclusive

1.3 Reference standards

- .1 Ontario Electrical Safety Code, 29th Edition, 2024. and latest bulletins of Electrical Safety Authority (ESA).
- .2 CSA C22.2 No. 0.19 - Requirements for Service Entrance Equipment 2010 (R2020).
- .3 CSA C22.2 No. 107.1 - Power Conversion Equipment 2016.
- .4 CSA C22.2 No. 257 - Interconnecting Inverter-Based Micro-Distributed Resources to Distribution Systems 2006 (R2015).
- .5 CSA C22.2 No. 269.1 - Surge Protective Devices - Type 1 - Permanently Connected 2017.
- .6 IEC 61215-1 - Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval - Part 1: Test Requirements 2021.

- .7 IEC 61215-1-1 - Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval - Part 1-1: Special Requirements for Testing of Crystalline Silicon Photovoltaic (PV) Modules 2021.
- .8 IEC 61215-1-2 - Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval - Part 1-2: Special Requirements for Testing of Thin-Film Cadmium Telluride (CDTE) Based Photovoltaic (PV) Modules 2022.
- .9 IEC 61215-1-3 - Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval - Part 1-3: Special Requirements for Testing of Thin-Film Amorphous Silicon Based Photovoltaic (PV) Modules 2022.
- .10 IEC 61215-1-4 - Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval - Part 1-4: Special Requirements for Testing of Thin-Film Cu(In,Ga)(S,Se)₂ Based Photovoltaic (PV) Modules 2022.
- .11 IEC 61215-2 - Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval - Part 2: Test Procedures 2022.
- .12 IEEE C57.12.91 - IEEE Standard Test Code for Dry-Type Distribution and Power Transformers.
- .13 IEEE 1547 - Standard for Interconnecting Distributed Resources with Electric Power Systems 2018.
- .14 NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- .15 UL 489B - Outline of Investigation for Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures for Use with Photovoltaic (PV) Systems Current Edition, Including All Revisions.
- .16 UL 1449 - Standard for Surge Protective Devices Current Edition, Including All Revisions.
- .17 UL 1699B - Outline of Investigation for Photovoltaic (PV) DC Arc-Fault Circuit Protection; Current Edition Current Edition, Including All Revisions.
- .18 UL 1703 - Flat Plate Photovoltaic Modules and Panels Current Edition, Including All Revisions.
- .19 UL 1741 SA - Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources Current Edition, Including All Revisions.
- .20 UL 2579 - Low-Voltage Fuses - Fuses for Photovoltaic Systems Current Edition, Including All Revisions.
- .21 CSA C22.2 NO. 292 DC Arc Fault Protection for Photovoltaic Applications (R2022).

1.4 Administrative requirements

- .1 Coordination:
 - .1 Coordinate work to avoid placement of ductwork, piping, equipment or other potential obstructions within spaces dedicated for photovoltaic system components.
 - .2 Coordinate arrangement of electrical equipment with dimensions and clearance requirements of actual equipment to be installed.
 - .3 Roof-Mounted Arrays: Coordinate work to avoid roof penetrations to preserve integrity of roofing system and do not void roof warranty.
 - .4 Notify Engineer of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- .2 Preinstallation Meeting: Convene preinstallation meeting prior to commencing work of this section; require attendance of affected installers. Include adequate instruction on electrical hazards associated with photovoltaic systems and appropriate safety procedures to be followed.
- .3 Utility Interconnection:
 - .1 Coordinate with Welland Hydro (Zachary Sherwood, (905) 732-1381 x 238) for design approval and include any connection fees required.
 - .2 A PCIR was submitted December 2024 and returned January 2025. Welland Hydro has confirmed a CIA will not be required for this 3-phase, 20kW rooftop solar PV system.
 - .3 Prepare and submit documentation as required for securing utility interconnection agreement between Owner and Welland Hydro.
 - .1 Include copies of documentation with submittals.
 - .4 Preinstallation Meeting: Convene preinstallation meeting prior to commencing work of this section to review interconnection requirements and details with Welland Hydro's representative.
 - .5 Coordinate with Welland Hydro to provide utility metering suitable for system requirements. Welland Hydro proposes the net-metering arrangement with a bi-directional meter.
 - .6 The offer to connect includes a connection cost for Welland Hydro to supply and install a bi-directional meter. The 20kW capacity on Welland Hydro's system will be reserved for this project with the offer to connect.

- .7 Arrange for inspections and secure permits necessary to obtain Welland Hydro's approval of system.

1.5 Submittals

- .1 Shop Drawings
 - .1 Design Documents: Prepare and submit information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, details, and description of operation.
 - .2 Product Data: Provide manufacturer's standard catalog pages and data sheets for each product. Include ratings, configurations, standard wiring diagrams, outline and support point dimensions, finishes, weights, service condition requirements, and installed features.
 - .3 Include proposed location of roof loading and proposed method for roof mounting.
 - .4 Design Data:
 - .1 Provide complete engineered plans including electrical and structural details. Include dimensioned plan views and sections indicating locations of system components, required clearances, attachments, attachment locations and details, and proposed size, type, and routing of conduits and cables. Include system interconnection schematic diagrams showing factory and site connections. Include ancillary system details including but not limited to PV system monitoring as described in this contract. All engineered designs shall be sealed by a Professional Engineer licensed to practice in the Province of Ontario.
 - .2 Include structural calculations, authenticated by professional engineer licensed to practice in province of the work, for equipment and mounting system.
 - .3 Include electrical calculations, authenticated by professional engineer licensed to practice in province of the work, for array and associated equipment other than basis of design products and configuration.
 - .4 For designs deviating from the provided design intent, provide a simulation report meeting or exceeding minimum performance parameters outlined herein.
 - .5 Certify that products of this section meet or exceed specified requirements.
 - .6 Certify that work of this section does not void roof warranty.

- .7 Certify that work of this section does not void photovoltaic module warranty.
- .8 Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.
- .9 Manufacturer's detailed site testing procedures.
- .10 Manufacturer's detailed startup procedures.
- .11 Utility interconnection documentation.
- .12 Source quality control test reports. Site quality control test reports.
 - .1 Include manufacturer's site reports.
- .13 Structural designer's qualification statement.
- .14 Structural designer's qualification statement.
- .15 Electrical designer's qualification statement.
- .16 Manufacturer's qualification statement.
- .17 Installer's qualification statement.
- .2 Submit PV system Verification, Testing and Commissioning plans for the Engineer's review. Include a detailed description of verification, testing and commissioning activities. Final Verification, Testing and Commissioning report shall be sealed by a Professional Engineer licensed to practice in the Province of Ontario. At minimum, the following information shall be included:
 - .1 System parameters
 - .2 Verification
 - .1 Site conditions,
 - .2 PV modules and arrays,
 - .3 Inverters,
 - .4 Transformer,
 - .5 Disconnect switches,
 - .6 Monitoring system,
 - .7 Other ancillary systems
 - .3 Prestart-up testing:
 - .1 Continuity of bonding and grounding
 - .2 Insulation resistance

- .3 Polarity testing
 - .4 String open circuit voltage
 - .5 String short circuit current
 - .6 Results
- .4 Startup testing
 - .1 Inverter energization
 - .2 DC operating current testing.
 - .3 Anti-island testing
 - .4 Infrared thermographic imaging
 - .5 Module flash test results
 - .6 Instantaneous yield verification testing
 - .7 Time plots and waveforms
- .3 Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
- .4 Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.
- .5 Project Record Documents: Record actual locations of system components, installed circuiting arrangements and routing, and final equipment settings.
- .6 Software: One copy of software provided under this section.
- .7 Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - .1 See Section 01 77 00 – Closeout Procedures for additional provisions.
 - .2 Extra Photovoltaic Modules: Two (2).

1.6 Quality assurance

- .1 Comply with CSA C22.1.
 - .2 Comply with Welland Hydro requirements for interconnection.
 - .3 Maintain at project site one copy of each referenced document that prescribes execution requirements.
 - .4 Structural Designer Qualifications: Professional engineer licensed to practice in the province of Ontario.
-

- .5 Electrical Designer Qualifications: Professional engineer licensed to practice in the province of Ontario, experienced in design of photovoltaic systems.
- .6 Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- .7 Installer Qualifications: Company specializing in performing work of this section with minimum five (5) years documented experience with photovoltaic systems of similar size, type, and complexity.
 - .1 Licensed in Ontario to install photovoltaic systems.
 - .2 Manufacturer's authorized installer.
 - .3 Supervisor: CSA certified Construction Electrician (NOC 7241) Solar Photovoltaic (PV) Systems Personnel and/or North American Board of Certified Energy Practitioners (NABCEP) certified PV Installer or three years' experience supervising installation of photovoltaic systems.
 - .4 Installer Personnel: CSA certified Construction Electrician (NOC 7241) Solar Photovoltaic (PV) Systems Personnel or at least 2 years of experience installing photovoltaic systems.
- .8 Product Listing Organization Qualifications: Organization recognized by Standards Council of Canada and acceptable to authorities having jurisdiction.

1.7 Delivery, storage, and handling

- .1 Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.8 Warranty

- .1 See Section 01 77 00 – Closeout Procedures & Section 01 78 39 – Project Record Documents for additional warranty requirements.
- .2 Specified warranties indicate minimum requirements. Provide additional warranties or extended warranty periods, where required, to qualify for rebate and incentive programs.
- .3 Photovoltaic Modules:
 - .1 Provide minimum five (5) year manufacturer warranty starting from date of Substantial Performance covering repair or replacement due to defective materials or workmanship.

- .2 Provide manufacturer warranty guaranteeing minimum 90 % of rated power output for ten (10) years starting from date of Substantial Performance and minimum 80 % of rated power output for twenty (20) years starting from date of Substantial Performance.
- .4 Photovoltaic Module Mounting System: Provide minimum ten (10) year manufacturer warranty starting from date of Substantial Performance covering repair or replacement due to defective materials or workmanship.
- .5 Photovoltaic Inverters: Provide minimum five (5) year manufacturer warranty starting from date of Substantial Performance covering repair or replacement due to defective materials or workmanship.

2 Products

2.1 System integrators

- .1 Essex Energy Corporation
- .2 Blackstone Energy Services
- .3 SunGrid Solutions Inc.
- .4 VCT Group
- .5 Otter Energy
- .6 Guelph Solar
- .7 EG Energy Management
- .8 RESCo Energy
- .9 German Solar Corporation
- .10 Arcadian Projects Inc.
- .11 Moose Power Inc.
- .12 Alternates: Not acceptable.

2.2 Manufacturers

- .1 Photovoltaic Modules, Crystalline Silicon:
 - .1 Longi (basis of design)

- .2 Canadian Solar
- .3 Hanwha
- .4 Panasonic
- .5 Alternates: Not acceptable.
- .2 Photovoltaic Module Mounting System:
 - .1 KB Racking (basis of design)
 - .2 TerraGen Solar
 - .3 Opsun
 - .4 hb Solar
 - .5 Approved alternate.
- .3 Photovoltaic Inverters:
 - .1 Fronius (basis of design)
 - .2 Solar Edge
 - .3 Solis
 - .4 Sungrow
 - .5 SMA
 - .6 Alternates: Not acceptable.
- .4 Monitoring System:
 - .1 Fronius (basis of design)
 - .2 Also Energy
 - .3 Meteo Control
 - .4 Schneider Electric
 - .5 Cachelan
 - .6 Approved alternate.
- .5 Source Limitations: For each type of component, furnish products produced by a single manufacturer and obtained from a single supplier.

2.3 Photovoltaic system requirements

- .1 Provide complete photovoltaic system consisting of photovoltaic modules and associated balance of system components necessary for connection to facility electrical system.

- .2 System Description:
 - .1 Photovoltaic array is roof-mounted in locations as indicated on Drawings. Maintain all minimum clearances from roof edges and walkways as indicated on drawings. Maintain access to roof drains. Roof area for PV modules as indicated on plans may be used partially or in its entirety.
 - .2 Racking for PV system shall be mounted on a ballasted system outlined on Electrical Plans. Racking system directly anchored to roof deck is not permitted.
 - .3 Orientation of array is as indicated on Drawings.
 - .4 Photovoltaic DC system is bonded but not tied into building grounding system.
 - .5 System includes interconnection with utility grid (grid-tied system).
 - .1 Utility metering configuration: Net metering.
 - .6 System does not include battery storage system.
 - .7 System includes engine generator.
 - .8 System includes DC system surge protection.
 - .9 System includes monitoring system.
 - .10 System shall be comprised of one inverter.
- .3 Capacity:
 - .1 Minimum Expected Annual Energy Production: 28.81 MWhr per year.
 - .2 Minimum Specific Energy Production: 1283.7 kWhr / kWp.
 - .3 Total Nominal Rated Power Output of Array: Equal to or greater than 22,440 W DC.
 - .4 Nominal Rated Power Output of Individual Modules: Equal to or greater than 660W DC, bifacial modules.
 - .5 System Nameplate Rating: Equal to 20,000W AC.
- .4 Size:
 - .1 Array: Designed to fit within area designated on Drawings.
- .5 Appearance:
 - .1 Only systems with similar appearance to basis of design system will be considered.
 - .2 Arrange array such that modules are aligned with uniform spacing.

- .3 Make no alterations affecting appearance of building exterior or interior without approval of Engineer.
- .4 Final determination of acceptable appearance is by Engineer.
- .6 Provide photovoltaic system and associated components suitable for wind loads, snow loads, seismic loads, and other structural design considerations of installed location.
 - .1 Include structural calculations demonstrating compliance with submittals.
- .7 Provide photovoltaic system and associated components suitable for continuous operation under service conditions at installed location.
 - .1 Altitude: 170 m.
 - .2 Ambient Temperature: Between -40 and 40 °C.
- .8 Provide products listed, classified, and labeled as suitable for purpose intended.
- .9 Unless specifically indicated to be excluded, provide required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for complete operating system.
- .10 DC Arc Fault Circuit Protection: Provide DC photovoltaic arc-fault protection devices listed as complying with UL 1699B as required for compliance with CSA C22.1.
- .11 Rapid Shutdown of Photovoltaic Systems on Buildings: Provide listed equipment arranged to provide rapid shutdown in accordance with CSA C22.1.
- .12 Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and CSA C22.1.
- .13 Arrange array to provide adequate access to rear of string(s) for maintenance.
- .14 Arrange array to minimize shading during peak production periods.
- .15 Roof-Mounted Arrays:
 - .1 Arrange array such that normal roof drainage is not affected.
 - .2 Arrange array to maintain required safety clearances from edges of roof as indicated.
 - .3 Arrange array to maintain access and clearance requirements for other roof-mounted equipment.
 - .4 Arrange array to avoid spanning of expansion joints.

2.4 Photovoltaic modules

- .1 Acceptable Module Types: Crystalline silicon modules with bifacial gain complying with specified requirements will be considered for this project
- .2 General Requirements:
 - .1 Photovoltaic Modules: Factory assembled; consisting of photovoltaic cells, frame, junction box, cables for series connection, and bypass diodes for shade tolerance; rated for a minimum of 1000 V DC; complying with IEC 61215-1 and IEC 61215-2 and listed as complying with UL 1703 and CSA C22.2 No. 107.1.
 - .2 Crystalline Silicon Photovoltaic Modules: Comply with IEC 61215-1-1.
 - .3 Frame: Anodized aluminum.
 - .4 Factory-Installed Junction Box: Weatherproof, with factory-installed terminals and bypass diodes.
 - .5 Factory-Installed Cables: Type USE-2 or listed photovoltaic (PV) wire with polarized locking connectors.
 - .6 Unless otherwise indicated, specified module performance characteristics are rated under Standard Test Conditions (STC).
 - .7 Power Rating Tolerance: Plus 10 or minus 5 %.
 - .1 Include flash test data for each module with source quality control reports to demonstrate compliance.
- .3 Basis of Design: Longi LR7-72HYD, 660W, bifacial or approved alternate.

2.5 Balance of system components

- .1 Photovoltaic Module Mounting System:
 - .1 Provide complete mounting system compatible with modules to be installed and suitable to properly install them in location indicated, including necessary hardware and accessories.
 - .2 Support Structure and Associated Hardware Materials: Use aluminum, galvanized steel, or stainless steel.
 - .3 Roof-Mounted Arrays:
 - .1 Acceptable System Types: Non-penetrating, ballasted system described on Structural Plans.
 - .2 Provide system compatible with roof at installed location.

- .3 Module Tilt Angle: As required to provide maximum energy production for installed location. 10 °.
 - .4 Racking system shall be compliant with seismic post-disaster constraints of this building.
- .2 Photovoltaic Inverters:
- .1 Provide inverter(s) as indicated or as required for connection of photovoltaic array DC system to AC system indicated.
 - .2 Inverters: Suitable for requirements of connected array; output configuration compatible with connected system; listed as complying with UL 1741 SA and CSA C22.2 No. 107.1; furnished with the following features:
 - .1 Maximum power point tracking (MPPT).
 - .2 Screen display.
 - .3 Integral AC disconnect.
 - .4 Integral DC disconnect.
 - .5 Integral DC ground fault detection and interruption (GFDI).
 - .6 Communications Interface: As required for connection to system indicated.
 - .7 Fused string input terminals.
 - .3 Grid-Tied Inverters: Comply with IEEE 1547 and CSA C22.2 No. 257, including over/under grid voltage and frequency protection, and anti-islanding protection to automatically disconnect upon loss of utility power and to remain disconnected until utility power restoration has been maintained for five minutes.
 - .4 Total Harmonic Distortion: Less than five percent.
 - .5 Enclosure Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - .1 Outdoor Locations: Type 3R or 4X.
- .3 Enclosed Switches, in Addition to Requirements of Section 26 05 00 – General Electrical Requirements:
- .1 Switches for DC System: Rated for 1000VDC.
 - .2 Switches Connected to Supply Side of Service Disconnecting Means: Listed and labeled as suitable for use as service equipment according to CSA C22.2 No. 0.19.
-

- .4 Surge Protective Devices:
 - .1 Surge Protective Devices for DC System:
 - .1 Rated for 1,000 V DC.
 - .2 Listed and labeled as complying with CSA C22.2 No. 269.1, Type 1.
 - .3 Surge Current Rating: Not less than 50 kA per mode.
 - .4 CSA C22.2 No. 269.1 Nominal Discharge Current (I-n): 20 kA.
- .5 Fuses:
 - .1 Fuses for DC System: Rated for 1,000 V DC.
 - .2 Fuses for Protection of Photovoltaic Strings and Arrays: Photovoltaic fuses listed as complying with UL 2579.
- .6 Monitoring System:
 - .1 Provide system to monitor photovoltaic system performance including sensors, dataloggers, connections, software, equipment and accessories necessary for complete operating system.
 - .2 System communications interfaces to be wired or wireless, with compatible interconnected components.
 - .1 Provide suitable raceway, minimum 21 mm trade size, for required wired connections.
 - .3 System to monitor and record, in fifteen (15) minute intervals:
 - .1 Inverter status.
 - .2 Instantaneous power (kW).
 - .3 Cumulative energy production (kWh).
 - .4 Irradiation.
 - .5 Ambient temperature.
 - .6 Module cell temperature.
 - .7 Wind speed and direction.
 - .8 Current monitoring for individual strings.
 - .4 System real-time and historical data to be accessible from the following locations:
 - .1 Personal computer(s), via internet connection.
 - .5 System to provide alarm notification via e-mail or instant message.

- .6 System to be compatible with third party monitoring service to be selected by Owner.

2.6 Source quality control

- .1 Factory test the following products to verify operation and performance characteristics. Include test reports with submittals.
 - .1 Photovoltaic modules.
 - .2 Photovoltaic inverters.
 - .3 Rapid shutdown equipment.

2.7 Spare Parts

- .1 Provide the following spare parts:
 - .1 Extra Photovoltaic Modules: Two (2)
 - .2 DC String Fuses: Six (6)

3 Execution

3.1 Examination

- .1 Verify that site measurements are as indicated.
- .2 Verify that ratings and configurations of system components are consistent with indicated requirements.
- .3 Verify that mounting surfaces are ready to receive system components.
- .4 Verify that conditions are satisfactory for installation prior to starting work.

3.2 Preparation

- .1 Use open circuiting, short circuiting, or opaque covering to disable modules, array or portions of array prior to installation and service.
- .2 Roof-Mounted Arrays: Protect roof and adjacent roof-mounted items from damage.

3.3 Installation

- .1 Install products in accordance with manufacturer's instructions.
- .2 Install photovoltaic system in accordance with CSA C22.1.

- .3 Provide required support and attachment in accordance with reviewed shop drawings.
 - .4 Provide required seismic controls in accordance with Section 26 05 05 – Basic Electrical Materials And Methods.
 - .5 Mount equipment such that highest position of operating handle for circuit breakers or switches does not exceed 2,000 mm above floor, ground, or working platform.
 - .6 Circuiting Requirements:
 - .1 Wiring Methods:
 - .1 Unless otherwise indicated, use exposed module factory-installed cables (not routed inside building) for module interconnections.
 - .2 Unless otherwise indicated, use exposed type RPVU conductor cable (not routed inside building) for wiring between string(s).
 - .3 Secure exposed cables in accordance with CSA C22.1. Where possible, conceal behind array.
 - .4 Install cables in suitable raceway where readily accessible or where required by authority having jurisdiction.
 - .5 Use suitable twist-on insulated spring connectors, mechanical connectors, or compression connectors for photovoltaic circuit splices and taps.
 - .2 Photovoltaic DC System Conductor Colour Code:
 - .1 DC System:
 - .1 Positive: Red.
 - .2 Negative: Black.
 - .3 Maintain separation of photovoltaic and non-photovoltaic circuits in accordance with CSA C22.1.
 - .7 Grounding and Bonding Requirements:
 - .1 Ensure that there is only one AC System bonding connection between grounding system and grounded/neutral conductor, including external connections and connections internal to equipment.
 - .2 Grounded DC Systems: Ensure that there is only one point of system grounding connection to grounded conductor, including external connections and connections internal to equipment.
 - .3 Provide auxiliary electrodes for photovoltaic array grounding in accordance with CSA C22.1.
-

- .8 Identification Requirements:
- .1 Colour for Photovoltaic System Identification Nameplates and Labels: White text on red background, unless otherwise required by CSA C22.1 or authorities having jurisdiction.
 - .2 Use identification nameplate or means of identification acceptable to authority having jurisdiction to identify presence of multiple power sources and location of main service disconnecting means and each photovoltaic system disconnecting means. Locate at main service disconnecting means and at each photovoltaic system disconnecting means. Verify format and descriptions with authorities having jurisdiction.
 - .3 Use identification nameplate to identify each photovoltaic system disconnecting means with text "PV SYSTEM DISCONNECT".
 - .4 Use identification nameplate or identification label to identify systems equipped with rapid shutdown and associated rapid shutdown switch(es). Format, descriptions, and locations to comply with CSA C22.1 and requirements of authorities having jurisdiction.
 - .5 Use identification nameplate or identification label to identify information required by CSA C22.1 for marking of direct-current photovoltaic power sources. Locate at each DC disconnect means requiring marking.
 - .6 Use identification nameplate or identification label to identify interactive system point of interconnection at disconnecting means as power source and with rated AC output current and nominal operating AC voltage.
 - .7 Where inverter output connection is located in panelboard on opposite (load) end from input feeder location or main circuit location in order to meet requirements of CSA C22.1, use identification nameplate or identification label to identify overcurrent device with word message "Warning; Inverter output connection; Do not relocate this overcurrent device".
 - .8 Use warning labels to identify electrical hazards for photovoltaic system disconnecting means. Include word message "Warning - Electric Shock Hazard; Terminals on the line and load sides may be energized in the open position" or approved equivalent.
 - .9 Use warning labels, identification nameplates, or identification labels to identify electrical hazards for photovoltaic systems equipped with DC ground-fault protection in accordance with CSA C22.1. Include word message "Warning - Electric Shock Hazard; If a ground fault is indicated, normally grounded conductors may be ungrounded and energized".

- .10 Use wire and cable markers to identify photovoltaic system source, output, and inverter circuit conductors at points of termination, connection, and splices.
- .11 Use voltage markers, identification labels, stenciled text, or suitable permanent marking approved by authority having jurisdiction to identify exposed raceways, cable trays, pull boxes, junction boxes, and conduit bodies with text "Warning: Photovoltaic Power Source" at maximum intervals of 3 m in accordance with CSA C22.1.

3.4 Site quality control

- .1 See Section 01 45 00 – Quality Control for additional requirements.
- .2 See article "SYSTEM STARTUP" below for additional requirements related to testing and inspection.
- .3 Provide services of manufacturer's authorized representative to observe installation and assist in inspection and testing. Include manufacturer's detailed testing procedures and site reports with submittals.
- .4 Inspection and testing to include, at minimum:
 - .1 Inspect each system component for damage and defects.
 - .2 Verify that equipment enclosures, boxes, and associated connections installed outdoors are weatherproof.
 - .3 Verify proper wiring connections have been made and check for conductor continuity. Verify proper polarity.
 - .4 Verify tightness of mechanical and electrical connections are according to manufacturer's recommended torque settings.
 - .5 Perform insulation resistance tests.
 - .1 Disconnect surge protective devices (SPDs) prior to performing high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.
 - .6 Measure and record ambient conditions, including date and time, ambient temperature, cell temperature, solar irradiance in module plane, and wind speed.
 - .7 Measure and record open circuit voltage of each string.
 - .8 Measure and record voltages at inverter AC and DC inputs.
 - .9 Measure and record operating current for each string, sub-array, and array.
 - .10 Measure and record AC output power.

- .11 Perform inverter functional test.
 - .1 Grid-Tied Inverters: Include simulation of loss of utility power and subsequent power restoration.
- .12 Verify proper operation of monitoring system.
- .5 Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.
- .6 Diagnostic Period: After successful completion of inspections and tests, operate system in normal mode for at least fourteen (14) days without system or equipment malfunctions.
 - .1 Record system operations and malfunctions.
 - .2 If malfunction occurs, start diagnostic period over after correction of malfunction.
- .7 Submit detailed reports indicating inspection and testing results and corrective actions taken.
- .8 Repair roof or adjacent roof-mounted items damaged as result of work of this section.

3.5 System startup

- .1 Provide services of manufacturer's authorized representative to assist in performing system startup. Include manufacturer's detailed startup procedures with submittals.
- .2 Obtain Owner's approval prior to performing system startup.
- .3 Grid-Tied Systems: Obtain Welland Hydro's approval prior to performing system startup.
- .4 Prepare and start system in accordance with manufacturer's instructions.

3.6 Cleaning

- .1 Clean modules using only methods recommended by manufacturer to avoid scratches and other damage. Clean exposed surfaces on other components to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.7 Commissioning

- .1 See Section 01 91 13 – General Commissioning Requirements for commissioning requirements.

3.8 Closeout activities

- .1 See Section 01 77 00 – Closeout Procedures & Section 01 78 39 – Project Record Documents.

- .2 Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.
- .3 Training: Train Owner's personnel on operation, adjustment, and maintenance of photovoltaic system.
 - .1 Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - .2 Provide minimum of four hours of training.
 - .3 Instructor: Manufacturer's authorized representative.
 - .4 Location: At project site.

3.9 Protection

- .1 Protect installed products from subsequent construction operations.

4 Helioscope Simulation Report

- .1 Report appended on next pages.

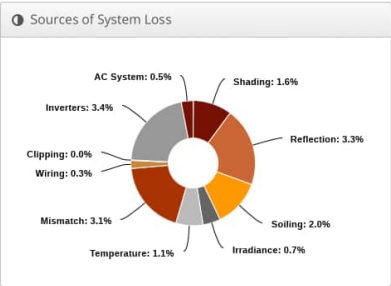
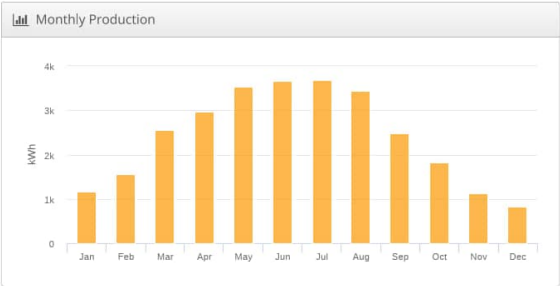
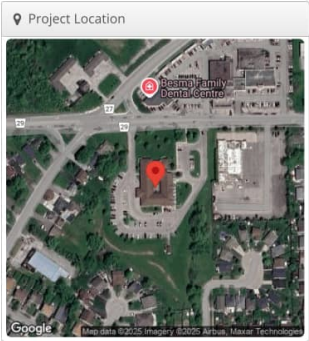


Annual Production Report produced by Jake Dickson

Final - 22.4kW (Longi 660W, 10ft offset, 1.5ft inter-row spacing) NRPS - 911 Solar, welland ontario

Report	
Project Name	NRPS - 911 Solar
Project Description	20kW Solar Rooftop Mount
Project Address	welland ontario
Prepared By	Jake Dickson jake.dickson@aecom.com

System Metrics	
Design	Final - 22.4kW (Longi 660W, 10ft offset, 1.5ft inter-row spacing)
Module DC Nameplate	22.4 kW
Inverter AC Nameplate	20.0 kW Load Ratio: 1.12
Annual Production	28.81 MWh
Performance Ratio	84.9%
kWh/kWp	1,283.7
Weather Dataset	TMY, 0.04° Grid (42.97,-79.26), NREL (psm3)
Simulator Version	7253ee4cad-5d08d58a56-5e0653e318-0946ff5a2d





Annual Production Report produced by Jake Dickson

⚡ Annual Production			
	Description	Output	% Delta
Irradiance (kWh/m ²)	Annual Global Horizontal Irradiance	1,402.4	
	POA Irradiance	1,512.5	7.9%
	Shaded Irradiance	1,487.6	-1.6%
	Irradiance after Reflection	1,438.4	-3.3%
	Irradiance after Soiling	1,409.7	-2.0%
	Total Collector Irradiance	1,409.5	0.0%
Energy (kWh)	Nameplate	31,637.1	
	Output at Irradiance Levels	31,403.4	-0.7%
	Output at Cell Temperature Derate	31,044.6	-1.1%
	Output After Mismatch	30,083.0	-3.1%
	Optimal DC Output	29,981.0	-0.3%
	Constrained DC Output	29,975.3	0.0%
	Inverter Output	28,952.1	-3.4%
	Energy to Grid	28,807.3	-0.5%
Temperature Metrics			
	Avg. Operating Ambient Temp	11.8 °C	
	Avg. Operating Cell Temp	20.0 °C	
Simulation Metrics			
	Operating Hours	4364	
	Solved Hours	4364	

☁ Condition Set											
Description	Condition Set 1										
Weather Dataset	TMY, 0.04° Grid (42.97,-79.26), NREL (psm3)										
Solar Angle Location	Meteo Lat/Lng										
Transposition Model	Perez Model										
Temperature Model	Sandia Model										
Temperature Model Parameters	Rack Type	a	b	Temperature Delta							
	Fixed Tilt	-3.56	-0.075	3°C							
	Flush Mount	-2.81	-0.0455	0°C							
	East-West	-3.56	-0.075	3°C							
	Carport	-3.56	-0.075	3°C							
Soiling (%)	J	F	M	A	M	J	J	A	S	O	N D
	2	2	2	2	2	2	2	2	2	2	2
Irradiation Variance	5%										
Cell Temperature Spread	4° C										
Module Binning Range	-2.5% to 2.5%										
AC System Derate	0.50%										
Module Characterizations	Module	Uploaded By		Characterization							
	LR7-72HYD-660M (Longi Solar)	HelioScope		Spec Sheet Characterization, PAN							
	TS-BGT72(580) (Thornova)	HelioScope		Spec Sheet Characterization, PAN							
	Device	Uploaded By		Characterization							
Component Characterizations	Symo Advanced 20.0-3 / 480_OND (Fronius USA)	HelioScope		Default Characterization							

📦 Components		
Component	Name	Count
Inverters	Symo Advanced 20.0-3 / 480_OND (Fronius USA)	1 (20.0 kW)
Strings	10 AWG (Copper)	3 (193.7 ft)
Module	Longi Solar, LR7-72HYD-660M (660W)	34 (22.4 kW)

🔌 Wiring Zones			
Description	Combiner Poles	String Size	Stringing Strategy
Wiring Zone	-	11-16	Along Racking

🏠 Field Segments									
Description	Racking	Orientation	Tilt	Azimuth	Intrarow Spacing	Frame Size	Frames	Modules	Power
Higher Roof	Fixed Tilt	Landscape (Horizontal)	Module: 10° Module: 180°	Module: 180°	1.5 ft	1x1	25	25	16.5 kW
Lower Roof	Fixed Tilt	Landscape (Horizontal)	Module: 10° Module: 180°	Module: 180°	2.0 ft	1x1			0
Lower Roof - South Portion	Fixed Tilt	Landscape (Horizontal)	Module: 10° Module: 180°	Module: 180°	2.0 ft	1x1			0
Middle High Roof	Fixed Tilt	Landscape (Horizontal)	Module: 10° Module: 180°	Module: 180°	1.5 ft	1x1	9	9	5.94 kW

