PROJECT TITLE PORT WELLER SEARCH & RESCUE STATION
PACKAGE 04 - GARAGE
ST. CATHARINES, ONTARIO
ISSUED FOR RE-TENDER

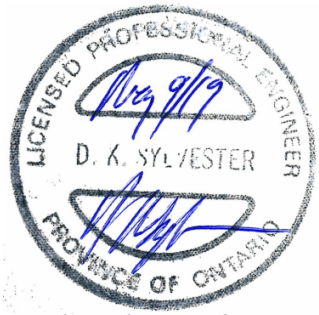
PROJECT NUMBER R.079827.001

PROJECT DATE 2019-05-09

Architect

STRUCTURAL ENGINEER

Mechanical ENGINEER



ELECTRICAL ENGINEER

END

END

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Title and description of Work.

.2 Contract Method.

.3 Contractor use of premises.

.4 Owner occupancy.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this Contract comprises construction of the new garage/workshop at the Port Weller Search and Rescue Station, located in St. Catharines, Ontario; and further identified as Project Number R.079827.001.

1.3 CONTRACT METHOD

.1 Construct Work under single, lump sum contract.

1.4 COST BREAKDOWN

.1 Within 48 hours of notification of acceptance of bid furnish a cost breakdown by Section aggregating contract amount.

.2 Show separately cost of equipment purchased exempt from Ontario Retail Sales Tax under your Ontario Sales Tax license number.

.3 Within 48 hours of acceptance of bid submit a list of subcontractors.

1.5 CONTRACTOR USE OF PREMISES

.1 Contractor construction zone is defined on drawing A010.

.2 Coordinate use of premises under direction of Departmental Representative.

1.6 OWNER OCCUPANCY

.1 Owner may occupy specific areas periodically during entire construction period.

.2 Cooperate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not used.

END

PART 1 - GENERAL

1.1 ACCESS AND EGRESS

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

1.2 USE OF SITE AND FACILITIES

.1 Make arrangements with Departmental Representative to facilitate work as stated.

.2 Provide for personnel and vehicle access to specific location when required.

.3 Where security is reduced by work provide temporary means to maintain security.

.4 Closures: protect work temporarily until permanent enclosures are completed.

1.3 SPECIAL REQUIREMENTS

.1 Submit schedule in accordance with Section 01 32 16 - Construction Progress Schedule - Bar (GANTT) Chart.

.2 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.

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

1.4 SECURITY

.1 Where security has been reduced by Work of Contract, provide temporary means to maintain security.

1.5 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions. Smoking is not permitted. Post signs.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END

PART 1 - GENERAL

1.1 ADMINISTRATIVE

.1 Schedule and administer project meetings throughout the progress of the work at the call of Departmental Representative.

.2 Prepare agenda for meetings.

.3 Distribute written notice of each meeting 4 days in advance of meeting date to Departmental Representative.

.4 Provide physical space and make arrangements for meetings.

.5 Preside at meetings.

.6 Unless directed otherwise by Departmental Representative, record minutes of meetings. Minutes shall be circulated to attending parties and affected parties not in attendance within 5 days after meeting.

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

1.2 PRECONSTRUCTION MEETING

.1 Within 10 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.

.2 Departmental Representative, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.

.3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.

.4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.

.5 Agenda to include:
.1 Appointment of official representative of participants in the Work.
.2 Schedule of Work: in accordance with Section 01 32 16.
.3 Schedule of submission of shop drawings, samples, mock-ups, colour chips. Submit submittals in accordance with Section 01 33 00.
.4 Requirements for temporary facilities, site sign, storage sheds, utilities, fences in accordance with Section 01 52 00.
.5 Site security in accordance with Section 01 56 00.
.6 Health and safety in accordance with Section 01 35 29.
.7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
.8 Owner provided products.

.9 Record drawings and specifications in accordance with Sections 01 33 00 and 01 78 00.
.10 Maintenance manuals in accordance with Section 01 78 00.
.11 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00.
.12 Monthly progress claims, administrative procedures, photographs, hold backs.
.13 Appointment of inspection and testing agencies or firms.
.14 Insurances, transcript of policies.

1.3 PROGRESS MEETINGS

.1 During course of Work and 2 weeks prior to project completion, schedule progress meetings monthly.

.2 Contractor, major Subcontractors involved in Work and Departmental Representative are to be in attendance.

.3 Notify parties minimum 10 days prior to meetings.

.4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within 5 days after meeting.

.5 Agenda to include the following:
.1 Review, approval of minutes of previous meeting.
.2 Review of Work progress since previous meeting.
.3 Field observations, problems, conflicts.
.4 Problems which impede construction schedule.
.5 Review of off-site fabrication delivery schedules.
.6 Corrective measures and procedures to regain projected schedule.
.7 Revision to construction schedule.
.8 Progress schedule, during succeeding work period.
.9 Review submittal schedules: expedite as required.
.10 Maintenance of quality standards.
.11 Review proposed changes for affect on construction schedule and on completion date.
.12 Other business.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END

PART 1 - GENERAL

1.1 DEFINITIONS

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

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

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

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

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

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

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

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

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

1.2 REQUIREMENTS

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

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

.3 Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting.

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

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Submit to Departmental Representative within 10 working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.

.3 Submit Project Schedule to Departmental Representative within [5] working days of receipt of acceptance of Master Plan.

1.4 PROJECT MILESTONES

.1 Project milestones form interim targets for Project Schedule.
 .1 Certificate of Substantial Performance by to be achieved within 203 working days after Award of Contract.
 .2 Total completion to be achieved within 23 working days after Substantial Performance.

1.5 MASTER PLAN

.1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).

.2 Departmental Representative will review and return revised schedules within 5 working days.

.3 Revise impractical schedule and resubmit within 5 working days.

.4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

1.6 PROJECT SCHEDULE

.1 Develop detailed Project Schedule derived from Master Plan.

.2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
 .1 Award.
 .2 Shop Drawings, Samples.
 .3 Permits.
 .4 Mobilization.
 .5 Excavation.
 .6 Backfill.
 .7 Building footings.
 .8 Slab on grade.
 .9 Siding and Roofing.
 .10 Interior Architecture (Walls, Floors and Ceiling).

.11 Plumbing.
.12 Lighting.
.13 Electrical.
.14 Piping.
.15 Controls.
.16 Heating, Ventilating, and Air Conditioning.
.17 Testing and Commissioning.
.18 Supplied equipment long delivery items.
.19 Departmental Representative supplied equipment required dates.
.20 Overtime and premium pay to ensure milestone are met.

1.7 PROJECT SCHEDULE REPORTING

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

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

1.8 PROJECT MEETINGS

.1 Discuss Project Schedule at regular site meetings specified in Section 01 31 19, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.

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

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not used.

END

PART 1 - GENERAL

1.1 SUMMARY

.1 Provide dated photos of construction progress, completed building and features specific to individual LEED prerequisites and credits.

1.2 RELATED SECTIONS

.1 Section 01 35 66 – Sustainability Procedures
Section 01 35 46 – Indoor Air Quality Procedures.

PART 2 - PRODUCTS Not used.

PART 3 - EXECUTION

.1 Provide a representative collection of dated digital jpg photos (max 1 Mb per photo) of construction progress, including:
- .1 Photos of site work (excavation, landscaping etc)
- .2 Photos of foundations
- .3 Photos of main building structure
- .4 Photos of envelope work
- .5 Photos of interior fit-up
- .6 Photos of interior finishes.

.2 Construction Progress Photos Provide a representative collection of dated digital jpg photos (max 1 Mb per photo) of construction progress, including:
- .1 Photos of site work (excavation, landscaping etc)
- .2 Photos of foundations
- .3 Photos of main building structure
- .4 Photos of envelope work
- .5 Photos of interior fit-up
- .6 Photos of interior finishes.

.3 Completed Building Photos
- .1 Provide dated digital jpg photos (max 1 Mb per photo) of completed building, including:
  - .1 Photos of each exterior building elevation
  - .2 Photos of primary entrance to the building
  - .3 Photos of all typical spaces
  - .4 Photos of typical landscaping.

.4 LEED Prerequisite and Credit Photos

.1 Provide dated digital jpg photos (max 1 Mb per photo) of features specific to individual LEED prerequisites and credits, including:

.1 SSp1 - Photos of Erosion and Sedimentation control measures. Label each photo with date and specific ESC measure. Include photos of any corrective action taken. Photos should be taken at regular intervals from site clearing/demolition through to excavation and construction completion, and show all areas of the site covered in the plan. Refer to Section 01 57 13 Temporary Erosion and Sedimentation Control.

.2 EQp2 - Photos of signage communicating exterior smoking policy

.3 EQp2 - Photos of signage communicating interior smoking policy

.4 EQc3 - Photos of IAQ measures as specified in Section 01 35 66.

3.4 ADDITIONAL PHOTOS

.1 Provide other photos as requested by LEED Departmental Representative to document sustainable design and construction.

END OF SECTION

PART 1 - GENERAL

1.1 ADMINISTRATIVE

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

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

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

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

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

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

.7 Verify field measurements and affected adjacent Work are co-ordinated.

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

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

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

.11 Submit number of hard copies specified for each type and format of submittal and also submit in electronic format as pdf files. Forward pdf, NMSEdit Professional spp, MS Word, MS Excel, MS Project and Autocad dwg files on USB compatible with PWGSC encryption requirements or through email or alternate electronic file sharing service such as ftp, as directed by Departmental Representative.

1.2 SHOP DRAWINGS AND PRODUCT DATA

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

.2 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario of Canada.

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

.4 Allow 5 working days for Departmental Representative's review of each submission.

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

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

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

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

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

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

.11 Submit three hard copies and one electronic copy of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
.1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
.2 Testing must have been within 3 years of date of contract award for project.

.12 Submit three hard copies and one electronic copy of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
.1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
.2 Certificates must be dated after award of project contract complete with project name.

.13 Submit three hard copies and one electronic copy of manufacturers instructions for requirements requested in specification Sections and as requested by Departmental Representative.
.1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

.14 Submit three hard copies and one electronic copy of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.

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

.16 Submit three hard copies and one electronic copy of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.

.17 Delete information not applicable to project.

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

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

.20 The review of shop drawings by Public Works and Government Services Canada (PWGSC) is for sole purpose of ascertaining conformance with general concept.

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

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

1.3 SAMPLES

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

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

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

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

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

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

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

1.4 MOCK-UPS

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

1.5 CERTIFICATES AND TRANSCRIPTS

.1 Immediately after award of Contract, submit Workers' Safety and Insurance Board Experience Report.

.2 Submit transcription of insurance immediately after award of Contract.

1.6 FEES, PERMITS AND CERTIFICATES

.1 Provide authorities having jurisdiction with information requested.

.2 Pay fees and obtain certificates and permits required.

.3 Furnish certificates and permits.

.4 Submit acceptable certificate stating that suspended ceiling systems provide adequate support for electrical fixtures, as required by current bulletin of Electrical Safety Authority (ESA.)

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END

LEED v4
EMISSIONS LIMITS TABLE
EQc2 – LOW EMITTING MATERIALS

These limits apply to all site-applied products installed within the waterproofing membrane.

No product may have intentionally-added methylene chloride or perchloroethylene.

Inherently Non-Emitting Materials

- Include: stone, ceramic, powder-coated metals, plated or anodized metals, lass, concrete, clay brick, unfinished solid wood, untreated solid wood
- These materials are considered compliant without VOC testing if they do not include integral organic-based surface coatings, binders or sealants

Adhesives and Sealants

	VOC limit (g/L)
	SQAQMD 1168 (2005)
Architectural Applications	
Indoor Carpet Adhesives	50
Carpet Pad Adhesives	50
Wood Flooring Adhesives	100
Rubber Floor Adhesives	60
Subfloor Adhesives	50
Ceramic Tile Adhesives	65
VCT & Asphalt Adhesives	50
Drywall & Panel Adhesives	50
Cove Base Adhesives	50
Multipurpose Construction Adhesives	70
Structural Glazing Adhesives	100
Single Ply Roof Membrane Adhesives	250
Specialty Applications	
PVC Welding	510
CPVC Welding	490
ABS Welding	325
Plastic Cement Welding	250
Adhesive Primer for Plastic	550
Computer Diskette Manufacturing	350
Contact Adhesive	80
Special Purpose Contact Adhesive	250
Tire Retread	100
Adhesive Primer for Traffic Marking Tape	150
Structural Wood Member Adhesive	140
Sheet Applied Rubber Lining Operations	850
Top & Trim Adhesive	250
Substrate Specific Applications	
Metal to Metal	30

Paints and Coatings

	VOC limit (g/L)		
	SCAQMD 1113 (2011)	**CAN**	**ARB**
Basement Specialty Coatings	--		400
Bond Breakers	350	350	350
Building Envelope Coating	100		
Calcimine Recoater	--	475	
Colourants added to:			
Architectural Coatings, excl. IM Coatings	50		
Solvent-Based IM	600		
Waterborne IM	50		
Concrete-Curing Compounds	100	350	350
Concrete Surface Retarder	50	780	
Driveway Sealer	50		50
Dry-Fog Coatings	50	400	150
Extreme High Durability Coating	--	800	
Faux Finishing – Clear Topcoat	100		
Faux Finishing – Decorative Coatings	350	350	350
Faux Finishing – Glazes	350		
Faux Finishing – Japan	350		
Faux Finishing – Trowel Applied Coatings	50		
Fire-Proofing/Resistant Coatings	150	350	350
Fire Retardant Coating, Clear	--	650	
Flats	50	100	50
Floor Coatings	50	250	100
Form Release Compounds	100	250	250
Graphic Arts (Sign) Coatings	200	500	500
High Gloss Coatings	--	250	150
Industrial Maintenance Coatings	100	340	250
Colour Indicating Safety Coatings	480	550	
High Temperature IM Coatings	420	420	420
Non-Sacrificial Anti-Graffiti Coatings	100		
Zinc-Rich Primers	100		340
Low-Solids Coatings	120	120	120
Magnesite Cement Coatings	450		450
Mastic (Texture) Coatings	100	300	100

Plastic Foams	50
Porous Material (except wood)	50
Wood	30
Fiberglass	80
Sealants	
Architectural	250
Marine Deck	760
Non-membrane Roof	300
Roadway	250
Single-Ply Roof Membrane	450
Other	420
Sealant Primers	
Architectural Non Porous	250
Architectural Porous	775
Modified Bituminous	500
Marine Deck	760
Other	750

Metallic Pigmented Coatings	150	500	500
Multi-Color Coatings	250	250	250
Non-Flat Coatings	50	150	100
Nuclear Coatings	--	450	
Pre-Treatment Wash Primers	420	420	420
Primers, Sealers and Undercoaters	100	200	100
Quick-dry Enamel	--	250	
Reactive Penetrating Sealers	350		350
Recycled Coatings	250	350	250
Roof Coatings	50		50
Roof Coatings, Bituminous	--	300	50
Roof Coatings, Non-Bituminous	--	250	
Roof Coatings, Aluminum	100		400
Roof Primers, Bituminous	350	350	350
Rust Preventative Coatings	100	400	250
Sacrificial Anti-Graffiti Coatings	50		
Shellac: Clear	730	730	730
Shellac: Pigmented	550	550	550
Specialty Primers	100	350	100
Stains	100	250	250
Stains, Interior	250	250	
Stone Consolidants	450		450
Swimming Pool Coatings	340	340	340
Thermoplastic Rubber Coatings	--	550	
Tile and Stone Sealers	100		
Traffic Coatings	100	450	100
Tub and Tile Refinishing Coatings	420		420
Waterproofing Sealers	100	250	250
Waterproofing Concrete/Masonry Sealers	100	400	100
Wood Coatings: Varnish	275	350	275
Wood Coatings: Conversion Varnish	--	725	
Wood Coatings: Conjugated Oil Varnish	--	450	
Wood Coatings: Sanding Sealers	275	350	
Wood Coatings: Lacquer	275	550	
Wood Coatings: Lacquer (Clear)	--	680	
Wood Conditioners	100		
Wood Preservatives	350		350

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA):
.1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.

.2 National Building Code 2015 (NBC):
.1 NBC 2015, Division B, Part 8 Safety Measures at Construction and Demolition Sites.

.3 National Fire Code 2015 (NFC):
.1 NFC 2015, Division B, Part 5 Hazardous Processes and Operations, subsection 5.6.1.3 Fire Safety Plan.

.4 Province of Ontario:
.1 Occupational Health and Safety Act Revised Statutes of Ontario 1990, Chapter O.1 as amended, and Regulations for Construction Projects, O. Reg. 213/91 as amended.
.2 O. Reg. 490/09, Designated Substances.
.3 Workplace Safety and Insurance Act, 1997.
.4 Municipal statutes and authorities.

.5 Treasury Board of Canada Secretariat (TBS):
.1 Treasury Board, Fire Protection Standard April 1, 2010 www.tbs-sct.gc.ca/pol/doc-eng.aspx ?id=17316&section=text.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
.1 Results of site specific safety hazard assessment.
.2 Results of safety and health risk or hazard analysis for site tasks and operations.
.3 Measures and controls to be implemented to address identified safety hazards and risks.

.3 Provide a Fire Safety Plan, specific to the work location, in accordance with NBC, Division B, Article 8.1.1.1.3 prior to commencement of work. The plan shall be coordinated with, and integrated into, the existing Emergency Procedures and Evacuation Plan in place at the site. Departmental Representative will provide Emergency Procedures and Evacuation Plan. Deliver two copies of the Fire Safety Plan to the Departmental Representative not later than 14 days before commencing work.

.4 Contractor's and Sub-contractors' Safety Communication Plan.

.5 Contingency and Emergency Response Plan addressing standard operating procedures specific to the project site to be implemented during emergency situations. Coordinate plan with existing Emergency Response requirements and procedures provided by Departmental Representative.

.6 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 10 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 5 days after receipt of comments from Departmental Representative.

.7 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.

.8 Submit names of personnel and alternates responsible for site safety and health.

.9 Submit records of Contractor's Health and Safety meetings when requested.

.10 Submit 3 copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative, weekly.

.11 Submit 3 copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative, weekly.

.12 Submit copies of orders, directions or reports issued by health and safety inspectors of the authorities having jurisdiction.

.13 Submit copies of incident and accident reports.

.14 Submit Material Safety Data Sheets (MSDS).

.15 Submit Workplace Safety and Insurance Board (WSIB)- Experience Rating Report.

1.3 FILING OF NOTICE

.1 File Notice of Project with Provincial authorities prior to commencement of Work.

1.4 WORK PERMIT

.1 Obtain Hot Work Permit from Departmental Representative.

1.5 SAFETY ASSESSMENT

.1 Perform site specific safety hazard assessment related to project.

1.6 MEETINGS

.1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.

1.7 REGULATORY REQUIREMENTS

.1 Comply with the Acts and regulations of the Province of Ontario.

.2 Comply with specified standards and regulations to ensure safe operations at site.

1.8 PROJECT/SITE CONDITIONS

.1 Work at site will involve contact with:

.1 Soil and Groundwater Assessment in Support of Proposed Construction Project. Port Weller Search and Rescue Station, 4 Welland Canals Parkway, St. Catharines, ON. Prepared by Dillion Consulting. Dated February 4th, 2019 (Phase 2ESA).

1.9 GENERAL REQUIREMENTS

.1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.

.2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns either accepting or requesting improvements.

.3 Relief from or substitution for any portion or provision of minimum Health and Safety standards specified herein or reviewed site-specific Health and Safety Plan shall be submitted to Departmental Representative in writing.

1.10 COMPLIANCE REQUIREMENTS

.1 Comply with Ontario Occupational Health and Safety Act, R.S.O. 1990 Chapter 0.1, as amended.

1.11 RESPONSIBILITY

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

.2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

.3 Where applicable the Contractor shall be designated "Constructor", as defined by Occupational Health and Safety Act and Regulations for Construction Projects for the Province of Ontario.

1.12 UNFORSEEN HAZARDS

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

.2 Follow procedures in place for Employees Right to Refuse Work as specified in the Occupational Health and Safety Act for the Province of Ontario.

1.13 HEALTH AND SAFETY CO-ORDINATOR

.1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
.1 Have site-related working experience specific to activities associated with abatement of hazardous materials.
.2 Have working knowledge of occupational safety and health regulations.
.3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
.4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
.5 Be on site during execution of Work site supervisor.

1.14 POSTING OF DOCUMENTS

.1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province of Ontario, and in consultation with Departmental Representative.

.1 Contractor's Safety Policy.
.2 Constructor's Name.
.3 Notice of Project.
.4 Name, trade, and employer of Health and Safety Representative or Joint Health and Safety Committee members (if applicable).
.5 Ministry of Labour Orders and reports.
.6 Occupational Health and Safety Act and Regulations for Construction Projects for Province of Ontario.
.7 Address and phone number of nearest Ministry of Labour office.
.8 Material Safety Data Sheets.
.9 Written Emeregency Response Plan.
.10 Site Specific Safety Plan.
.11 Valid certificate of first aider on duty.
.12 WSIB "In Case of Injury At Work" poster.
.13 Location of toilet and cleanup facilities.

1.15 CORRECTION OF NON-COMPLIANCE

.1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.

.2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.

.3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.16 BLASTING

.1 Blasting or other use of explosives is not permitted.

1.17 POWDER ACTUATED DEVICES

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

1.18 WORK STOPPAGE

.1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

.2 Assign responsibility and obligation to Health and Safety Coordinator to stop or start Work when, at Health and Safety Coordinator's discretion, it is necessary or advisable for reasons of health or safety. Departmental Representative may also stop Work for health and safety considerations.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not used.

END

PART 1 - GENERAL

1.1 DEFINITIONS

.1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.

.2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Submit 2 copies of WHMIS MSDS.

.3 Before commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review by Departmental Representative.

.4 Environmental Protection Plan must include comprehensive overview of known or potential environmental issues to be addressed during construction.

.5 Address topics at level of detail commensurate with environmental issue and required construction tasks.

.6 Include in Environmental Protection Plan:
.1 Names of persons responsible for ensuring adherence to Environmental Protection Plan.
.2 Names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.
.3 Names and qualifications of persons responsible for training site personnel.
.4 Descriptions of environmental protection personnel training program.
.5 Erosion and sediment control plan identifying type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.
.6 Drawings indicating locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.
.7 Traffic Control Plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather.

.1 Plans to include measures to minimize amount of material transported onto paved public roads by vehicles or runoff.

.8 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use.

.1 Plan to include measures for marking limits of use areas and methods for protection of features to be preserved within authorized work areas.

.9 Spill Control Plan to include procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.

.10 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.

.11 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, are contained on project site.

.12 Contaminant Prevention Plan identifying potentially hazardous substances identified in the ESA Reports and to be used on job site; intended actions to prevent introduction of such materials into air, water, or ground; and detailing provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.

.13 Waste Water Management Plan identifying methods and procedures for management and discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.

.14 Soil and groundwater assessment and recommendations implementation plan.

.15 Soil disposal procedures for all for soil generated through excavation during construction in accordance with the Phase 2 Soil and Groundwater Assessment and Recommendations ESA Recommendations.

.16 Dewatering plan in accordance with the Phase 2 Soil and Groundwater Assessment and Recommendations ESA Recommendations. All costs for dewatering, including storage, transportation, and testing, must be included in this contract.

.17 Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.

.18 Pesticide treatment plan to be included and updated, as required.

1.3 FIRES

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

1.4 DRAINAGE

.1 Develop and submit erosion and Sediment Control Plan (ESC) identifying type and location of erosion and sediment controls provided. Plan to include monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.

.2 Storm Water Pollution Prevention Plan (SWPPP) to be substituted for erosion and sediment control plan.

.3 Provide temporary drainage and pumping required to keep excavations and site free from water.

.4 Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials.

.5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.5 SITE CLEARING AND PLANT PROTECTION

.1 Protect trees and plants on site and adjacent properties as indicated.

.2 Protect trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m minimum.

.3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.

.4 Minimize stripping of topsoil and vegetation.

.5 Restrict tree removal to areas designated by Departmental Representative.

1.6 WORK ADJACENT TO WATERWAYS

.1 Construction equipment to be operated on land only.

.2 Use waterway beds for borrow material only after written receipt of approval from Departmental Representative.

.3 Waterways to be kept free of excavated fill, waste material and debris.

.4 Avoid indicated spawning beds when constructing temporary crossings of waterways.

1.7 POLLUTION CONTROL

.1 Maintain temporary erosion and pollution control features installed under this Contract.

.2 Control emissions from equipment and plant in accordance with local authorities' emission requirements.

.3 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.8 HISTORICAL/ARCHAEOLOGICAL CONTROL

.1 Provide historical, archaeological, cultural resources, and biological resources that defines procedures for identifying and protecting historical, archaeological, cultural resources, and biological resources known to be on project site: and identifies procedures to be followed if historical archaeological, cultural resources, and biological resources not previously known to be onsite or in area are discovered during construction.

.2 Plan: include methods to assure protection of known or discovered resources and identify lines of communication between Contractor personnel and Departmental Representative.

.3 All building conservation work is to be carried out in accordance with the "Standards and Guidelines for the Conservation of Historic Places in Canada".

1.9 NOTIFICATION

.1 Departmental Representative will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.

.2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.
.1 Take action only after receipt of written approval by Departmental Representative.

.3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.

.4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11. Leave Work area clean at end of each day.

.2 Remove rubbish from Site in accordance with Authorities having jurisdiction.

.3 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.

.4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.5 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 This section describes Construction Indoor Air Quality (IAQ) requirements for LEED EQp2, EQc2, EQc3 and EQc4 Equivalency and includes administrative and procedural requirements for the development of and execution of indoor air quality procedures, monthly tracking, and final submittals.

.2 The Owner has established that this project is to generate the least amount of airborne contaminants possible. Where contaminants are unavoidable, implement control measures to protect the health and safety of construction personnel and to prevent residual building contaminants from affecting the indoor air quality over the lifetime of the building.

.3 The Contractor is responsible for meeting all requirements of LEED EQp2, EQc2, EQc3 and EQc4, and for the identification and management of construction related airborne contaminants in compliance with all municipal, provincial and federal Acts and regulations.

.4 The Contractor is responsible for the management of Indoor Air Quality for all building areas.

1.2 RELATED SECTIONS

.1 Section 01 35 66 Sustainability Procedures

1.3 REFERENCED STANDARDS

.1 LEED v4 for Building Design and Construction Reference Guide

.2 SMACNA - Sheet Metal and Air Conditioning National Contractors Association IAQ Guidelines for Occupied Buildings Under Construction, 2nd Edition, 2007, ANSI/SMACNA 008-2008 (Chapter 3): smacna.org

.3 Standard Test Method for Determining Air Leakage Rate by Fan Pressurization, ASTM E779-10(2018): astm.org

.4 Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door, ASTM E1827-11(2017): astm.org

.5 Nondestructive testing, Leak testing—Criteria for method and technique selection, CEN Standard EN 1779—1999: cen.eu

.6 Nondestructive testing, Leak testing, Tracer gas method, CEN Standard EN 13185—2001: cen.eu

.7 Nondestructive testing, Leak testing, Calibration of reference leaks for gases, CEN Standard EN 13192—2001: cen.eu

.8 RESNET Standards: resnet.us/standards/

1.4 REQUIREMENTS

.1 General Requirements

.1 IAQ Manager: The Contractor shall designate an on-site party responsible for instructing workers, monitoring, documenting, and photographing the IAQ Management Plan for the project. Monitoring shall happen at least monthly.

.2 Instruction: The Contractor shall provide on-site instruction of appropriate IAQ management measures.
Meetings: Contractor LEED Coordinator shall discuss IAQ Management at meetings which include subcontractors affected by the IAQ Management Plan. At a minimum, IAQ management shall be discussed at the following meetings: Pre-construction meeting, Regular job-site meetings, as needed.

.2 EQp2 – Non-Smoking Building

.1 For the duration of construction activities, Contractor shall provide clear signage indicating the site's non-smoking policy. Signage shall read as follows: No smoking allowed within the building, or within 7.5m of entrances, windows, or fresh air intakes.

.3 EQc2 – Meet the requirements of LEED EQc2 Low Emitting Materials. Products inside of the waterproofing membrane must be reviewed against the LEED Emissions Checklist in Section 01 33 02 and the LEED Emissions Limit Table in Section 01 33 03, and approved by Contractor LEED Coordinator prior to installation/application on site. This applies to the following categories of products:

.1 Interior paints and coating applied on site
.2 Interior adhesives and sealants applied on site (including flooring adhesive)
.3 Flooring
.4 Composite wood
.5 Ceilings, walls, thermal, and acoustic insulation

.4 EQc3 – Develop and implement an Indoor Air Quality Management Plan for the construction and pre-occupancy phases of the building to meet LEED EQc3.The Contractor and all Subcontractors are required to comply with the Indoor Air Quality Management Plan. Distribute the Plan to all relevant Subcontractors, and posted in an accessible location onsite.

.5 Address all of the following in the Plan:

.1 Protect absorptive materials stored on-site and installed from moisture damage.
.2 Do not operate permanently installed air-handling equipment during construction unless filtration media with a minimum efficiency reporting value (MERV) of 8, as determined by ASHRAE 52.2–2017, with errata (or equivalent filtration media class of F5 or higher, as defined by CEN Standard EN 779–2002, Particulate Air Filters for General Ventilation, Determination of the Filtration Performance), are installed at each return air grille and return or transfer duct inlet opening such that there is no bypass around the filtration media.
.3 Immediately before occupancy, replace all filtration media with the final design filtration media, installed in accordance with the manufacturer's recommendations.
.4 Prohibit the use of tobacco products inside the building and within 25 feet (7.5 meters) of the building entrance during construction.

.5 During construction, meet or exceed all applicable recommended control measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 2nd edition, 2007, ANSI/SMACNA 008-2008, Chapter 3. The SMACNA guideline can be accessed at www.smacna.org. The following SMACNA guidelines shall be followed:

.1 HVAC Protection:

.1 Keep contaminants out of the HVAC system. Do not run permanently installed equipment if possible, or maintain proper filtration if it is used.

.2 If conditioning is required during construction, use supplementary HVAC units instead of permanently installed equipment if possible.

.3 If permanently installed HVAC system must be used during construction, install filtration to protect the return (negative pressure) side of the system. Replace these filters regularly during construction.

.4 Seal all ductwork, registers, diffusers, and returns with plastic when stored on site or not in service. The seal shall be secure around the border of the supply and return openings. Seal unfinished runs of ductwork at the end of each day.

.5 Replace all filtration media before occupancy. Do not store materials in mechanical rooms, to reduce potential debris and contamination to mechanical systems.

.2 Source Control:

.1 Keep sources of contaminants out of the building and have a plan to eliminate any that are introduced.

.2 Use low-toxicity and low-VOC materials to the greatest extent possible.

.3 Develop protocols for the use of any high-toxicity materials. Isolate areas where high-toxicity materials are being installed and use temporary ventilation for that area.

.4 Prevent exhaust fumes (from idling vehicles, equipment, and fossil-fueled tools) from entering the building. Prioritize the use of electric equipment such as forklifts and heaters.

.5 Enforce the no-smoking job site policy. Store materials in dry conditions indoors, under cover, and off the ground or floor. Protect stored materials from moisture because absorbent materials exposed to moisture during construction can mould and degenerate long after installation.

.6 If materials are improperly exposed to moisture, replace the material and consider testing air quality before occupancy to make sure no mould contamination has occurred.

.7 Mechanical rooms containing air handling equipment shall not be used as storage spaces for materials or waste.

.3 Pathway Interruption:

.1 Prevent circulation of contaminated air when cutting concrete or wood, sanding drywall, installing VOC-emitting materials, or performing other activities that affect IAQ in other work spaces.

.2 When possible, locate particulate-producing activities, such as a cutting station, outdoors.

.3 Isolate areas of work to prevent contamination of other spaces, whether they are finished or not. Seal doorways, windows, or tent off areas as needed using temporary barriers, such as plastic separations. Provide walk-off mats at entryways, in elevator lobbies and in stairwells to reduce introduced dirt and pollutants.

.4 Depressurize the work area to allow a differential between construction areas and clean areas. Exhaust to the outdoors using 100% outdoor air, if possible.

.5 Use dust guards and collectors on saws and other tools.

.6 Bag sawdust at the end of each day.

.4 Housekeeping:

.1 Maintain good job site housekeeping on a daily basis. Use vacuum cleaners with high-efficiency particulate filters and use sweeping compounds or wetting agents for dust control when sweeping.

.2 Keep materials organized to improve job site safety as well as indoor air quality.

.3 Any interior water accumulation or spills must be cleaned up immediately.

.5 Scheduling:

.1 For major renovations, coordinate construction activities to minimize or eliminate disruption of operations in occupied areas.

.2 Keep trades that affect IAQ physically isolated on site and separated from each other by the construction schedule. For example, schedule drywall finishing and carpet installation for different days or different sections of the building. Consider after-hours or weekend work if practical.

.3 Install absorptive-finish materials after wet-applied materials have fully cured whenever possible. For example, install carpet and ceiling tile after paints and stains are completely dry.

.4 Remove all temporary filtration media and replace them with new filters before occupancy.

.6 EQc4 - Meet the requirements of EQc4 Indoor Air Quality Assessment Option 2 Air Testing

.1 After construction ends, the building has been completely cleaned, all interior finishes, such as millwork, doors, paint, carpet, acoustic tiles, and movable furnishings (e.g., workstations, partitions), have been installed, and major VOC punch list items have been finished, test the building in accordance with LEED EQc4

.2 Option 2: Air Testing

.1 Before occupancy, but under ventilation conditions typical for occupancy, conduct baseline IAQ testing using protocols consistent with the methods listed in Table 1 for all occupied spaces. A minimum of one outdoor air sample is required for each day of indoor testing.

.2 Use current versions of ASTM standard methods, EPA compendium methods, or ISO methods, as indicated below.

.3 Laboratories that conduct the tests for chemical analysis of formaldehyde and volatile organic compounds must be accredited under ISO/IEC 17025 for the test methods they use.

.4 Demonstrate that contaminants do not exceed the concentration levels listed in the following table:

Contaminant	Maximum Concentration	ASTM and U.S. EPA methods	ISO method
Formaldehyde	27 parts per billion	ASTM D5197; EPA TO-11 or EPA Compendium Method IP-6	ISO 16000-3
Particulates (PM10 for all buildings; PM2.5 for buildings in EPA non-attainment areas*, or local equivalent)	PM10: 50 micrograms per m^3 PM2.5: 15 micrograms per m^3	EPA Compendium Method IP-10	ISO 7708
Ozone (for buildings in EPA non-attainment areas*)	0.075 ppm	ASTM D5149 - 02	ISO 13964
Total Volatile Organic Compounds (TVOC)	500 micrograms per m^3	EPA TO-1, TO-15, TO-17, or EPA Compendium Method IP-1	ISO 16000-6
Target chemicals listed in CDPH Standard Method v1.1, Table 4-1, except formaldehyde**	CDPH Standard Method v1.1-2010, Allowable Concentrations, Table 4-1	ASTM D5197; EPA TO-1, TO-15, TO-17	ISO 16000-3, 16000-6
Carbon Monoxide (CO)	9 parts per million and no greater than 2 parts per million above outdoor levels	EPA Compendium Method IP-3	ISO 4224

**See www.epa.gov/green-book for information regarding EPA non-attainment areas*

*** See https://www.cdph.ca.gov/programs/IAQ/Documents/cdph-iaq_standardmethod_v1_1_2010%20new1110.pdf*

.3 Determination of Air Testing Locations:

.1 The number of testing locations depends on the size of the building and number of ventilation systems but must include all occupied spaces. All space types must be represented (example: office and classroom).

.1 Test at least one location per ventilation system for each occupied space type. There must be a minimum of one test per floor. The locations selected for testing must represent the worst-case zones where the highest concentrations of contaminants of concern are likely to occur.

.2 Spaces (e.g. residential rooms) that are identical in their construction, finishes, configuration, square footage, and HVAC systems may sample spaces by testing one in seven. If the sampled space fails the test, all seven must be tested.

.3 Minimum of one outdoor sample is required for each day of indoor testing.

.4 Testing Procedures

.1 The measurement equipment must be positioned in the breathing zone, between 3 and 6 feet (900 and 1 800 millimeters) above the floor.

.2 The test must occur during normal occupied hours, with the HVAC system starting at the normal start time and delivering outdoor air at the minimum rate.

.3 The gravimetric method must be used for testing.

.5 Re-testing

.3 For each sampling point where the concentration exceeds the limit, take corrective action and retest for the noncompliant contaminants at the same sampling points. Repeat until all requirements are met.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 The Project is shadowing LEED Version 4 Building Design and Construction (LEED v4 BD+C) rating system, with an anticipated performance level of Gold. The Contractor, subcontractors, suppliers, and manufacturers are required to participate to achieve LEED Equivalency.

.2 LEED Registration Number: The Project is not registered for formal certification.

.3 To achieve LEED Equivalency, the Project must meet certain LEED prerequisites and achieve certain LEED credits. A summary of prerequisites and credits the Project will be seeking to achieve are outlined in 01 35 63. Refer to Section 01 35 66 for a full description of Contractor's LEED responsibilities.

.4 Follow special administrative procedures and summarize actions performed to assist the Departmental Representative with demonstrating LEED Equivalency. Refer to Section 01 35 66 to determine required LEED documentation.

.5 At contract award, the Contractor shall appoint a Contractor LEED Coordinator to be responsible for all Contractor LEED responsibilities and submittals. The Contractor LEED Coordinator must have a LEED AP designation, a LEED GA designation, or experience in all aspects of Contractor LEED responsibilities.

.6 Where the term 'LEED' of 'LEED Equivalency' is used within these specifications it refers to the LEED (Leadership in Energy and Environmental Design) Version 4 for Building Design and Construction Rating System, including detailed requirements as set out in the LEED v4 Reference Guide.

.7 The project LEED Departmental Representative has provided a preliminary scorecard for the LEED strategies to outline targeted LEED credits for the project. All credits in the columns 'Y', '?Y' are required and shall be pursued and achieved. Any obstacles in achieving the targeted LEED credits are to be reported to the project LEED Departmental Representative immediately. Note that targeted credits, with direction of the design team and/or ownership, are subject to change throughout the construction process. Updates and notification will be provided to the Departmental Representative immediately and tracked in the bi-weekly construction meeting minutes.

.8 USGBC has removed credit numbering in LEED v4 and identifies prerequisites and credits by name only. LEED v4 Credit numbering (as provided by LEEDUser.com) is included herein for ease of use in project administration.

.9 Provide dated photos of construction progress, completed building and features specific to individual LEED prerequisites and credits.

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Requirements and procedures for LEED Equivalency:
.1 Specific requirements for LEED are also included in other Sections.
.2 Some LEED prerequisites and credits needed to obtain LEED Equivalency depend on product selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
.3 Definitions included in the LEED v4 Building Design and Construction Reference Guide and online amendments apply to this Section.

.2 Procedures to summarize documentation of LEED Equivalency

.3 List of LEED Equivalency documentation

1.2 RELATED SECTIONS

.1 01 11 00 – Summary of Work
.2 01 32 33 – Photographic Documentation
.3 01 33 02 – LEED Emissions Checklist
.4 01 33 03 – LEED Emissions Limits Table
.5 01 35 46 – Indoor Air Quality Procedures
.6 01 35 63 – Sustainability Requirements
.7 01 74 20 – Construction Waste Management and Disposal
.8 01 77 00 – Closeout Procedures
.9 22 40 00 – Plumbing Fixtures
.10 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 REFERENCES

.1 ANSI/BIFMA e3-2011 Furniture Sustainability Standard: bifma.org

.2 CaGBC – Canada Green Building Council, cagbc.org

.3 Canadian VOC Concentration Limits for Architectural Coatings: ec.gc.ca/lcpe-cepa/eng/regulations/detailReg.cfm?intReg=117 (See Emissions Limit Table, Section 01 33 03)

.4 CARB 93120 ATCM: arb.ca.gov/toxics/compwood/compwood.htm

.5 CDPH Standard Method v1.1: California Department of Public Health (CDPH) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, v. 1.1-2010, for the emissions testing and requirements of products and materials. (See Emissions Limit Table, Section 01 33 03) cal-iaq.org

.6 CEN Comité Européen de Normalisation (European Committee for Standardization) EN 15804—2012 Sustainability of construction works, Environmental product declarations, Core rules for the product category of construction products: cen.eu

.7 Chemical Abstracts Service: cas.org/

.8 Cradle-to-Cradle Certified Product Standard: c2ccertified.org/product_certification

.9 Cool Roof Rating Council Standard (CRRC-1): coolroofs.org

.10 Forest Stewardship Council: ic.fsc.org

.11 GreenScreen: cleanproduction.org/Greenscreen.v1-2.php

.12 Health Product Declaration: hpdcollaborative.org/

.13 ISO 14021-2016, Environmental labels and declarations—Self Declared Claims (Type II Environmental Labeling): iso.org

.14 ISO 14025-2006, Environmental labels and declarations (Type III Environmental Declarations—Principles and Procedures): iso.org

.15 ISO 14040-2006, Environmental management, Life cycle assessment principles, and frameworks: iso.org

.16 ISO 14044-2006, Environmental management, Life cycle assessment requirements, and guidelines: iso.org

.17 ISO 21930-2017 Sustainability in building construction—Environmental declaration of building products: iso.org

.18 Environmental Protection Agency (EPA) Construction General Permit (CGP): cfpub.epa.gov/npdes/stormwater/cgp.cfm

.19 LEED (Leadership in Energy and Environmental Design) v4 for Building Design and Construction Reference Guide: usgbc.org/leed

.20 Rainforest Alliance: rainforest-alliance.org/

.21 REACH - Registration, Evaluation, Authorisation and Restriction of Chemicals: echa.europa.eu/support/guidance-on-reach-and-clp-implementation

.22 SCAQMD – South Coast Air Quality Management District, aqmd.gov (See Emissions Limit Table, Section 01 33 03)

.23 SMACNA – Sheet Metal and Air-Conditioning National Contractors Association IAQ Guidelines for Occupied Buildings under Construction, 2nd edition, 2007, ANSI/SMACNA 008-2008 (Chapter 3): smacna.org

.24 USGBC – United States Green Building Council, usgbc.org

.25 WaterSense: epa.gov/watersense

1.4 DEFINITIONS

.1 Bio-Based Materials: Materials that meet the Sustainable Agriculture Network's Sustainable Agriculture Standard. Bio-based raw materials shall

be tested using ASTM D 6866 and be legally harvested, as defined by the exporting and receiving country.

.2 Chain-of-Custody (COC): A procedure that tracks a product form the point of harvest or extraction to its end use, including all successive stage of processing, transformation, manufacturing, a distribution.

.3 Chain-of-Custody Certificates: Certificates signed by manufacturers and fabricators certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001.

.4 Composite Wood and Agrifiber: Products made of wood particles and/or plant material pressed and bonded with adhesive or resin such as particleboard, medium density fiberboard (MDF), plywood, wheatboard, strawboard, panel substrates, and door cores.

.5 Corporate Sustainability Report: A third-party verified report that outlines the environmental impacts of extraction operations and activities associated with the manufacturer’s product and the product’s supply chain. (See LEED Reference Guide MRc3 for accepted CSR frameworks, p.526)

.6 Environmental Product Declaration (EPD): An independently verified report based on life-cycle assessment studies that have been conducted according to a set of common rules for each product category and peer-reviewed.
.1 Product-Specific Declaration: A product with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that has at least a cradle to gate scope.
.2 Industry-Wide (Generic) EPD: Provide products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator. EPD must conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.
.3 Product-Specific Type III EPD: A product with a third-party certification, including external verification, in which the manufacturer is explicitly recognized by the program operator. EPD must conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

.7 Extended Producer Responsibility (EPR): Measures undertaken by the maker of a product to accept its own and sometimes other manufacturers’ products as postconsumer waste at the end of the products’ useful life.

.8 FSC Certification: A third party certification by the Forest Stewardship Council (FSC) is a seal of approval awarded to forest managers who adopt environmentally and socially responsible forest management practices and to companies that manufacture and sell products made from certified wood.

.9 Health Product Declaration Open Standard (HPD): A standard format for reporting product content and associated health information for building products and materials.

.10 Indoor Air Quality (IAQ) Management Plan: Plan developed by the Contractor to provide a healthy indoor environment for workers and building occupants during construction. Plan must meet or exceed the recommendations of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA)

"IAQ Guidelines for Occupied Buildings Under Construction."

.11 Leadership Extraction Practices: Products that meet at least one of the responsible extraction criteria, which include: extended producer responsibility; bio-based materials; FSC wood products; materials reuse; recycled content; and other USGBC approved programs.

.12 LEED: Leadership in Energy and Environmental Design, a voluntary, consensus-based rating system to promote and evaluate strategies and innovations in building design to reduce environmental impacts and increase occupant comfort. Where the term "LEED" is used within these specifications, it refers to the LEED Version 4 Building Design and Construction Rating System.

.13 Manufacturer Inventory: A complete inventory for a product including a publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN). For any materials defined as trade secret or intellectual property, the name and/or CASRN may be withheld, but the role, amount and GreenScreen benchmark must be disclosed as defined in GreenScreen v1.2.

.14 Material Cost: The dollar value of materials being provided to the site, after Contractor mark-ups, including transportation costs, taxes, fees, and shop labour, but excluding field equipment and field labour costs.

.15 Materials Reuse: Reuse includes salvaged, refurbished, or reused products.

.16 Multi-Attribute Optimization: Third party certified products that demonstrate impact reduction below industry average in at least three of the following six categories: global warming potential; stratospheric ozone depletion; acidification; eutrophication; tropospheric ozone creation; non-renewable resource depletion.

.17 Product: For the purposes of credits MRc2, MRc3 and MRc4, a product (permanently installed building product) is defined as an item that arrives on the project site either as a finished element ready for installation or as a component to another item assembled on-site. A product is a unit of purchase - that is, entire assemblies, not individual components. The product unit is defined by the functional requirement for use in the project; this includes the physical components and services needed to serve the intended function of the permanently installed building project. In addition, similar products within a specification, each contributes as a separate product. Aesthetic variations do not constitute different products. For example, paints of different gloss levels are separate products because each paint type serves a different function (such as water resistance), however different colours of the same paint are not separate products. Similarly, carpets of different pile heights are separate products, but the same carpet in differing colours is not.

.18 Recycled Content: Recycled content is the sum of post-consumer recycled content plus one-half the pre-consumer recycled content, based on cost.

.1 "Post-consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.

.2 "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of

materials, such as rework, regrind, or scrap, generated in a process and capable of being reclaimed within the same process that generated it.

.19 Regional Materials: Materials that are extracted, harvested, recovered, and manufactured within a radius of 160 kilometers (100 miles) from the Project site.

1.5 ADMINISTRATIVE REQUIREMENTS

.1 LEED Equivalency:

.1 The Project is shadowing LEED Version 4 (LEED v4) rating system, with an anticipated performance level of Gold. The Contractor, subcontractor, suppliers, and manufacturers are required to participate to achieve LEED Equivalency. Work is not complete until acceptance of submitted materials.

.2 LEED v4 is organized into prerequisites and credits in nine categories of performance:

.1 Integrative Process (IP)
.2 Location and Transportation (LT)
.3 Sustainable Sites (SS)
.4 Water Efficiency (WE)
.5 Energy and Atmosphere (EA)
.6 Materials and Resources (MR)
.7 Indoor Environmental Quality (EQ)
.8 Innovation (IN)
.9 Regional Priority (RP).

.3 USGBC has removed credit numbering in LEED v4 and identifies prerequisites and credits by name only. Numbering is included herein for ease of use in project administration. Refer to Section 01 35 63 for a full list of LEED credit names and numbers.

.4 To achieve LEED Equivalency, the Project must meet certain LEED prerequisites and obtain certain LEED credits. A summary of prerequisites and credits the Project will be seeking to achieve are outlined in Section 01 35 63.

.5 The LEED Scorecard is an evolving document and will be updated throughout course of the Project. Participants must ensure they are fully aware of current goals and objectives outlined for Project, as summarized on the LEED Scorecard.

LEED Submittals: LEED Equivalency documentation is required as detailed in 'Performance Requirements' section below. At project culmination, upload LEED documentation data directly to LEED Departmental Representative's FTP site.

.2 Personnel:

.1 Project Departmental Representative: The Owner Departmental Representative is appointed to develop the LEED Scorecard for the Project, and to review a documentation summary upon project completion.

.2 Contractor LEED Coordinator: Within two weeks of contract award, the Contractor shall select and name the Contractor LEED Coordinator for the Project. This individual shall be in regular communication with on-site personnel and is responsible for ensuring that all the Contractor's LEED requirements are met. The Contractor LEED Coordinator will liaise with the

.3 Subcontractor LEED Representatives. The Contractor LEED Coordinator shall be familiar with LEED, having worked on past LEED projects or having earned accreditation as either LEED GA or LEED AP.

Subcontractor LEED Representative: At contract award, each Subcontractor shall select and name the Subcontractor LEED Representative. This individual will be responsible for ensuring the Subcontractor's LEED requirements are

met. The Subcontractor LEED Representative will liaise with Contractor LEED Coordinator and Subcontractor personnel.

.3 Meetings:

.1 There is no provision for LEED meetings. The Contractor LEED Coordinator shall present a LEED Equivalency update at least bi-weekly during Construction Progress Meetings.

.2 Construction Team LEED Orientation: The Contractor LEED Coordinator shall conduct on-site LEED orientation as needed to familiarize Subcontractors with Project's LEED requirements. Subcontractor LEED Representatives shall attend and report back to Subcontractors' forces on LEED requirements and procedures.

.4 Coordination / Communication:

.1 LEED submittals are in addition to other submittals required for the project. Where a LEED submittal is identical to that submitted to comply with other requirements, duplicate copies shall be provided as a separate submittal to verify LEED compliance.

.2 Subcontractor LEED Representatives and Contractor LEED Coordinator shall ensure that summary documentation required to demonstrate LEED Equivalency is prepared, submitted, reviewed and compiled efficiently and effectively.

.3 Subcontractor LEED Representative:

.1 Shall select materials and products which comply with the LEED Emissions Checklist, the LEED Materials Checklist, and the LEED Emissions Limits Table for each relevant product and material within Subcontractor Scope of Work.

.2 Shall provide a list of materials and products used on site to the Contractor LEED Coordinator. The list shall include manufacturer, model, quantity used, and a "Compliant" or "Non-Compliant" designation.

.3 Shall promptly notify Contractor LEED Coordinator where materials or products cannot comply with the LEED Checklists and Emissions Table.

.4 Contractor LEED Representative:

.1 Shall prepare and maintain until complete Material Tracking Spreadsheet and Emissions Tracking Spreadsheet to organize the data provided by Subcontractors or Suppliers on the Materials and Emissions submittal forms.

.2 Shall provide prompt feedback to the Subcontractor or Supplier on any non-compliant, unclear or missing documentation.

.3 Shall compile a summary of conformance for final review by the Departmental Representative. Documents shall be submitted via upload to a file-sharing website in a clearly organized structure, as agreed by Contractor and Departmental Representative.

.4 Shall submit by email to the Departmental Representative, a LEED Report in the format specified below.

.5 Shall respond promptly with clarification and/or further documentation, if the Departmental Representative deems any LEED submittals inadequate.

1.6 PERFORMANCE REQUIREMENTS

.1 The items below provide a summary of Contractor LEED requirements for specific prerequisites and credits. Where there is conflicting information between the summaries provided herein and the text of the LEED Reference

Guide, the LEED Reference Guide shall take precedence.

.2 Construction Activity Pollution Prevention (LEED SSp1)

.1 The Contractor will implement, inspect and maintain erosion and sedimentation control measures on-site during the various stages of construction (demolition, excavation, and construction), per the provided Erosion and Sedimentation Control (ESC) plan as per Phase 2 Soil and Groundwater Assessment Recommendations report. Temporary erosion and sedimentation control measures can be altered or removed upon approval of the Departmental Representative.

.2 The Contractor is required to undertake, or engage a qualified consultant to undertake the following:

.3 Perform regular inspections (minimum monthly, and after major rainfall events) of the ESC measures

.1 Document ESC milestones during construction (such as the removal of a silt fence upon completion of landscape grading)

.2 Document implementation of the erosion and sedimentation control plan through date-stamped photos, inspection logs or reports, and descriptions of corrective action taken in response to problems. Inspections should follow the requirements of the EPA CGP, Section 4.1.

.3 Waste Tracking (LEED MRp2, MRc5)

.4 Plan, implement and document construction/demolition/land-clearing waste management measures, as specified in Section 01 74 20 – Construction Waste Management and Disposal.

.5 Emissions (LEED EQp2, EQc2)

.1 Contractor shall protect the new construction as a non-smoking environment for the duration of the construction process, and shall provide signage to that effect.

.2 This section applies to site-applied products installed within the waterproofing membrane.

.3 Prior to products being used on site, shall ensure compliance with requirements for low-emitting materials for the following:

.1 Paints and coatings

.2 Adhesives and sealants

.3 Flooring

.4 Products containing composite wood, agrifibre products, or wood glues

.5 Ceilings, walls, thermal and acoustic insulation

.4 Contractor shall achieve the threshold level of compliance with emissions and content standards for all five of the following categories.

Category	**Threshold**	**Emissions and Content Requirements (see below)**
1. Interior Paints and Coatings	At least 90%, by volume, for emissions; 100% for VOC content	• General Emissions Evaluation for paints and coatings applied to walls, floors, and ceilings • VOC content requirements for wet applied products
2. Interior Adhesives and Sealants (incl. flooring adhesives)	At least 90%, by volume, for emissions; 100% for VOC content	• General Emissions Evaluation • VOC content requirements for wet applied products
3. Flooring	100%	• General Emissions Evaluation
4. Composite Wood	100% not covered by other categories	• Composite Wood Evaluation
5. Ceilings, walls, thermal and acoustic insulation	100%	• General Emissions Evaluation

.5 Inherently non-emitting sources: Products that are inherently non-emitting sources of VOCs (stone, ceramic, powder-coated metals, plated or anodized metal, glass, concrete, clay brick, and unfinished or untreated solid wood flooring) are considered fully compliant without any VOC emissions testing if they do not include integral organic based surface coatings, binders, or sealants.

.6 General Emissions Requirements: Products must demonstrate they have been tested and determined compliant in accordance with California Department of Public Health, (CDPH), Standard Method v1.1-2010, using the applicable exposure scenario. Manufacturer's or third party documentation demonstrating compliance must state the exposure scenario used to determine compliance, and the range of total VOCs (tVOC) after 14 days measured as specified in the CDPH Standard Method v1.1 as follows:

.1 0.5mg/m^3 or less

.2 between 0.5 and 5.0 mg/m^3

.3 0.50 mg/m^3 or more.

.7 Claims of compliance for wet-applied products must state the amount applied in mass per surface area.

.8 VOC Content Requirements:

.1 All paints and coatings wet-applied on site and within the waterproofing membrane must meet the applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011. See LEED Emissions Limit Table, Section 01 33 03

.2 All adhesives and sealants wet-applied on site and within the waterproofing membrane must meet the applicable chemical content requirements of SCAQMD Rule 1168, Amended Oct 6, 2017, Adhesive and Sealant Applications, as analyzed by the methods specified in Rule 1168. The provisions of SCAQMD Rule 1168 do not apply to adhesives and sealants subject to state or federal consumer product VOC regulations. See LEED Emissions Limit Table, Section 01 33 03

.3 For wet-applied products, the manufacturer must state each product's classification and application according to the referenced standard's definitions.

.4 For wet-applied products, document volume used.

.5 If the applicable regulation requires subtraction of exempt compounds, any content of intentionally added exempt compounds larger than 1% weight by mass (total exempt compounds) must be disclosed.

.6 If a product cannot reasonably be tested as specified above, testing of VOC content must comply with ASTM D2369-10(2015)e1; ISO 11890, part 1; ASTM D6886-14e1; or ISO 11890-2.

.7 For projects in North America, methylene chloride and perchloroethylene may not be intentionally added in paints, coatings, adhesives, or sealants.

.9 Composite Wood Evaluation:

.1 New products must be documented to have low formaldehyde emissions that meet the California Air Resources Board (CARB) ATCM for formaldehyde requirements for ultra-low-emitting formaldehyde (ULEF) resins or no added formaldehyde (NAF) resins.

.2 Salvaged and reused architectural millwork more than one year old at the time of occupancy is considered compliant, provided it meets the requirements for any site-applied paints, coatings, adhesives, and sealants.

.6 Indoor Air Quality Management (LEED EQc3, EQc4)

.1 Plan, implement and document indoor air quality management procedures, as specified in Section 01 35 46 – Indoor Air Quality Procedures.

1.7 LEED SUMMARY DOCUMENTATION

.1 LEED documentation to be provided:

.1 LEED SSp1 - Erosion and Sedimentation Control Plan, or an ESC Implementation Plan as modified by the General Contractor.

.2 LEED MRp2, MRc5 - Construction Waste Management Plan, as specified in Section 01 74 20

.3 LEED EQc3 - Construction Indoor Air Quality Plan, as specified in Section 01 35 46

.4 Project materials budget estimate noting costs of materials

(excluding labour and equipment) and highlighting materials contributing to contractor LEED credits. As available, USGBC-supplied tracking spreadsheets shall be used.

.5 Monthly LEED Summary, including at minimum:

.1 Date of Issue

.2 Project Progress "snapshot" description

.3 Summary of issues concerning any LEED prerequisites

.4 List of each LEED Construction credit targeted, with

.1 Current credit status (anticipated/on track, pending/at risk, unlikely/forfeit)

.2 Current credit progress (complete, in progress, future)

.6 The Contractor LEED Coordinator shall maintain:

.1 LEED SSp1 - ESC Inspection Reports

.2 LEED MRp2 and MRc5 – Monthly Waste Summary, as specified in Section 01 74 20

.3 LEED EQc2 - Emissions Tracker for each of the following products applied or installed within the waterproofing membrane: paints, coatings, adhesives, sealants, flooring systems, composite wood products, ceilings, walls, thermal insulation, acoustic insulation.

.4 LEED EQc3 – Once interior work commences, a monthly IAQ Summary, as specified in Section 01 35 46.

.7 LEED-relevant Shop Drawings are to be submitted per standard Shop Drawings review process, with relevant information highlighted or circled:

.1 LEED SSc5 - Shop drawings of each roofing material, highlighting 3-year aged Solar Reflectance Index (SRI) value. If 3-year aged information is not available, provide initial SRI value.

.2 LEED EAp1 – Shop drawings of energy-related equipment, noting efficiency parameters (Example: Air source heat pump EER and HSPF)

.3 LEED EAp4, EAc6 – Shop drawings of equipment with refrigerants, noting refrigerant type and charge, and equipment life.

.4 LEED EQc7 - Shop drawings of window schedules, highlighting visible transmittance (VT or Tvis) for each window type.

.2 Substantial Performance: LEED submittals to be provided prior to Application for Substantial Performance:

.1 LEED documentation requested by the Departmental Representative

.2 Photographic documentation as required by Section 01 32 33 and as determined by the Departmental Representative

.3 SSp1 - Erosion and Sedimentation Control Photographs

.1 date-stamped photos showing the measures taken, including any corrective action, to effectively implement the ESC plan. Photos should be taken at regular intervals and show all areas of the site covered in the plan

.2 MRp2 and MRc5 – Final Construction Waste Report as specified in Section 01 74 20

.3 EQc3 - An Indoor Air Quality report as specified in Section 01 35 46.

.4 A summary of general conformance to LEED Equivalency.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES AND CODES

.1 Perform Work in accordance with National Building Code of Canada (NBC) 2015, National Fire Code of Canada (NFC) 2015 and Ontario Building Code (OBC) 2012 including all amendments up to bid closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply as directed by the Departmental Representative.

.2 Meet or exceed requirements of:
- .1 Contract documents.
- .2 Specified standards, codes and referenced documents.

1.2 HAZARDOUS MATERIAL DISCOVERY

.1 Stop work immediately and notify Departmental Representative if materials which may contain designated substances or PCB's, other than those identified in Section 01 35 29 are discovered in course of work.

1.3 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions.

1.4 RELICS AND ANTIQUITIES

.1 Relics and antiquities, and items of historical or scientific interest such as cornerstones and contents, commemorative plaques, inscribed tables, and similar objects found on site shall remain the property of Department of Fisheries and Oceans. Protect such articles and request directives from Departmental Representative.

.2 Should historic objects be uncovered during excavating, stop work immediately and notify the Departmental Representative. Do not resume work until directed to by the Departmental Representative.

.3 Departmental Representative will monitor the project work and may require temporary stop of work to carry out site investigations.

1.5 HISTORIC BUILDINGS

.1 The former Lighthouse Keepers Dwelling is a FHBRO recognized under the Treasure Board Heritage Buildings Policy.

.2 Protect this building from damage.

.3 Comply with the Standards and Guidelines for Conservation of Historic Place in Canada.

1.6 IAQ - INDOOR AIR QUALITY

.1 Comply with CSA-Z204-94(R1999), Guideline for Managing Indoor Air Quality in Office Buildings and CSA B651-12(R2017), Annex A, article A.5.

1.7 ACCESSIBLE DESIGN

.1 Comply with CSA B651-12(R2017), Accessible Design for the Built Environment, unless specified otherwise. In any case of conflict or discrepancy between the building codes and CSA B651, the requirements of CSA B651 shall apply.

1.8 TAXES

.1 Pay applicable Federal, Provincial and Municipal taxes.

1.9 EXAMINATION

.1 Examine existing conditions and determine conditions affecting work.

.2 Conduct concrete floor moisture testing using Calcium Chloride moisture tests.
.1 Submit test results to Departmental Representative for approval prior to installing any flooring. Conduct one test per 100 m^2 of area being covered.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END

PART 1 - GENERAL

1.1 ABBREVIATIONS AND ACRONYMS

.1 The abbreviations and acronyms are commonly found in the Project Manual and represent the associated organizations or terms.

1.2 MATERIALS, EQUIPMENT AND METHODS

.1 A:
- .1 AB: anchor bolt.
- .2 AC: acoustic.
- .3 AC PAN: acoustic panel.
- .4 ACU: acoustic unit ceiling.
- .5 AFF: above finished floor.
- .6 AFS: air flow measuring station.
- .7 AC PLAS: acoustic plaster.
- .8 ACT: acoustic tile.
- .9 ACR CU LVR: acrylic cube louvre.
- .10 ADH: adhesive.
- .11 ADJ: adjustable.
- .12 A/C: air conditioner.
- .13 AHU: air handling unit.
- .14 AL: aluminum.
- .15 ANOD: anodized.
- .16 APPROX: approximate.
- .17 ARCH: architecture.
- .18 ARCH BLK: architectural block.
- .19 AVB: air vapour barrier.

.2 B:
- .1 B: base.
- .2 BEAST: benthic assessment of sediment.
- .3 BH: bore hole.
- .4 BHP: brake horse power.
- .5 BL: bottom layer.
- .6 BLK: block.
- .7 BLKD: bulkhead.
- .8 BM: beam.
- .9 BOT: bottom.
- .10 BMP: best management practice.
- .11 B PL: base plate.
- .12 BRG: bearing.
- .13 BRK: brick.
- .14 BS: bleed sensor.
- .15 BSMT: basement.
- .16 BTEX: benzene, toluene, ethylbenzene and xylenes.
- .17 BUR: built-up roof.

.3 C:
- .1 C: ceiling mounted.
- .2 CAL: caliper.

.3 CANTIL: cantilever.
.4 CB: catch basin.
.5 CC: centre to centre (architectural); cooling unit (mechanical).
.6 CCN: contemplated change notice.
.7 CDF: controlled density fill.
.8 DCX: DX coil.
.9 CEC: Canadian Electrical Code.
.10 CF: chair fabric.
.11 CG: glycol coil.
.12 CH: Device mounted 150 mm above countertop.
.13 CHA: air cooled chiller.
.14 CHAN: channel.
.15 CHP: Childproof.
.16 CHS: Canadian hydrographic service.
.17 CJ: construction joint.
.18 CL: centreline.
.19 CK: cork.
.20 CLG: ceiling.
.21 CLR: clear.
.22 CO: carbon monoxide sensor.
.23 COL: column.
.24 CONC: concrete.
.25 CONC BLK: concrete block.
.26 CONC BRK: concrete brick.
.27 CONT: continuos.
.28 CONT J: control joint.
.29 COMPL: complete.
.30 CM: centimeter. (Nursery stock).
.31 CP: circulating pump.
.32 CPL: cement plaster.
.33 CPM: critical path method.
.34 CR: condensate receiver package.
.35 CT: ceramic tile.
.36 CTE: connect to existing.
.37 CU: condensing unit.
.38 CV: control valve.
.39 CVT: conductive vinyl tile.
.40 C/W: complete with.

.4 D:
.1 D: deep.
.2 dB: decibels.
.3 DB: dry-bulb.
.4 DD: dutch door.
.5 DEG: degree.
.6 DF: drinking fountain.
.7 DIA: diameter.
.8 DIM: dimension.
.9 DL: dead load.
.10 DMNT: demountable.
.11 DP: dampproofing.
.12 DR: door.
.13 DRP: drapery.

.14 DWL: dowel.

.5 E:
- .1 E: existing item to remain.
- .2 EA: each
- .3 E/A: exhaust air.
- .4 EC: empty conduit.
- .5 ECF: engineered containment facility.
- .6 EE: each end.
- .7 EF: each face (architectural/structural).
- .8 EF: exhaust fan (mechanical/electrical).
- .9 EHW: Engineered Hardwood.
- .10 EL: elevation.
- .11 ELEC: electric.
- .12 ELEV: elevator.
- .13 EM: expanded metal.
- .14 ENCL: enclosure.
- .15 EPX: explosion proof (electrical).
- .16 EQ: equal.
- .17 ER: existing item to be relocated (electrical).
- .18 ET: expansion tank.
- .19 EXH: exhaust.
- .20 EXIST: existing.
- .21 EXPJ: expansion joint.
- .22 EXP STRUCT: exposed structure (structural).
- .23 EXT: exterior.
- .24 EW: each way.
- .25 EWT: entering water temperature.

.6 F:
- .1 FC: fan coul unit.
- .2 FD: floor drain or fire damper.
- .3 FDN: foundation.
- .4 FE/A: fume exhaust air.
- .5 FEAT W: feature wall.
- .6 FEXT: fire extinguisher.
- .7 FH: fire hose.
- .8 FHC: fire hose cabinet.
- .9 FHR: fire hose rack.
- .10 FIN: finish.
- .11 FIP: federal identity program.
- .12 FL: floor.
- .13 FLD: field.
- .14 FLUOR: fluorescent.
- .15 FR: frame.
- .16 FRR: fire resistance rating.
- .17 FSD: fire smoke damper.
- .18 FTG: footing.

.7 G:
- .1 G: grille and deffuser.
- .2 GALV: galvanized steel.
- .3 GB: grab bar.

.4 GC: General Conditions.
.5 GE/A: general exhaust air.
.6 GF: ground floor.
.7 GFI: ground fault interrupter.
.8 GL: glass or glazing.
.9 GL BLK: glass block.
.10 GLD: glass (demountable partition).
.11 GPC: gypsum plaster ceiling.
.12 GPW: gypsum plaster wall.
.13 GT: glass tile.
.14 GWB: gypsum board.
.15 GWBM: gypsum board mould resistant.

.8 H:
.1 HB: hose bib.
.2 HC: hollow core.
.3 H/C: handicap push button.
.4 HCWD: hollow core wood door.
.5 HD: hand dryer.
.6 HDW: hardware.
.7 HDWD: hardwood.
.8 HEX: heat exchanger.
.9 HM: hollow metal.
.10 HOR: horizontal.
.11 HOR EF: horizontal each face.
.12 HP: hydro pole (electrical); heat pump (mechanical).
.13 HPA: Hamilton Port Authority.
.14 HR: hour.
.15 HRU: heat recovery unit.
.16 HRV: heat recovery ventilator.
.17 HT: height.
.18 HTR: heater.
.19 HU: humidifier.
.20 HUE: instantaneous hot water.
.21 HWIG: instantaneous natural gas hot water.
.22 HWT: hot water tank.
.23 HWTE: electric hot water tank.
.24 HWTG: natural gas hot water tank heater
.25 HYD: hydrant.
.26 HZ: Hertz frequency, cycles per second.

.9 I:
.1 ICF: insulated concrete formwork.
.2 ID: inside diameter.
.3 IG: isolated ground.
.4 INS: insulation.
.5 INTLK: interlock.
.6 IS: isolator.

.10 J:
.1 JT: joint.

.11 K:
- .1 K: key operated.
- .2 KPL: kick plate.

.12 L:
- .1 LAT: leaving air temperature.
- .2 LAV: lavatory.
- .3 LDG: landing.
- .4 LG: laminated glass.
- .5 LINO: linoleum.
- .6 LL: live load.
- .7 LPH: louvred penthouse.
- .8 LT: light.
- .9 LWT: leaving water temperature.
- .10 LV: louvre.

.13 M:
- .1 MAS: masonry.
- .2 MAS FL: masonry flashing.
- .3 MAX: maximum.
- .4 MBG: metal bar grating.
- .5 MCL: metal cube louvre.
- .6 MECH: mechanical.
- .7 MET DK: metal deck.
- .8 MET FL: metal flashing.
- .9 MET GRID CLG: metal grid ceiling.
- .10 MET GRTG: metal grating.
- .11 MET LIN CLG: metal linear ceiling.
- .12 MET T PTN: metal toilet partition.
- .13 MH: maintenance hole.
- .14 MIN: minimum.
- .15 MLP: metal lath and plaster.
- .16 MO: masonry opening.
- .17 MR: marble.
- .18 MT: metal or metal threshold.
- .19 MW: mounted millwork (electrical).
- .20 MWP: membrane waterproofing.

.14 N:
- .1 NBC: national building code.
- .2 NC: normally closed.
- .3 NF: no finish.
- .4 NFC: national fire code.
- .5 NIC: not in contract.
- .6 NO: number.
- .7 NO2: nitrogen oxide sensor.
- .8 NRC: noise reduction coefficient.
- .9 NRP: non removable pin.
- .10 NTS: not to scale.

.15 O:
- .1 OA O/A: outside air.
- .2 OBC: Ontario building code.

.3 OC: on centre.
.4 OD: outside diameter.
.5 OPNG: opening.
.6 OPR: operator.
.7 OVHD: overhead.
.8 OWSJ: open web steel joist.

.16 P:
.1 P: prefinished (architectural) or pump (mechanical).
.2 PAH: polynuclear aromatic hydrocarbons.
.3 PARG: parging.
.4 PCC: precast concrete.
.5 PCT: porcelain ceramic tile.
.6 PED ACS FLG: pedestal access flooring.
.7 PF: panel fabric.
.8 PH: phase.
.9 PL: plate (architectural) or on/off switch complete with pilot light (electrical).
.10 PLAM: plastic laminate.
.11 PLAS: plaster.
.12 PLY: plywood.
.13 PR: pair.
.14 PRG: gas pressure regulator.
.15 PREFAB: prefabricated.
.16 PREFIN: prefinished.
.17 PRESS: pressure.
.18 PRFL: profile.
.19 PRV: pressure regulating valve.
.20 PT: paint.
.21 PTD: paper towel dispenser.
.22 PTN: partition.
.23 PVC: polyvinyl chloride.

.17 Q:
.1 QTB: quarry tile base.
.2 QTF: quarry tile floor.
.3 QTR: quarry tile roof.

.18 R:
.1 R: radius (architectural) or existing item to be removed (electrical) or refrigerant leak sensor (mechanica).
.2 RA or R/A: return air.
.3 RAD: return air damper.
.4 RB: resilient base (architectural) or relay base (electrical).
.5 RC: reinforced concrete.
.6 RCPT: receptacle.
.7 RD: roof drain.
.8 RE: existing item in relocated position.
.9 REINF: reinforced/reinforcing.
.10 REQD: required.
.11 REQT: requirement.
.12 RF: rubber flooring (architectural) or return fan (electrical).
.13 RM: room.

.14 RO: rough opening.
.15 RP: radiant panel.
.16 RRS: recycled rubber sheet.
.17 RRT: recycled rubber tile.
.18 RSD: rolling steel door.
.19 RSF: rubber sheet flooring.
.20 RT: rubber tile.
.21 RW: existing device with new wiring.
.22 RTU: roof top unit.
.21 RWL: rain water leader.

.19 S:
.1 SA or S/A: supply air.
.2 SAN SEW: sanitary sewer.
.3 SCHED: schedule.
.4 SC: solid core (architectural) or separate circuit (electrical).
.5 SCRN: screen.
.6 SCWD: solid core wood door.
.7 SD: smoke developed or smoke damper.
.8 SDT: static dissipative tile.
.9 SE/A: sanitary exhaust air.
.10 SECT: section.
.11 SF: supply fan.
.12 SFT water softener.
.13 SH: sill height.
.14 SIM: similar.
.15 SL: sliding or silencer.
.16 SLR: sealer.
.17 SPEC: specification.
.18 SS: stainless steel.
.19 ST: stained.
.20 STD: standard.
.21 STL: steel.
.22 STL BM: steel beam.
.23 STC: sound transmission class.
.24 STL FL DK: steel floor deck.
.25 STL PL: steel plate.
.26 STN: stone.
.27 STR: structure or structural.
.28 ST SEW: storm sewer.
.29 S&U: stain and urethane.
.30 S&V: stain and varnish.
.31 SVT: solid vinyle tile.

.20 T:
.1 T: top or temperature sensor/thermostat.
.2 TA: transfer air opening
.3 T&B: top and bottom.
.4 TCB: turbidity control plan.
.5 TEL: telephone.
.6 TER: terrazzo.
.7 TERT: terrazzo tile.
.8 THKNS: thickness.

.9 THR: threshold.
.10 TL: twist lock.
.11 TMPD: tempered.
.12 TOPG: topping.
.13 TP: tamper proof.
.14 TRD: toilet roll dispenser.
.15 TRANSV: transverse.
.16 TYP: typical.

.21 U:
.1 U: urethane.
.2 U/C: undercut.
.3 UGRD: underground.
.4 UNO: unless noted otherwise.
.5 UOS: unless otherwise specified.
.6 U/S: underside.
.7 UR: urinal.

.22 V:
.1 V: volt.
.2 VCF: vinyl coated fabric.
.3 VCT: vinyl composition tile.
.4 VD: volume damper.
.5 VEL: velocity.
.6 VERT: vertical.
.7 VERT B: vertical blinds.
.8 VERT EF: vertical each face.
.9 VSF: vinyl sheet flooring.
.10 VPT: vinyl plank flooring.
.11 VT: vinyl tile.
.12 VWC: vinyl wall covering.

.23 W:
.1 WB: wood base.
.2 WC: water closet.
.3 W-C: wall connectors.
.4 WD: wood.
.5 WV: wood veneer.
.6 WG: water gauge (mechanical) or wire guard (electrical).
.7 WH: wall hydrant.
.8 WHMIS: workplace hazardous materials information system.
.9 WP: waterproofing (architectural) or waterproof (electrical).
.10 WR: washroom.
.11 WSIB: workplace safety and insurance board.
.12 WT: weight (structural) or water tight (electrical).
.13 WTP: water treatment plant.

1.3 STANDARDS ORGANIZATIONS

.1 Standards writing organizations:
.1 AA - Aluminum Association.
.2 ACPA - American Concrete Pipe Association.
.3 ANSI - American National Standards Institute.

.4 ASHRAE - American Society of Heating and Refrigerating and Air-Conditioning Engineers.
.5 ASTM - American Society for Testing and Materials.
.6 AWI/AWMAC - Architectural Woodwork Institute/Architectural Woodwork Manufacturers Association of Canada.
.7 AWPA - American Wood Preservers' Association.
.8 AWWA - American Water Works Association.
.9 BHMA - Builders Hardware Manufacturers Association.
.10 CCDC - Canadian Construction Documents Committee.
.11 CCMPA - Canadian Concrete Masonry Producers Association.
.12 CGSB - Canadian General Standards Board.
.13 CNTA - Canadian Nursery Trades Association.
.14 CPCA - Canadian Painting Contractors Association.
.15 CRCA - Canadian Roofing Contractors Association.
.16 CSA - Canadian Standards Association.
.17 CSC - Construction Specifications Canada.
.18 CSDMA - Canadian Steel Door Manufacturers Association.
.19 CSI - Construction Specifications Institute.
.20 CSSBI - Canadian Sheet Steel Building Institute.
.21 CRCA - Canadian Roofing Contractors Association.
.22 DHI - Door and Hardware Institute.
.23 EEMAC - Electrical and Electronic Manufacturer's Association of Canada.
.24 ESA - Electrical Safety Authority.
.25 FCC - Fire Commissioner of Canada.
.26 FSC - Forest Stewardship Council.
.27 GANA - Glass Association of North America.
.28 HMMA - Hollow Metal Manufacturers Association.
.29 IEEE - Institute of Electrical and Electronics Engineers Inc.
.30 ISO - International Organization for Standardization.
.31 IWFA - International Window Film Association.
.32 LEED - LEED Canada, Leadership in Energy and Environmental Design.
.33 MPI - Master Painters Institute.
.34 NAAMM - National Association of Architectural Metal Manufacturers.
.35 NCPI - National Clay Pipe Institute.
.36 NEMA - National Electrical Manufacturers Association.
.37 NFPA - National Fire Protection Association.
.38 OPSD - Ontario Provincial Standard Drawings.
.39 OPSS - Ontario Provincial Standard Specifications.
.40 PPI - Plastics Pipe Institute.
.41 SDI - Steel Door Institute.
.42 SCAQMD - South Coast Air Quality Management District.
.43 TIA - Telecommunications Industry Association.
.44 TIAC - Thermal Insulation Association of Canada.
.45 TTMAC - Terrazzo Tile and Marble Association of Canada.
.46 UL - Underwriters Laboratories.
.47 ULC - Underwriters Laboratories of Canada.
.48 US EPA - United States Environmental Protection Agency.
.49 WH - Warnock Hersey.

1.4 FEDERAL GOVERNMENT DEPARTMENTS AND AGENCIES

.1 Departments, agencies and crown corporations.

.1 CEAA - Canadian Environmental Assessment Agency.
.2 CSC - Correctional Service Canada.
.3 CRA - Canada Revenue Agency.
.4 DND - Department of National Defence.
.5 ECCC - Environment and Climate Change Canada.
.6 FHBRO - Federal Heritage Buildings Review Office.
.7 HC - Health Canada.
.8 HCD - Heritage Conservation Directorate.
.9 LC - Labour Canada.
.10 PC - Parks Canada.
.11 PSPC - Public Service Procurement Canada.
.12 PWGSC - Public Works and Government Services Canada.
.13 RCMP - Royal Canadian Mounted Police.
.14 TBS - Treasury Board Secretariat.
.15 TC - Transport Canada.

1.5 PROVINCIAL GOVERNMENT DEPARTMENTS AND AGENCIES

.1 MOEECC - Ontario Ministry of Environment and Climate Change.

.2 MOL - Ontario Ministry of Labour.

.3 MTO and MOT - Ontario Ministry of Transportation.

.4 TSSA - Technical Standards and Safety Authority.

1.6 INTERNATIONAL GOVERNMENT DEPARTMENTS AND AGENCIES

.1 DOHMH - New York City Department of Health and Mental Hygiene, USA.

.2 GSA - Government Services Administration, USA.

1.7 UNITS OF MEASURE METRIC

.1 The following abbreviations of units of measure are commonly found in the Project Manual:
.1 C: Celsius.
.2 cm: centimetre.
.3 kg: kilogram.
.4 kg/m³: kilogram per cubic metre.
.5 kN: kilonewton.
.6 kPa: kilopascals.
.7 kw: kilowatts.
.8 l/s: litre per second.
.9 m: metre.
.10 m³: cubic metre.
.11 mg/kg: milligrams per kilogram.
.12 mg/L: milligrams per litre.
.13 mm: millimetres.
.14 MPa: megapascal.
.15 NTU: nephelometric turbidity unit.
.16 ppm: parts per million.
.17 ug/L: micrograms per litre.

.18 ug/m³: micrograms per cubic metre.

1.8 UNITS OF MEASURE IMPERIAL

.1 The following abbreviations of units of measure are commonly found in the Project Manual:
- .1 BTU: British thermal units.
- .2 CFM: cubic feet per minute.
- .3 F: Fahrenheit.
- .4 ft: foot/feet.
- .5 FPI: fins per inch.
- .6 FPM: feet per minute.
- .7 ga: gauge.
- .8 gpm: gallons per minute.
- .9 in: inches.
- .10 lbs: pounds.
- .11 NTU: nephelometric turbidity unit.
- .12 psi: pounds-force per square inch.
- .13 PSIG: PSI gauge.
- .14 ppm: parts per million.
- .15 RPM: revolutions per minute.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Inspection and testing, administrative and enforcement requirements.

.2 Tests and mix designs.

.3 Mock-ups.

.4 Mill tests.

.5 Equipment and system adjust and balance.

1.3 INSPECTION

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

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

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

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

1.4 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work, above and beyond those required of the Contractor. Cost of such services will be borne by Departmental Representative.

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

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

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

1.5 ACCESS TO WORK

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

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

1.6 PROCEDURES

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

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

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

1.7 REJECTED WORK

.1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

.2 Make good other Contractor's work damaged by such removals or replacements promptly.

.3 If in opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Departmental Representative may deduct from Contract Amount difference in value between Work performed and that called for by Contract Documents, amount of which shall be determined by Departmental Representative.

1.8 REPORTS

.1 Submit 4 copies of inspection and test reports to Departmental Representative.

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

1.9 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as may be requested.

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

1.10 MOCK-UPS

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

.2 Construct in all locations acceptable to Departmental Representative unless otherwise specified.

.3 Prepare mock-ups for Departmental Representative's review with reasonable promptness and in an orderly sequence, so as not to cause any delay in Work.

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

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

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

1.11 MILL TESTS

.1 Submit mill test certificates as requested.

1.12 EQUIPMENT AND SYSTEMS

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

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Temporary utilities.

1.3 REFERENCES

.1 U.S. Environmental Protection Agency (EPA) / Office of Water
.1 EPA 833-R-06-004, May 2007, Developing Your Stormwater Pollution Prevention Plan - A Guide for Construction Sites.

1.4 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

1.5 INSTALLATION AND REMOVAL

.1 Provide temporary utilities controls in order to execute work expeditiously.

.2 Remove from site all such work after use.

1.6 DEWATERING

.1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.

1.7 WATER SUPPLY

.1 Potable water is not available on Site. Contractor to provide all water required for the work of this Contract.

1.8 TEMPORARY HEATING AND VENTILATION

.1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.

.2 Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.

.3 Provide temporary heat and ventilation in enclosed areas as required to:
.1 Facilitate progress of Work.
.2 Protect Work and products against dampness and cold.
.3 Prevent moisture condensation on surfaces.
.4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
.5 Provide adequate ventilation to meet health regulations for safe working environment.

.4 Maintain temperatures of minimum 10°C in areas where construction is in progress.

.5 Ventilating:
.1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
.2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
.3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
.4 Ventilate storage spaces containing hazardous or volatile materials.
.5 Ventilate temporary sanitary facilities.
.6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.

.6 Permanent heating system of building, may not be used when available.

.7 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
.1 Conform with applicable codes and standards.
.2 Enforce safe practices.
.3 Prevent abuse of services.
.4 Prevent damage to finishes.
.5 Vent direct-fired combustion units to outside.

.8 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.9 TEMPORARY POWER AND LIGHT

.1 Departmental Representative will pay for temporary power during construction for temporary lighting and operating of power tools, to a maximum supply of 120 volts 15 amps.

.2 Arrange for connection with appropriate utility company. Pay all costs for installation, maintenance and removal.

.3 Temporary power for equipment requiring in excess of above is responsibility of Contractor.

.4 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx.

.5 Electrical power and lighting systems installed under this Contract may be used for construction requirements only with prior approval of Departmental Representative provided that guarantees are not affected. Make good damage to electrical system caused by use under this Contract. Replace lamps which have been used for more than 3 months.

1.10 TEMPORARY COMMUNICATION FACILITIES

.1 Provide and pay for temporary telephone, data hook up, lines and equipment necessary for own use.

1.11 FIRE PROTECTION

.1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and bylaws.

.2 Burning rubbish and construction waste materials is not permitted on site.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction EPA 832/R-92-005, whichever is more stringent.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

END

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Construction aids.

.2 Parking.

.3 Project identification.

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-1.189-2000, Exterior Alkyd Primer for Wood.
.2 CAN/CGSB-1.59-97, Alkyd Exterior Gloss Enamel.

.2 Canadian Standards Association (CSA International)
.1 CSA A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
.2 CSA 0121-17, Douglas Fir Plywood.
.3 CSA Z797-18, Code of Practice for Access Scaffold.
.4 CAN/CSA-Z321-96(R2006), Signs and Symbols for the Occupational Environment, withdrawn but still available from CSA, CCOHS and Techstreet.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

1.4 INSTALLATION AND REMOVAL

.1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.

.2 Identify areas which have to be gravelled to prevent tracking of mud.

.3 Indicate use of supplemental or other staging area.

.4 Provide construction facilities in order to execute work expeditiously.

.5 Remove from site all such work after use.

1.5 SCAFFOLDING

.1 Scaffolding in accordance with CSA Z797.

.2 Provide and maintain scaffolding, ramps, ladders, platforms, and temporary stairs required for the Work.

1.6 HOISTING

.1 Provide, operate and maintain hoists/cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for use thereof.

.2 Hoists/cranes shall be operated by qualified operator.

1.7 SITE STORAGE/LOADING

.1 Confine work and operations of employees to areas defined by Contract Documents. Do not unreasonably encumber premises with products.

.2 Do not load or permit to load any part of Work with a weight or force that will endanger the Work.

1.8 CONSTRUCTION PARKING

.1 Parking will be permitted on site provided it does not disrupt performance of Work.

.2 Provide and maintain adequate access to project site.

.3 Build, maintain, and keep clean temporary roads where indicated or directed by Departmental Representative and provide snow removal during period of Work.

.4 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractors' use of roads.

1.9 SECURITY

.1 Ensure that construction areas and contents are secure for the full length of private road after secure access gated, indicated on drawing 2/A000, after working hours and during holidays.

.2 Ensure existing Site security signage and monitoring remains operational throughout construction.

1.10 EQUIPMENT, TOOL AND MATERIALS STORAGE

.1 Provide and maintain, in a clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.

.2 Locate materials not required to be stored in weatherproof sheds on site in a manner to cause least interference with work activities.

1.11 SANITARY FACILITIES

.1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.

.2 Post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition.

1.12 CONSTRUCTION SIGNAGE

.1 Provide project identification site sign comprising foundation, framing, and one 1200 x 2400 mm signboard as detailed and as described below.
.1 Foundations: 15 MPa concrete to CSA A23.1/A23.2 minimum 200 mm x 900 mm deep.
.2 Framework and battens: SPF, pressure treated minimum 89 x 89 mm.
.3 Signboard: 19 mm Medium Density Overlaid Douglas Fir Plywood to CSA O121.
.4 Paint: alkyd enamel to CAN/CGSB-1.59 over exterior alkyd primer to CAN/CGSB-1.189.
.5 Fasteners: hot-dip galvanized steel nails and carriage bolts.
.6 Vinyl sign face: printed project identification, self adhesive, vinyl film overlay, supplied by Departmental Representative.

.2 No other signs or advertisements, other than warning signs, are permitted on site.

.3 Signs and notices for safety and instruction shall be in both official languages. Graphic symbols shall conform to CAN/CSA-Z321.

.4 Maintain approved signs and notices in good condition for duration of project, and dispose of off Site on completion of project or earlier if directed by Departmental Representative.

1.13 PROTECTION AND MAINTENANCE OF TRAFFIC

.1 Provide access and temporary relocated roads as necessary to maintain traffic.

.2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.

.3 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs

.4 Protect travelling public from damage to person and property.

.5 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.

.6 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.

.7 Construct access and haul roads necessary.

.8 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.

.9 Dust control: adequate to ensure safe operation at all times.

.10 Location, grade, width, and alignment of construction and hauling roads: subject to approval by Departmental Representative.

.11 Provide snow removal during period of Work for entire Site. Ensure road access to boat dock are free of debris and snow and are available for Coast Guard personnel use at all times.

.12 Coordinate road repairs to road to boat dock in accordance with Departmental Representative. Ensure road to docks are operational at all times.

.13 Remove, upon completion of work, haul roads designated by Departmental Representative.

1.14 CLEAN-UP

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

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

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Barriers.

.2 Environmental Controls.

.3 Traffic Controls.

.4 Fire Routes.

1.2 INSTALLATION AND REMOVAL

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

.2 Remove from site all such work after use.

1.3 FENCING

.1 Existing site fencing can be used to secure Site. Maintain existing fencing in good condition. Coordinate security options with Departmental Representative.

.2 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

1.4 GUARD RAILS AND BARRICADES

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

.2 Provide as required by governing authorities.

1.5 WEATHER ENCLOSURES

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

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

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

1.6 DUST TIGHT SCREENS

.1 Provide dust tight screens or insulated partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.

.2 Maintain and relocate protection until such work is complete.

1.7 PUBLIC TRAFFIC FLOW

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

1.8 FIRE ROUTES

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

1.9 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

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

.2 Be responsible for damage incurred.

1.10 PROTECTION OF BUILDING FINISHES

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

.2 Provide necessary screens, covers, and hoardings.

.3 Confirm with Departmental Representative locations and installation schedule 3 days prior to installation.

.4 Be responsible for damage incurred due to lack of or improper protection.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Product quality, availability, storage, handling, protection, and transportation.

.2 Manufacturer's instructions.

.3 Quality of Work, coordination and fastenings.

.4 Existing facilities.

1.2 REFERENCES

.1 Within text of specifications, reference may be made to reference standards.

.2 Conform to these standards, in whole or in part as specifically requested in specifications.

.3 If there is question as to whether any product or system is in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.

.4 The cost for such testing will be born by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

.5 Conform to latest date of issue of referenced standards in effect on date of submission of Bids, except where specific date or issue is specifically noted.

1.3 QUALITY

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

.2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

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

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

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

1.4 AVAILABILITY

.1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, notify Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.

.2 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Amount or Contract Time.

1.5 METRIC SIZED MATERIALS

.1 SI metric units of measurement are used exclusively on the drawings and in the specifications for this project.

.2 The Contractor is required to provide metric products in the sizes called for in the Contract Documents except where a valid claim can be made that a particular product is not available on the Canadian market.

.3 Claims for exemptions from use of metric sized products shall be in writing and fully substantiated with supportive documentation. Promptly submit application to Departmental Representative for consideration and ruling. Non-metric sized products may not be used unless Contractor's application has been approved in writing by the Departmental Representative.

.4 Difficulties caused by the Contractor's lack of planning and effort to obtain modular metric sized products which are available on the Canadian market will not be considered sufficient reasons for claiming that they cannot be provided.

.5 Claims for additional costs due to provision of specified modular metric sized products will not be considered.

1.6 STORAGE, HANDLING AND PROTECTION

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

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.

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

.4 Store cementitious products clear of earth or concrete floors, and away from walls.

.5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

.6 Store sheet materials and lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.

.7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.

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

.9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.7 TRANSPORTATION

.1 Pay costs of transportation of products required in performance of Work.

.2 Transportation cost of products supplied by Owner will be paid for by Departmental Representative. Unload, handle and store such products.

1.8 MANUFACTURER'S INSTRUCTIONS

.1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.

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

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Amount or Contract Time.

1.9 QUALITY OF WORK

.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.

.3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

1.10 CO-ORDINATION

.1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.

.2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.11 CONCEALMENT

.1 In finished areas, conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.

.2 Before installation, inform Departmental Representative if there is interference. Install as directed by Departmental Representative.

1.12 REMEDIAL WORK

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

.2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.13 LOCATION OF FIXTURES

.1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.

.2 Inform Departmental Representative of conflicting installation. Install as directed.

1.14 FASTENINGS

.1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.

.2 Prevent electrolytic action between dissimilar metals and materials.

.3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.

.4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.

.5 Keep exposed fastenings to a minimum, space evenly and install neatly.

.6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.15 FASTENINGS - EQUIPMENT

.1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.

.2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No.304 stainless steel for exterior areas.

.3 Bolts may not project more than one diameter beyond nuts.

.4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.16 PROTECTION OF WORK IN PROGRESS

.1 Prevent overloading of any part of building. Do not cut, drill or sleeve any load bearing structural member, unless specifically indicated without written approval of Departmental Representative.

1.17 EXISTING UTILITIES

.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work.

.2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Field engineering survey services to measure and stake site.

.2 Survey services to establish and confirm inverts for Work.

1.2 REFERENCES

.1 Owner's identification of existing survey control points and property limits.

1.3 QUALIFICATIONS OF SURVEYOR

.1 Qualified registered land surveyor, licensed to practice in Place of Work, acceptable to Departmental Representative.

1.4 SURVEY REFERENCE POINTS

.1 Existing base horizontal and vertical control points are designated on drawings.

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

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

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

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

1.5 SURVEY REQUIREMENTS

.1 Establish one permanent bench marks on site, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data in Project Record Documents.

.2 Establish lines and levels, locate and lay out, by instrumentation.

.3 Stake for grading, fill and topsoil placement.

.4 Stake batter boards for foundations.

.5 Establish foundation and floor elevations.

.6 Establish lines and levels for mechanical and electrical work.

1.6 EXISTING SERVICES

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

1.7 LOCATION OF EQUIPMENT AND FIXTURES

.1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.

.2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.

.3 Inform Departmental Representative of impending installation and obtain approval for actual location.

.4 Submit field drawings to indicate relative position of various services and equipment when required by Departmental Representative.

1.8 RECORDS

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

1.9 SUBMITTALS

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

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

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

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END

PART 1 - GENERAL

1.1 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00.

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

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

1.2 MATERIALS

.1 Required for original installation.

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

1.3 PREPARATION

.1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.

.2 After uncovering, inspect conditions affecting performance of Work.

.3 Beginning of cutting or patching means acceptance of existing conditions.

.4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.

.5 Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.

1.4 EXECUTION

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

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

.3 Uncover Work to install ill-timed Work.

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

.5 Remove samples of installed Work for testing, if required.

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

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

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

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

.11 Submit proposed materials, finishes and installation method for patching to Departmental Representative for approval, prior to patching.

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

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

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

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse, recycling, composting and anaerobic digestion in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Progressive cleaning.

.2 Final cleaning.

1.2 PROJECT CLEANLINESS

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

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

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

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

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

.6 Provide and use clearly marked separate bins for recycling. Refer to Section 01 74 20.

.7 Remove waste material and debris from site and deposit in waste container at end of each working day.

.8 Dispose of waste materials and debris off site.

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

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

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

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

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

1.3 FINAL CLEANING

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

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

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

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

.5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.

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

.7 Clean and polish glass, hardware, stainless steel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

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

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

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

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

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

.13 Remove dirt and other disfiguration from exterior surfaces.

.14 Clean roofs, gutters, and downspouts.

.15 Sweep and wash clean paved areas.

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

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

.18 Remove snow and ice from access to building.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END

PART 1 - GENERAL

1.1 SUMMARY

.1 This section describes Construction and Demolition Waste Management (CWM) requirements for LEED MRp2 and LEED MRc5 Equivalency and includes administrative and procedural requirements for the development and execution of a construction waste management plan, waste tracking, and final LEED submittals for MRp2 and MRc5.

.2 The Owner has established that this Project shall generate the least amount of waste possible and processes shall be employed to minimize waste, including prevention of damage due to mishandling, improper storage, contamination, inadequate protection or other factors such as over-packaging and poor quantity estimating.

1.2 RELATED SECTIONS

.1 Section 01 35 66 Sustainability Procedures

1.3 REFERENCES

.1 LEED v4 for Building Design and Construction Reference Guide
.2 European Commission Waste Framework Directive 2008/98/EC: www.ec.europa.eu/environment/waste/framework/index.htm
.3 European Commission Waste Incineration Directive 2000/76/EC: www.europa.eu/legislation_summaries/environment/waste_management
.4 Phase 2 ESA - Soil and Groundwater Assessment Recommendations Port Weller Search and Rescue Station, DRAFT dated November 29th, 2018.

1.4 DEFINITIONS

.1 Alternative Daily Cover (ADC) – Material other than earthen material placed on the surface of the active face of a municipal solid waste landfill at the end of each operating day to control vectors, fires, odours, blowing litter, and scavenging. Generally, these materials must be processed so they do not allow gaps in the exposed landfill face.

.2 Land-Clearing Debris – Materials that are natural (e.g.: rock, soil, stone, vegetation). Materials that are man-made (e.g.: concrete, brick, cement) are considered construction waste even if they were on site.

.3 Waste to Energy (may also be referred to as Incineration) – The conversion of non-recyclable waste materials into usable heat, electricity or fuel through a variety of processes, including combustion, gasification, pyrolization, anaerobic digestion, and landfill gas recovery.

.4 Phase 2 ESA Soil and Groundwater Assessment – A Phase 2 Environmental Site Assessment (ESA) is a study done per amended O. Reg. 153/04 which involves the sampling and analyses of soils and groundwater. This type of investigation is undertaken as a follow-up study when a Phase 1 ESA reveals actual or potential sources of contamination. Soil and groundwater samples are obtained via drilled boreholes or test pits in order to determine the

extent of already confirmed soil or groundwater contamination.

1.5 REQUIREMENTS

.1 General Requirements

.1 CWM Manager: The Contractor shall designate an on-site party responsible for instructing workers and for overseeing and documenting results of the Waste Management Plan for the project.

.2 Instruction: The Contractor shall provide on-site instruction of appropriate separation, handling, and recycling to be used by all parties at the appropriate stages of the Project. On demolition projects the Contractor shall provide on-site instruction for salvage and requirements for reusing salvaged materials within the project, either in new construction or in a renovation.

.3 Separation facilities: The Contractor shall lay out and label a specific area to facilitate separation of materials for recycling and salvage. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials. The requirement for separation will only be waived if the Contractor can demonstrate to the Owner/Departmental Representative that there is insufficient room to accommodate it. If this is the case, comingled materials must be sent to a processing facility for separation off site.

.4 Transportation: The Contractor may engage a hauling subcontractor, self-haul, or make subcontractors responsible for their own waste.

.5 Meetings: Contractor LEED Coordinator shall discuss Waste Management at meetings that include subcontractors affected by the Waste Management Plan.

.2 The Contractor shall develop and implement a Construction and Demolition Waste Management Plan.

.1 The plan shall:

.1 Contain all requirements to achieve LEED MRp2 equivalency.

.2 Identify the waste diversion goal (75%) for the project.

.3 Identify units of measure for tracking. Waste can be tracked by either volume or weight, but shall be used consistently.

.4 Identify at least five materials (both structural and non-structural) targeted for diversion. Approximate the amount of waste of each, and a percentage of the overall project waste that these materials represent.

.5 Specify whether materials will be separated on site or comingled.

.6 Describe the diversion strategies planned for the project, including

.1 Source-reduction strategies,

.2 On-site diversion strategies, and

.3 Off-site diversion strategies

.7 Describe where the material will be taken and how the recycling facility will process the materials

.8 Account for all materials, including materials that do NOT contribute to the waste diversion calculation, including: land-clearing debris, materials to be used for alternative daily cover, and materials incinerated in a non-compliant waste-to-energy facility.

.9 Detail the safe removal and disposal of hazardous waste. Hazardous Materials shall be separated, stored, and disposed of in

accordance with the requirements of the authorities having jurisdiction including the Provincial Waste Management Act and B.C. Special Waste Regulation. Hazardous materials must be tracked separately, and not included in the project's total waste.

.10 Submit soil disposal procedures for all soil generated through excavation during construction in accordance with Phase 2 ESA Soil and Groundwater Assessment and Recommendations.

.11 Submit dewatering plan in accordance with Phase 2 ESA Soil and Groundwater Assessment and Recommendations. All costs for dewatering, including storage, transportation, and testing must be included in this contract.

.3 The Contractor and all Subcontractors are required to comply with the Construction Waste Management Plan.

.4 The Contractor shall meet the requirements of LEED MRc5, demonstrating .1 Option 1, Path 2 at least 75% diversion of the total construction and demolition materials, with diverted materials including at least four materials streams (common materials that may be simple to divert include drywall, wood, scrap metal, and concrete).

1.6 IMPLEMENTATION

.1 Alternative daily cover (ADC) does not qualify as material diverted from disposal. ADC must be excluded from diverted waste calculations but included in total construction waste calculations.

.2 Land-clearing debris is not considered construction, demolition, or renovation waste that can contribute to waste diversion. Excavated soil and land-clearing debris must be excluded from calculations.

.3 Incineration may be considered diversion only if recycling methods are not readily available in the project's location.

.4 Comingled collection is acceptable, provided that commingling recycling facility provides diversion rates either specific to the project (by measurement of each component waste material), or an average diversion rate for the facility that is regulated by the local authority. The average recycling rate must exclude ADC. Visual inspection is not an acceptable method measuring the component waste materials.

.5 Donating salvaged materials is permissible as long as the organization can verify and track the materials, including the quantity/volume received and destination.

.6 Waste-to-energy may be considered a viable diversion strategy if the project team follows European Commission Waste Framework Directive 2008/98/EC and European Commission Waste Incineration Directive 200/76/EC. In addition, the facility must meet the applicable European standards based on the fuel type.

.7 The combustion of wood or "wood-derived fuel" is not considered waste-to-energy and is exempt from the above criteria. Wood-derived fuel may contribute toward diversion.

.8 Project teams must demonstrate that reuse and recycling strategies were exhausted before counting material sent to waste-to-energy facilities.

.9 All construction waste leaving the site shall be tracked. Retain waste hauler reports and tickets, and receipts for materials donated.

1.7 SUBMITTALS

.1 Refer to Section 01 35 66 for required timing of submittals.

.2 Submit, upon project culmination, a final Construction Waste Report for the project, with:

.1 The Construction Waste Management Plan detailed in Item 1.6, above.

.2 The total construction waste (volume or weight)

.3 The total diversion rate, calculated as the total waste diverted from landfill, divided by the total waste produced by the project, multiplied by 100.

.4 Types of waste material, and quantity of each material

.5 A narrative that addresses ADC and other materials that are included in the calculation but do not count toward diversion.

.6 Documentation of recycling rates for commingled facilities (if applicable)

.7 Narrative for use of waste-to-energy strategy (if applicable) Documentation of waste-to-energy facilities adhering to relevant standards (if applicable)

.8 Documentation of waste-to-energy facilities adhering to relevant standards (if applicable)

END OF SECTION

PART 1 - GENERAL

1.1 INSPECTION AND DECLARATION

.1 Contractor's Inspection: Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
.1 Notify Departmental Representative in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
.2 Request Departmental Representative's Inspection.

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

.3 Completion: submit written certificate that following have been performed:
.1 Work has been completed and inspected for compliance with Contract Documents.
.2 Defects have been corrected and deficiencies have been completed.
.3 Equipment and systems have been tested, adjusted, and balanced and are fully operational.
.4 Certificates required by PWGSC Fire Protection Engineer and Authorities having jurisdiction have been submitted.
.5 Operation of systems have been demonstrated to Departmental Representative.
.6 Work is complete and ready for final inspection.

.4 Final Inspection: when items noted above are completed, request final inspection of Work by Departmental Representative and Contractor. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.

1.2 CLEANING

.1 In accordance with Section 01 74 11.

.2 Remove waste and surplus materials, rubbish and construction facilities from the site in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 As-built, samples, and specifications.

.2 Equipment and systems.

.3 Product data, materials and finishes, and related information.

.4 Operation and maintenance data.

.5 Spare parts, special tools and maintenance materials.

.6 Warranties and bonds.

.7 Final site survey.

1.2 SUBMISSION

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

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

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

.4 Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, four final copies of maintenance manuals and commissioning documentation in English.

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

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

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

.8 Pay costs of transportation.

1.3 FORMAT

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

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

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

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

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

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

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

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

.9 Provide 1:1 scaled CAD files in dwg format. Forward pdf, NMSEdit Professional spp, MS Word, MS Excel, MS Project and Autocad dwg files on USB compatible with PWGSC encryption requirements or through email or alternate electronic file sharing service such as ftp, as directed by Departmental Representative.

1.4 CONTENTS - EACH VOLUME

.1 Table of Contents: provide title of project;
.1 Date of submission; names,
.2 Addresses, and telephone numbers of Contractor with name of responsible parties;
.3 Schedule of products and systems, indexed to content of volume.

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

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

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

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

.6 Training: Refer to Section 01 79 00.

1.5 AS-BUILTS AND SAMPLES

.1 Maintain at the site for Departmental Representative one record copy of:
.1 Contract Drawings.
.2 Specifications.

.3 Amendments and addenda.
.4 Change Orders and other modifications to the Contract.
.5 Reviewed shop drawings, product data, and samples.
.6 Field test records.
.7 Inspection certificates.
.8 Manufacturer's certificates.

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

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

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

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

.6 Turn one set, paper copy and electronic copy, of AS-BUILT drawings and specifications over to Departmental Representative on completion of work. Submit files on USB compatible with PWGSC encryption requirements or through email or alternate electronic file sharing service such as ftp, as directed by Departmental Representative.

.7 If project is completed without significant deviations from Contract drawings and specifications submit to Departmental Representative one set of drawings and specifications marked "AS-BUILT".

1.6 RECORDING ACTUAL SITE CONDITIONS

.1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by Departmental Representative.

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

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

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

.5 Specifications: legibly mark each item to record actual construction, including:
.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
.2 Changes made by Amendments and change orders.

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

1.7 FINAL SURVEY

.1 Submit final site survey certificate in accordance with Section 01 71 00, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

1.8 EQUIPMENT AND SYSTEMS

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

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

.3 Include installed colour coded wiring diagrams.

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

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

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

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

.8 Include sequence of operation by controls manufacturer.

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

.10 Provide installed control diagrams by controls manufacturer.

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

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

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

.14 Include test and balancing reports as specified in Section 01 45 00.

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

1.9 MATERIALS AND FINISHES

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

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

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

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

1.10 SPARE PARTS

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

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

.3 Deliver to site; place and store.

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

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

1.11 MAINTENANCE MATERIALS

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

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

.3 Deliver to site; place and store.

.4 Receive and catalogue all items. Submit inventory listing to Departmental

Representative. Include approved listings in Maintenance Manual.

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

1.12 SPECIAL TOOLS

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

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

.3 Deliver to site; place and store.

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

1.13 STORAGE, HANDLING AND PROTECTION

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

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

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

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

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

1.14 WARRANTIES AND BONDS

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

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

.3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work.

.4 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Certificate of Substantial Performance is determined.

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

.6 Co-execute submittals when required.

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

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Procedures for demonstration and instruction of equipment and systems to Owner's O&M personnel.

.2 O&M personnel includes Departmental Representative, building operators, maintenance staff, security staff and technical specialists, as applicable.

1.2 DESCRIPTION

.1 Demonstrate scheduled operation and maintenance of equipment and systems to Departmental Representative's personnel two weeks prior to date of final inspection.

.2 Departmental Representative will provide list of personnel to receive instructions, and will coordinate their attendance at agreed-upon times.

1.3 QUALITY CONTROL

.1 When specified in individual Sections, require manufacturer to provide authorized representative to demonstrate operation of equipment and systems, instruct Owner's personnel, and provide written report that demonstration and instructions have been completed.

.2 Submit training schedule of time and date for demonstration and training of each item of equipment and each system in accordance with the training plan four weeks prior to designated dates, for Departmental Representative's approval.

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

.4 Report shall give time and date of each demonstration and training, with list of persons present.

1.4 CONDITIONS FOR DEMONSTRATIONS

.1 Equipment has been inspected and put into operation.

.2 Testing, adjusting, and balancing has been performed in accordance with Section 01 77 00 and equipment and systems are fully operational.

.3 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.5 PREPARATION

.1 Verify that conditions for demonstration and instructions comply with requirements.

.2 Verify that designated O&M personnel are present.

1.6 DEMONSTRATION AND INSTRUCTIONS

.1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at scheduled times, at the equipment location.

.2 Instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.

.3 Review contents of manual in detail to explain all aspects of operation and maintenance.

.4 Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instructions.

1.7 TIME ALLOCATED FOR INSTRUCTIONS

.1 Ensure amount of time required for instruction of each item of equipment or system as follows:
.1 Section 08 36 13.02 - Sectional Metal Doors: 1.0 hours of instruction.
.2 Division 23 - Heating, Ventilation, and Air-Conditioning: 2 hours of instruction.
.3 Division 26 - Electrical: 2 hours of instruction.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END

PART 1- GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 03 20 00: Concrete Reinforcing.

.2 Section 03 30 00: Cast-in-Place Concrete.

.3 Section 03 64 00: Concrete Repair.

1.2 REFERENCES

.1 All referenced standards to be the current edition or the edition referenced by the 2015 National Building Code.

.2 Canadian Standards Association (CSA International):
- .1 CSA A23.1/A23.2-14, Concrete materials and methods of concrete construction / Test methods and standard practices for concrete.
- .2 CSA O86-14, Engineering Design in Wood.
- .3 CSA O121-17, Douglas Fir Plywood.
- .4 CSA O141-05 (R2014), Softwood Lumber.
- .5 CSA O151-17, Canadian Softwood Plywood.
- .6 CSA O153-13 (R2017), Poplar Plywood.
- .7 CSA O325-16, Construction Sheathing.
- .8 CSA O437 Series-93 (R2011), Standards for OSB and Waferboard.
- .9 CSA S269.1-16, Falsework for Construction Purposes.

.3 American Concrete Institute (ACI):
- .1 ACI 117R-14, Specification for Tolerances for Concrete Construction and Materials.
- .2 ACI 347R-14, Guide to Formwork for Concrete.

.4 American Society for Testing and Materials (ASTM):
- .1 ASTM D4819-13, Standard Specification for Flexible Cellular Materials Made From Polyolefin Plastics.

1.3 QUALITY ASSURANCE

.1 Samples
- .1 Refer to Section 03 30 00.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

PART 2- PRODUCTS

2.1 DESIGN REQUIREMENTS

.1 Design in accordance with CSA S269.1-16.

.2 Departmental Representative accepts no responsibility for structural adequacy of formwork and will not review its design.

2.2 MATERIALS

.1 Formwork materials: to CSA S269.1-16.

.1 For concrete without special architectural features, use wood and wood product formwork materials to CSA O121-17, CSA O141-05 (R2014), CSA O437 Series-93 (R2011)or O153-13 (R2017).

.2 For concrete with special architectural features, use formwork materials to CSA A23.1/A23.2-14.

.3 Form ties:

.1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm (1”) diameter in concrete surface.

.2 Snap ties to snap cleanly at least 25 mm (1") from concrete surface without damage to the concrete.

.4 Form liner: high density overlay plywood to CSA O121-17 or other special materials to achieve the required concrete finish.

.5 Form release agent: non-toxic, low VOC, chemically active agent containing compounds that react with free lime in concrete resulting in water insoluble soaps.

.6 Form stripping agent: colourless mineral oil, non-toxic, low VOC, free of kerosene, with viscosity between 15 to 24 mm^2/s (70 and 110s Saybolt Universal) at 40°C, flashpoint minimum 150°C, open cup.

.7 Grooves, reglets and chamfers: White pine selected for straightness and accurately dressed to size.

.2 Compressible filler: flexible polyethylene closed cell expansion joint filler to ASTM D4819-13, type II.

PART 3- EXECUTION

3.1 FABRICATION AND ERECTION

.1 Conform to CSA A23.1/A23.2-14.

.2 Do not place shores and mud sills on frozen ground.

.3 Provide site drainage to prevent washout of soil supporting mud sills and shores.

.4 Fabricate and erect formwork in accordance with CSA S269.1-16 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA A23.1/A23.2-14.

.5 Make formwork tight and flush faced to prevent the leakage of mortar and the creation of unspecified fins or panel outlines.

.6 Form sides of footings.

.7 Obtain Departmental Representative approval for formed openings, slots

and chases not indicated on Structural Drawings.

.8 Do not permit loads from formwork to be transmitted to adjacent existing structure.

.9 Apply a form coating and release agent uniformly to the contact surface of formwork panels before reuse.

.10 Use 25 mm (1”) chamfer strips on external corners and 25 mm (1”) fillets at interior corners, unless specified otherwise.

.11 Form chases, slots, openings, drips, recesses and control joints as indicated on Architectural and Structural drawings.

.12 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.

.13 Anchors and inserts not to protrude beyond surfaces designated to receive applied finishes, including painting.

.14 Clean formwork in accordance with CSA A23.1/A23.2-14, before placing concrete.

.15 Build top form on sloping concrete where required to prevent concrete from flowing out of the form. Provide vents to allow air and bleed water to escape.

.16 Do not close wall forms before reinforcing steel has been reviewed by Departmental Representative.

3.2 JOINTS

.1 Refer to Typical Details and Drawings Notes for locations, detailing and maximum spacing requirements of all concrete joints.

.2 Refer to Section 03 30 00 for construction joints, sawcut joints and isolation joints in slab on grade and concrete toppings.

3.3 ARCHITECTURAL CONCRETE

.1 Refer to architectural drawings for concrete members requiring architectural exposed finishes.

.2 Ensure members have sharp and accurate definition of corners, reglets, etc. and are free from chips and spalls.

3.4 FIELD QUALITY CONTROL

.1 Refer to Section 01 45 00.

.2 Obtain field review of falsework and reshoring by the Professional Engineer responsible for that work prior to each pour. Departmental Representative will not field review the formwork, falsework or reshoring.

.3 An independent Inspection and Testing Agency will be appointed to inspect all features of formwork affecting appearance of finished architectural concrete surfaces for conformance with Contract documents.

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 03 10 00: Concrete Forming and Accessories.

.2 Section 03 30 00: Cast-in-Place Concrete.

.3 Section 03 64 00: Concrete Repair.

.4 Section 32 16 00: Curbs, Gutters and Sidewalks.

1.2 REFERENCES

.1 All referenced standards shall be the current edition or the edition referenced by the 2015 National Building Code.

.2 Canadian Standards Association (CSA International):
.1 CSA A23.1/A23.2-14, Concrete materials and methods of concrete construction / Test methods and standard practices for concrete.
.2 CSA A23.3-14, Design of Concrete Structures.
.3 CSA G30.18-09 (R2014), Carbon Steel Bars for Concrete Reinforcement.
.4 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
.5 W186-M1990 (R2016), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.3 Reinforcing Steel Institute of Canada (RSIC):
.1 Reinforcing Steel Manual of Standard Practice.

.4 American Concrete Institute (ACI):
.1 SP-066(04): ACI Detailing Manual-2004.

.5 ASTM International Inc.:
.1 ASTM A1064/A1064M-17, Standard Specification for Carbon Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
.2 ASTM A775/A775M-17, Standard Specification for Epoxy-Coated Reinforcing Steel.
.3 ASTM D3963/D3963M-15, Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars.
.4 ASTM A955/A955M-18, Standard Specification for Deformed and Plain Stainless Steel Bars for Concrete Reinforcement.
.5 ASTM A1064/A1064M-17, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete,

1.3 QUALITY ASSURANCE

.1 Qualifications
.1 Welding of reinforcing steel to be performed by welders certified under CSA W186-M1990 (R2016).

1.4 QUALITY CONTROL

.1 Submit in accordance with Section 01 45 00.

.2 Source Quality Control Submittals:
.1 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis.
.2 Upon request, inform Departmental Representative of proposed source of reinforcement material to be supplied.
.3 Upon request, provide Departmental Representative with a copy of plant certificate by the Concrete Reinforcing Steel Institute for epoxy coating of reinforcement.
.4 Upon request, provide Departmental Representative with a copy of manufacturer’s instructions for patching factory applied epoxy coating.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer’s data sheets for mechanical rebar splices.

.3 Shop Drawings:
.1 Prepare shop drawings in accordance with RSIC Manual of Standard Practice unless the Contract Documents contain a more stringent requirement. Conform to ACI SP-66 Detailing Manual whenever a detail condition is not covered by any of the above.
.2 Submit plans, elevations, sections and details necessary to fabricate, place and review reinforcement without reference to structural drawings, including masonry wall reinforcement. Draw to scale not smaller than 1:50 (1/4" = 1'-0").
.3 Show on drawings:
.1 Sizes, spacings and locations of reinforcement, with identifying labels.
.2 Bar bending details.
.3 Lengths and locations of all lap splices.
.4 Types and locations of mechanical splices.
.5 Placing sequence.
.6 Bar lists.
.7 Quantities of reinforcement (including all rebar added to accommodate installation).
.8 Construction joint and control joint locations.
.9 Concrete cover.
.4 Do not release for fabrication reinforcing bars whose length may be affected by field conditions, such as the final elevation of footings, until obtaining the required field measurements.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Reinforcing steel: carbon steel, deformed bars to CSA G30.18-09 (R2014), unless indicated otherwise.

.2 Weldable Reinforcing steel: weldable low alloy steel deformed bars to CSA G30.18-09 (R2014).

.3 Stainless Reinforcing steel: deformed bars to ASTM A955/A955M-18.

.4 Cold-drawn annealed steel wire ties: to ASTM A1064/A1064M-17.

.5 Welded steel wire fabric: to ASTM A1064/A1064M-17. Provide in flat sheets only.

.6 Epoxy Coating of reinforcement: to ASTM A775/A775M-17.

.7 Chairs, bolsters, bar supports, spacers: to CSA A23.1/A23.2-14.

.8 Mechanical splices: to concentrically align bars and develop specified tensile strength of rebar. Threaded couplers to have plastic internal coupler thread protectors.

.9 Rebar terminators: oversized taper-threaded couplings capable to develop specified tensile strength of rebar; area to be not less than 5 times the rebar area.

.10 Plain round bars: to CSA G40.20-13/G40.21-13.

PART 3- EXECUTION

3.1 FABRICATION

.1 Fabricate reinforcing steel in accordance with CSA A23.1/A23.2-14 and Reinforcing Steel Manual of Standard Practice.

.2 Fabricate epoxy coated reinforcing steel in accordance with ASTM D3963/D3963M-15. Plants to be certified by the CRSI for epoxy coated steel. Provide colour to contrast sharply with reinforcing steel and rust colour.

.3 Stagger mechanical splices 750 mm (2’-6”) unless otherwise noted on drawings.

.4 Weld reinforcement in accordance with CSA W186-M1990 (R2016), where indicated.

.5 Ship bundles of bar reinforcement, clearly identified in accordance with bar lists.

.6 Provide standard hooks at ends of all hooked bars.

.7 Unless a specific stirrup shape is indicated on plans or schedules, all stirrups to be closed hoops.

.8 Substitute different size bars only if permitted in writing by Departmental Representative.

3.2 FIELD BENDING

.1 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.

.2 When field bending is authorized, bend without heat, applying slow and steady pressure. Use tools which will limit bend radii to the values given in CSA A23.1/A23.2-14.

.3 Where key-creating stay form with pre-installed blind dowels is used, bend the dowels out using special tools approved by the stay form manufacturer.

.4 Replace bars which develop cracks or splits.

3.3 PLACING REINFORCEMENT

.1 Place reinforcing steel as indicated on reviewed placing drawings and in accordance with CSA A23.1/A23.2-14.

.2 Remove all loose scale, dirt, oil or other coatings which would reduce bond.

.3 Ensure cover to reinforcement is maintained during concrete pour.

.4 Turn ends of tie wire towards the interior of concrete.

.5 Support bars, chairs and spacers:

.1 Provide sufficient support bars, chairs, carriers and side form spacers as necessary to secure against displacement of reinforcement and maintain concrete cover before and during concrete placement. Support devices contacting surfaces exposed to the exterior to be non-corroding. Bars which are not shown on Structural Drawings and whose only function is supporting other reinforcing in lieu of other supporting devices to be considered accessories.

.2 Use bar supports for beams and slabs.

.3 Use plastic or plastic tipped bar supports and spacer with colour to match concrete for exposed concrete surfaces.

.4 Use plastic bar supports, epoxy coated support bars and plastic coated tie wire for epoxy coated reinforcement.

.5 Use precast concrete chairs where supports rest on the ground. Where welded wire fabric is used in slabs-on- grade, place precast concrete chairs at 600 mm (2’-0”) on centre each way. Do not attempt to position welded wire fabric by lifting it after concrete is poured.

.6 Do not splice reinforcing at locations other than shown on placing or structural drawings without Departmental Representative written approval.

.7 Do not cut reinforcement without Departmental Representative written approval.

.8 Bars marked continuous to be terminated in standard hooks at ends and spliced using class b laps. for lap lengths and development lengths, refer to typical details TC-REINF-01.

.9 Where two bars of different size are lapped in tension, splice length to be equal to the smaller bar's tension lap splice, or to the larger bar's tension development length, whichever is longer.

.10 Unless otherwise noted on drawings, stagger alternate mechanical couplers 750 mm (2’-6”) apart.

.11 Install end bearing compression splices so that bearing ends are fitted to within 3 degrees of full bearing after splice installed.

.12 Lap welded wire fabric sheets by one spacing of cross wires +50 (2”), measured between the outermost cross wires in each sheet.

.13 Place welded wire fabric in slabs on grade at 1/3 slab thickness below top of slab. provide adequate chairs to keep in specified position. lifting WWF after concrete is poured to bring it in position is not acceptable

.14 Minimum clear spacing between adjacent bars to be at least 1.4 times the bar diameter or 1.4 times the nominal maximum size of the coarse aggregate, whichever is more.

.15 Minimum concrete cover to principal reinforcement to be as follows (also refer to typical detail TC-RENF-21):
.1 Where concrete is cast against and permanently exposed to earth, minimum concrete cover to reinforcing bars closest to the concrete surface to be 75 (3”).
.2 for class n concrete, minimum concrete cover to reinforcing bars closest to the concrete surface to be 40 (1-1/2”) for beams and columns and 25 (1”) for slabs and walls.
.3 For class C-1 concrete, minimum cover to be 60 (2 1/2”).
.4 For class F-1 and F-2 concrete, minimum cover to be 40 (1 1/2”).
.5 increase cover where required to maintain minimum ratio of cover to nominal bar diameter of 1 for class N, 1.5 for classes F1, and 2 for class C1.

.16 For bars with 90° hooks, provide 50 (2”) cover on the bar extension beyond the hook (from the hooked portion to face of concrete).

.17 Where parallel reinforcement is placed in two or more layers, position bars in upper layer directly above the bars in lower layer, maintaining the minimum clear spacing between layers as specified above.

.18 Do not field weld reinforcement except where indicated or authorized by Departmental Representative.

.19 Do not weld epoxy coated reinforcement.

3.4 FIELD TOUCH-UP

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

3.5 INSPECTION AND TESTING

.1 An independent Inspection and Testing Agency will be appointed to carry out inspection and testing of concrete reinforcing and check conformance with applicable Standards and Contract documents.

.2 Assist the Inspection and Testing Agency in its work. Notify as to the Work Schedule and provide safe access to the work area as required.

.3 The Agency will submit reports covering the work inspected and provide details of errors or deficiencies observed.

.4 When requested, the Agency will review mill test reports and correlate reinforcing steel supplied with mill test reports provided.

.5 If reinforcing steel cannot be correlated to mill test reports, the Agency will conduct a sufficient number of tests to determine the yield strength of the reinforcing steel supplied.

.6 The Agency will inspect installation of all post installed dowels for compliance with the procedure described on the Contract Documents and the adhesive supplier’s requirements.

.7 The Agency will inspect field welding of reinforcement, including welders’ qualification, welding procedure, fit up and alignment, weld profile, size and length and confirm that the reinforcing is of weldable grade.

.8 The Agency will inspect installation of all mechanical splices for alignment and compliance with the splice supplier’s requirements.

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 03 10 00: Concrete Forming and Accessories.

.2 Section 03 20 00: Concrete Reinforcing.

.3 Section 03 64 00: Concrete Repair.

.4 Section 05 12 23: Structural Steel for Buildings.

.5 Section 09 67 72: Concrete Floor Sealer.

.6 Section 31 41 10: Shoring for Excavation.

.7 Section 31 66 15: Helical Foundation Piles.

.8 Section 32 16 00: Curbs, Gutters and Sidewalks.

1.2 REFERENCES

.1 All referenced standards to be the current edition or the edition referenced by the 2015 National Building Code.

.2 Canadian Standards Association (CSA International):
- .1 CSA A23.1/A23.2-14, Concrete materials and methods of concrete construction / Test methods and standard practices for concrete.
- .2 A283-06 (R2016), Qualification Code for Concrete Testing Laboratories.
- .3 CAN/CSA-A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.3 ASTM International Inc.:
- .1 ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- .2 ASTM C920–18, Standard Specification for Elastomeric Joint Sealants
- .3 ASTM E1155–14, Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers.
- .4 ASTM C578-18, Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
- .5 ASTM D2240-15e1, Standard Test Method for Rubber Property—Durometer Hardness.
- .6 ASTM D638-14, Standard Test Method for Tensile Properties of Plastics

1.3 QUALITY ASSURANCE

.1 Qualifications
- .1 Concrete supplier to have a valid “Certificate of Ready Mixed Concrete Production Facilities” issued by the relevant Ready Mixed

Concrete Association.

1.4 QUALITY CONTROL

.1 Submit in accordance with Section 01 45 00.

.2 Minimum two weeks prior to starting concrete work, provide valid certificate from plant delivering concrete.
  .1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.

.3 Minimum four weeks prior to starting concrete work, provide proposed quality control procedures on following items:
  .1 Hot weather concrete.
  .2 Cold weather concrete.
  .3 Finishing.
  .4 Protection.

1.5 ADMINISTRATIVE REQUIREMENTS

.1 Pre-installation Meeting: convene pre-installation meeting one week prior to beginning concrete works. Ensure key personnel to attend.

.2 Batch Logs: keep record of each batch delivered to site.

.3 Concrete Delivery Slips: Keep all concrete delivery slips ("driver's tickets") on site until building is completed. Record on delivery slip where concrete was placed, including time and date.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Minimum 2 weeks prior to starting concrete work, submit all concrete mix designs, and indicate where each concrete mix is to be used.

.3 Minimum 2 weeks prior to placing concrete, submit drawings showing proposed locations of all construction and control joints (slab on grade control joints) for Departmental Representative review and approval.

.4 Minimum submission requirements for each concrete mix design shall include the following:
  .1 Minimum specified compressive strength at 28 days (or at the time specified on drawings).
  .2 Maximum aggregate size.
  .3 Aggregate type (if not normal density).
  .4 Concrete density range, wet and dry (if not normal density).
  .5 CSA exposure class.
  .6 Cement type (if not type GU).
  .7 Percentage and type of supplemental cementing materials.
  .8 Maximum water/cementitious materials ratio.

.9 Assumed method of placement of concrete.
.10 Corrosion inhibitor (name and quantity, if applicable).
.11 Alkali-aggregate resistance.
.12 Architectural requirements (colour of cement and aggregate, if applicable).
.13 Maximum time from batching to placing concrete (if retarding admixtures are used).

.5 Concrete pours: provide accurate records of all concrete pours marked on a set of Structural Drawings.

.6 Flatness and levelness: submit measurements of slab tolerances for each concrete pour (as applicable).

.7 On completion of the works, provide written report to Departmental Representative certifying that the concrete in place meets performance requirements established in PART 2 - PRODUCTS.

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

.1 To CSA A23.1/A23.2, Alternative 1 – Performance, and as described under Mixes and on Structural Drawings.

2.2 PERFORMANCE CRITERIA

.1 Concrete supplier to meet the concrete performance criteria established by Departmental Representative and to provide verification of compliance.

2.3 MATERIALS

.1 Portland cement: to CSA A3001, type GU unless noted otherwise or required by exposure class.

.2 Cementitious hydraulic slag: to CSA A3000.

.3 Fly ash: to CSA A3001, Type CI.

.4 Water: to A23.1/A23.2-14.

.5 Aggregates: to CSA A23.1/A23.2-14, nominal maximum size of coarse aggregate to be 20 (3/4”) unless noted otherwise. Do not use recycled concrete as aggregate. Exposed pebble aggregate: 3mm to 6mm grey aggregate and matrix to match aggregate colour.

.6 Admixtures: not to contain chlorides.

.7 Corrosion-inhibiting admixture: calcium nitrite solution.

.8 Non premixed dry pack grout: composition of non metallic aggregate and

Portland cement with sufficient water for mixture to retain its shape when made into ball by hand and capable of developing compressive strength of 40 MPa at 28 days.

.9 Curing/sealing compound: to CSA A23.1/A23.2 and ASTM C309, Type 1, Class B, water based acrylic, compatible with surface hardener where hardener is used.

.10 Floor surface hardener: non-metallic, natural grey colour (unless other colour is requested by the Architect), premixed, Mohs Hardness 7 or better.

.11 Pre-moulded joint fillers: min.12 (1/2”) bituminous impregnated fiber board to ASTM D1751.

.12 Joint Sealants: to AST C920, class 100/50.

.13 Weep hole tubes: plastic.

.14 Evaporation reducer: water based polymer liquid forming continuous monomolecular temporary film on fresh concrete surface.

.15 Penetrating sealer: water based, clear water repellent, at least equivalent to AT&U Type 1b as specified in Alberta Infrastructure and Transportation Publication B388.

.16 Rigid insulation: extruded polystyrene boards per ASTM C578, structural grade, compressive strength 40 psi (275 kPa).

.17 Control joint filler: semi-rigid two component epoxy or polyurea with 100% solids, Shore A hardness (per ASTM D2240) min. 85, tensile strength at 7 days (per ASTM D638) min 5.0 MPa.

.1 For sawcuts in exterior slabs and in slabs in vehicle accessible areas use only polyurea fillers.

.18 Pre-formed control joint: two piece pre-assembled “T” shaped plastic; detachable top segment, minimum depth of horizontal segment equal to ¼ of slab thickness.

.19 Prefabricated Seepage Protection System: polymer core with a geotextile laminated on one side.

.20 Bond Breaker: 0.25 mm (10 mil) polyethylene or grade D, 30 minute building paper perforated with 8 mm (5/16”) holes at 150 mm (6”) centres, each way.

2.4 CONCRETE MIXES

.1 Use ready-mix concrete. Proportion concrete in accordance with CSA A23.1/A23.2-14, Alternative 1 - Performance Method for Specifying Concrete.

.2 Set performance characteristics of concrete in plastic state in

coordination with all trades involved.

.3 Meet performance criteria of concrete in hardened state as shown on Structural Drawings and provide verification of compliance.

.4 Use water-reducing agent in all concrete.

.5 Do not use admixtures containing chlorides.

.6 Concrete to be normal density (min. 2300 kg/m3) unless noted otherwise.

.7 Supplementary cementing materials (SCM):
- .1 Conform to CSA A23.1/A23.2-14.
- .2 Follow slag and fly ash manufacturers' directions for proportioning and mixing of concrete.
- .3 Avoid using SCM in architecturally exposed concrete. If necessary to achieve the required exposure classification, SCM not to affect colour and texture of finished concrete.
- .4 Do not use concrete with more than 40% of SCM when ambient temperature is forecast to be below +10°C at the time of concrete pour and during the seven days after the pour, except for footings, walls and columns.
- .5 Reduce W/C ratio to 0.45 where using more than 40% of SCM in concrete for slabs and other horizontal finished surfaces, in order to reduce bleed water and to increase rate or strength gain.

.8 Slabs on grade (unheated and exposed to vehicle traffic):
- .1 Exposure class: C1.
- .2 Minimum compressive strength at 28 days: 35 MPa.
- .3 At reinforced slabs on grade provide corrosion inhibitor with minimum dosage of corrosion inhibitor is 10L/m3 of 30% solution of calcium nitrite.

.9 Grade Beams:
- .1 Exposure class: C1.
- .2 Minimum compressive strength at 28 days: 35 MPa.

.10 Pile caps and exterior wall bond beams:
- .1 Exposure class: F2.
- .2 Minimum compressive strength at 28 days: 30 MPa.

.11 Lean concrete, mud slabs:
- .1 Exposure class: N.
- .2 Minimum compressive strength at 28 days: 10 MPa.

.12 Unshrinkable fill:
- .1 Minimum compressive strength at 28 days: 0.4 MPa.

PART 3 - EXECUTION

3.1 PREPARATION

.1 Provide advanced notice as indicated on drawings to allow Departmental Representative field review of reinforcing prior to placing of concrete/closing of wall forms.

.2 Obtain written approval of each foundation bearing surface by the Departmental Representative before placing concrete.

.3 Remove water and disturbed soil from excavations before placing concrete.

.4 Before placing slab-on-grade, confirm that subgrade and backfill meet specifications and are free of frost and surface water.

.5 Place concrete reinforcing in accordance with Section 03 20 00.

3.2 INSTALLATION/APPLICATION

.1 Set sleeves, conduits, pipe hangers, weep hole tubes, drains and other inserts and openings as indicated or specified elsewhere.

.2 Refer to Typical Details and Drawing Notes for placing guidelines, maximum size and minimum spacing of sleeves, embedded pipes and conduits.

.3 Check locations and sizes of sleeves and openings shown on Structural Drawings with Architectural, Mechanical and Electrical Drawings. Notify Departmental Representative of any discrepancies.

.4 Provide composite sleeving drawings showing sleeves required by all trades. Obtain Departmental Representative approval for any required sleeves and openings which are not shown on Structural Drawings.

.5 Set special inserts for strength testing as required for non-destructive method of testing concrete.

.6 Set anchor rods using templates under supervision of appropriate trade prior to placing concrete. Locate each anchor rod group to within 6 mm (1/4”) of required location.

.7 Refer to Section 03 10 00 for construction joint requirements.

3.3 PLACING CONCRETE

.1 Place concrete in accordance with CSA A23.1.

.2 Delivery and place concrete with minimum re-handling.

.3 If concrete is pumped or placed pneumatically, control discharge velocity to prevent separation or scattering of concrete mix ingredients.

.4 Place concrete in a continuous operation without cold joints. If cold joints develop inadvertently, notify Departmental Representative to

obtain instructions for required remedial work.

.5 Cast slabs with a top surface that is level or sloping as required by the Drawings.

.6 Do not add water to concrete on site.

.7 Convey concrete from truck to final location by methods which will prevent separation or loss of material. Maximum free fall not to exceed 1.5m (5'-0"). Consolidate concrete using mechanical vibrators.

.8 Place concrete as close as possible to final location to avoid segregation. Vibrate all concrete.

.9 Concrete exposed to view:
- .1 Exposed surfaces to be dense, even, uniform in colour, texture and distribution of exposed aggregate.
- .2 Defects such as honeycombing, voids, loss of fines, visible flow lines, cold joints or excessive bug holes may be cause for rejection at the discretion of the Architect.

.10 Maintain accurate records of all poured concrete including extent, date and location of each pour, concrete mix used, ambient air temperature and test samples taken on a set of Structural Drawings.

3.4 FINISHING CONCRETE

.1 Finish concrete to CSA A23.1/A23.2.

.2 Cooperate with any trade applying finishes to concrete surfaces and provide surfaces which will ensure adequate bond. Provide chases and reglets where required.

.3 Finishing Flatwork:
- .1 Protect concrete during finishing process. Use evaporation reducer during severe drying conditions.
- .2 Provide final finish in accordance with proposed use and as follows:
  - .1 Screeded and bull floated for: mud slabs and footings/pile caps.
  - .2 Wood float finish with brooming for: exterior exposed slabs – non Architectural Exposed Concrete.
  - .3 Powered steel trowel finish for: interior exposed slabs, slabs which receive resilient flooring, carpet, epoxy-based finishes, thin-set tiles, etc. and future floors. Do not trowel air entrained concrete.
  - .4 Steel trowel exposed interior concrete floors at least twice. Provide final spin troweling when non-slip finish is required.
  - .5 Pebble finish for Architectural Concrete: pebble aggregate and matrix to match colour and providing a consistent appearance. Surface texture to be slip resistant. Screed

concrete surface to slope minimum 6mm in 3m. Finish panel edges with edging tool. Expose pebbled surface by washing and brushing away surface mortar.

.3 Surface hardeners:

.1 Provide where hardened concrete is required by Architectural Drawings or Specifications.

.2 Use only liquid hardeners (or integral hardeners) on air entrained concrete; do not use dry-shake applied surface hardeners.

.3 Incorporate hardener into the surface of the concrete while concrete is still plastic.

.4 Follow manufacturer’s recommendations for dosage and application procedure.

.5 Where coloured hardeners are required, colour will be selected from available colours by the Architect.

.4 Surface Tolerances:

.1 Concrete surface tolerance to CSA A23.1/A23.2-14, F-Number method.

.2 Unless otherwise noted, conform to finish tolerance Class A.

.3 Measure surface tolerances within 72h of each concrete pour.

.4 Finishing Formed Surfaces:

.1 Completely fill holes left by through-bolts with grout.

.2 Concrete exposed to view:

.1 Provide smooth-form finish.

.2 Rub exposed sharp edges with carborundum to produce 3 mm (1/8") radius edges unless otherwise indicated.

.3 Architectural Concrete:

.1 Refer to Architectural drawings for concrete elements which are considered Architectural Concrete.

.2 Final appearance of architectural concrete is as important a factor as the engineering properties of the concrete and failure of the as-cast concrete to meet the required standard of appearance may be cause for rejection at the discretion of the Architect.

3.5 CONCRETE CURING AND PROTECTION

.1 At a minimum cure and protect concrete in accordance with CSA A23.1/A23.2-14.

.2 Do not place concrete against frozen ground.

.3 Extend curing and protection period until concrete has reached following strength levels for structural safety:

.1 Framed slabs and beams: 75% of specified 28 day strength.

.2 Piers and footings: 50% of specified 28 day strength

.4 For concrete containing supplementary cementing materials, curing and protection times may need to be extended beyond those outlined by CSA

A23.1 to achieve the required structural properties.

.5 Cure slab surfaces immediately after finishing is completed. Unless otherwise noted or required, use a curing compound compatible with applied finishes.

.6 Slabs on grade receiving resilient floor or other moisture sensitive finishes:
- .1 Apply 24 hours of continuous sprinkling with water. Start immediately after finishing slab.
- .2 Cover slab for at least the following 72 hours using plastic sheets with joints taped and free edges covered.
- .3 Protect finished and cured slab from surface water (i.e. rain, snow).
- .4 Refer to Architectural Specifications for required testing methods prior to placing floor finishes.

.7 Concrete exposed to view:
- .1 Protect during construction period from wear, damage, marking, discolouration, staining and becoming coated with concrete leakage.
- .2 Unless rejected, repair damage and remove marks and stains to the approval of the Architect.

.8 Do not load concrete until sufficient strength is developed.

3.6 SLABS ON GRADE

.1 Construction joints and control joints:
- .1 Refer to Notes on Structural Drawings for maximum spacing requirements.
- .2 Saw cut control joints to depth equal to one quarter of the concrete thickness u/n. Alternatively, for slabs on grade not exposed to view or vehicle traffic, create control joints by inserting pre-assembled “T” shaped plastic joints into fresh concrete; remove top part prior to concrete finishing.
- .3 Locate joints on column lines wherever possible and on intermediate lines, which result in approximately square panels, without re-entrant corners.
- .4 Do not create “L” shaped panels nor “T” shaped joint intersections.
- .5 Protect edges of sawcuts from breakage.
- .6 Clean out sawcuts in concrete exposed to view or vehicle traffic and fill with control joint filler after concrete is at least 120 days old.
- .7 Sawcut top 25 mm (1") at construction joints in exposed concrete for a width of 5 mm (3/16") and fill with control joint filler after concrete is at least 120 days old. Alternatively, form construction joint with a 5mm (3/16”) thick chamfer strip at top. Depth of the strip to be at least equal to 1/4 of slab thickness.
- .8 Clean out sawcuts in other concrete and fill with a sand-cement paste one month prior to installing floor coverings.
- .9 Unless noted otherwise, provide construction joints at 30m (100ft) maximum in both directions, with control joints in between at 25

times the slab thickness, but not more than 5m (15ft). Longer dimension of any sog segment created by construction and control joints not to exceed 1.25 times the shorter dimension of the segment. Consider slab depressions and pits when proposing layout, and show on layout drawings. Complete sawcutting within 6 to 18 hours of placing concrete.

.2 Isolation Joints:

.1 Unless otherwise shown on structural drawings, provide min.10 mm (3/8”) thick pre-moulded joint filler of the same depth as the thickness of the concrete wherever slabs-on-grade abut foundation walls, columns and piers. Omit if slab is chased or dowelled into structure.

.2 Furnish filler for each joint in single piece for depth and width required for joint.

.3 When more than one piece of filler is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.

.3 Cracks in Slabs-on-Grade:

.1 Extensive cracking of slabs-on-grade or cracks in excess of 3 mm (1/8”) in width may be cause for rejection of slab or portion of slab at the Architect’s discretion.

.2 Protect edges of cracks in slabs-on-grade from breakage.

.3 Exposed slab on grade: Unless slab is rejected, repair cracks that are over 0.4 mm (0.016") wide:

.1 Fill cracks with a sand-cement grout after concrete is at least 120 days old.

.2 Seven days later, cut out top 20 mm (3/4") of crack for a width of 5 mm (3/16") and fill with control joint filler.

.4 Architectural slab on grade: Unless slab is rejected, repair cracks that are over 0.2 mm (0.008") wide:

.1 Fill cracks with epoxy after concrete is at least 180 days old.

.2 Take all measures necessary to prevent epoxy on surface of exposed slab.

.3 Have manufacturer’s technical representative present during initial repairs.

3.7 CONSTRUCTION JOINTS

.1 Provide joints where specified or shown on drawings. Locate so as not to impair the required strength of the structure. Submit joint layout for the departmental representative review and approval a minimum of 2 weeks prior to pouring concrete. Refer to typical details and specifications for additional information.

.2 Unless otherwise noted, provide standard continuous 38 x 89 (2x4) formed keys at all construction joints. center at joints and chamfer sides.

3.8 PENETRATING SEALER

.1 Concrete to receive penetrating sealer to be at least 28 days old.

.2 Surfaces to be treated with the sealer to be dry and free of dirt and other contaminants.

.3 Completely remove all curing compounds before the sealer application.

.4 Follow manufacturer’s recommendations for coverage rate and application procedure.

.5 Use sealers approved for exterior use for all exposed flatwork.

.6 Sealant: multi-component, chemical curing, with compatible primer for concrete, bearing Ecologo to ECP/PCE-45-92

.7 Do not apply in inclement weather or if ambient air temperature or concrete surface temperature is less than 5°C or more than 38°C.

3.9 GROUTING UNDER BASE PLATES AND BEARING PLATES

.1 Grout under base plates and bearing plates using procedures in accordance with manufacturer's recommendations.

.2 Provide 100% contact over grouted area.

.3 Grout column base plates and beam bearing plates as soon as steelwork is completed.

.4 Do not add load on steelwork until grouting is completed and grout strength has reached at least 20 MPa.

3.10 EXISTING STRUCTURE

.1 Take precautions to protect the existing structure from damage.

.2 Provide temporary shoring and bracing as required.

.3 Retain a Professional Engineer to design the temporary shoring and bracing and to review this work on site.

.4 Obtain approval from Departmental Representative before coring or cutting.

.5 Retain an independent testing company to locate existing reinforcement and conduit in the areas of proposed openings and to mark locations on the surfaces of slabs and walls on which the cores and cuts are to be started using a non destructive method.

.6 Mark locations and sizes of cores and openings and locations of reinforcement and conduit using indelible markers as follows:
   .1 Red for top bars
   .2 Green for bottom bars

.3 Black for cores, openings and conduit.

.7 Relocate proposed openings and repeat process at no extra cost to the Contract if proposed locations are not acceptable to Departmental Representative.

.8 Save the complete length of all cores. Label each core with location taken. Make all cores available for review by Departmental Representative. Dispose of cores only with approval of Departmental Representative. See details on structural drawings for sawcutting procedure.

.9 Patching:
.1 Patch existing concrete where necessary to provide required smooth, flat surfaces for other trades.

3.11 INSPECTION AND TESTING:

.1 An independent Inspection and Testing Agency (certified under CSA A283 with category to suit testing provided) will be appointed to carry out inspection and testing of concrete and concrete materials and check conformance with applicable Standards and Contract documents.

.2 Assist the Inspection and Testing Agency in its work. Notify as to the Work Schedule and provide safe access to the work area as required. Provide concrete samples.

.3 The Agency will submit reports covering the work inspected and the testing performed. The reports will include the Supplier’s mix design numbers, locations in structure to which the tests relate and comments on abnormal results and conditions. The reports will be provided not later than five working days after the testing is completed.

.4 Sampling, storing, curing and testing of concrete will be in accordance with CSA A23.1/A23.2.

.5 The Agency will measure slab surface tolerances (flatness and levelness) using the F-Number system in accordance with ASTM E1155M. Measurements to be made a maximum of 72 hours after every slab pour.

.6 Compressive Strength Testing:
.1 One test is required for each 100 cubic meters of placed concrete, but not less than one test for each concrete mix placed each day. At least 3 tests are required for each class of concrete used.
.2 A group of three cylinders for each test will be provided, Location of concrete placement will be recorded for each cylinder set. One specimens will be tested at 7 and one at 28 days. The third specimen will be tested at 56 days if the required strength at 28 days is not achieved.
.3 One additional cylinder will be provided for each concrete mix during cold weather concreting. The specimens will be cured on site adjacent to and under the same conditions as the work they represent, and will be tested prior to form removal.

.4 If standard on site cured cylinders are used to determine concrete strength prior to removal of formwork, they will be kept adjacent to and under the same conditions as the work they represent.

.7 Air Entrainment Testing:

.1 One standard test for air content in plastic concrete will be conducted for each 100 cubic meters of each air entrained concrete mix.

.2 One standard test per ASTM C457 will be conducted to determine air void spacing factor in hardened concrete for each 100 cubic meters each air entrained concrete mix.

.8 Permeability Testing:

.1 One chloride ion permeability test will be conducted for each 100 cubic meters of class C-1 concrete mixes used for floor slabs.

.9 Inspection and testing by the Agency will not augment or replace the Contractor’s quality control nor relieve him of his contractual responsibility.

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International).
- .1 CSA A165 Series-14, CSA Standards on Concrete Masonry Units.
- .2 CAN/CSA-A179-14, Mortar and Grout for Unit Masonry.
- .3 CAN/CSA-A370-14, Connectors for Masonry.
- .4 CAN/CSA-A371-14, Masonry Construction for Buildings.
- .5 CSA S304-14, Design of Masonry Structures.

.2 International Masonry Industry All-Weather Council (IMIAC).
- .1 Recommended Practices and Guide Specification for Cold Weather Masonry Construction.
- .2 Recommended Practices and Guide Specifications for Hot Weather Masonry Construction.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Pre-installation meetings: comply with Section 01 31 19. Conduct pre-installation meeting one week prior to commencing work of this Section to:
- .1 Verify project requirements, including mock-up requirements.
- .2 Verify substrate conditions.
- .3 Co-ordinate products, installation methods and techniques.
- .4 Sequence work of related sections.
- .5 Co-ordinate with other building subtrades.
- .6 Review manufacturer's installation instructions.
- .7 Review masonry cutting operations, methods and tools and determine worker safety and protection from dust during cutting operations.
- .8 Review warranty requirements.

.2 Sequencing: sequence with other work in accordance with Section 01 32 16. Comply with manufacturer's written recommendations for sequencing construction operations.

.3 Scheduling: schedule with other work in accordance with Section 01 32 16.

1.3 SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for masonry and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.

.3 Shop Drawings:
.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
.2 Submit shop drawings detailing temporary bracing required, designed to resist wind pressure and lateral forces during installation.

.4 Samples:
.1 Provide samples as follows:
.1 Duplicate samples of concrete masonry unit specified, including special shapes, supplemented with specific requirements in Sections.
.3 Duplicate samples of each type of masonry accessory specified, supplemented by specific requirements in Section 04 05 23.
.4 Duplicate samples of each type of masonry anchorage, reinforcement and connector proposed for use, supplemented by specific requirements in Section 04 05 19.
.5 Samples: used for testing and when accepted become standard for material used.

.5 Certificates: submit manufacturer's product certificates certifying materials comply with specified requirements.

.6 Test and Evaluation Reports:
.1 Submit certified test reports in accordance with Section 01 45 00.
.2 Test reports to certify compliance of masonry units and mortar ingredients with specified performance characteristics and physical properties.
.3 Submit data for masonry units, in addition to requirements set out in referenced CSA and ASTM Standards, indicating initial rates of absorption.

.7 Installer Instructions: provide manufacturer's installation instructions, including storage, handling, safety and cleaning.

1.4 QUALITY ASSURANCE

.1 Provide plain and reinforced masonry in accordance with CAN/CSA A370, CAN/CSA A371, and CSA S304.

.2 Comply with hot and cold weather requirements in accordance with CAN/CSA A371 and IMIAC requirements.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect materials from nicks, scratches, and blemishes.

.3 Keep materials dry until use.
.4 Store under waterproof cover on pallets or plank platforms held off ground by means of plank or timber skids.
.5 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return of pallets, crates, padding and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 20.

1.6 SITE CONDITIONS

.1 Ambient Conditions: assemble and erect components when temperatures are above 4 degrees C.

.2 Weather Requirements: to CAN/CSA-A371 and to IMIAC - Recommended Practices and Guide Specifications for Hot and Cold Weather Masonry Construction.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Masonry materials are specified elsewhere in related Sections:
.1 Sections 04 05 12, 04 05 19, 04 05 23 and 04 22 00.

PART 3 - EXECUTION

3.1 INSTALLERS

.1 Experienced and qualified masons to carry out erection, assembly and installation of masonry work.

3.2 EXAMINATION

.1 Examine conditions, substrates and work to receive work of this Section. Co-ordinate with Section 01 71 00.

.2 Examine openings to receive masonry units. Verify opening size, location, and that opening is square and plumb, and ready to receive work of this Section.
.1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.2 Proceed with installation after unacceptable conditions have been remedied and after receipt of written approval from Departmental Representative.

.3 Verification of Conditions:
.1 Verify that:
.1 Substrate conditions which have been previously installed under other sections or contracts, are acceptable for product installation in accordance with manufacturer's instructions prior to installation of concrete block.
.2 Field conditions are acceptable and are ready to receive work.
.3 Built-in items are in proper location, and ready for roughing into masonry work.
.2 Commencing installation means acceptance of existing substrates.

3.3 PREPARATION

.1 Surface Preparation: prepare surface in accordance with manufacturer's written recommendations and co-ordinate with Section 01 71 00.

.2 Establish and protect lines, levels, and coursing.

.3 Protect adjacent materials from damage and disfiguration.

3.4 INSTALLATION

.1 Do masonry work in accordance with CAN/CSA-A371 except where specified otherwise.

.2 Build masonry plumb, level, and true to line, with vertical joints in alignment, respecting construction tolerances permitted by CAN/CSA-A371.

.3 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

.4 Unless otherwise noted, interlock masonry courses at all corners.

3.5 CONSTRUCTION

.1 Exposed masonry:
.1 Remove chipped, cracked, and otherwise damaged units, in accordance with CSA A165, in exposed masonry and replace with undamaged units.

.2 Jointing:
.1 Allow joints to set just enough to remove excess water, then tool with round jointer to provide smooth, joints true to line, compressed, uniformly concave joints where concave joints are indicated.
.2 Strike flush joints concealed in walls and joints in walls to receive plaster, tile, insulation, or other applied material except paint or similar thin finish coating.

.3 Cutting:
.1 Cut out for electrical switches, outlet boxes, and other recessed or built-in objects.
.2 Make cuts straight, clean, and free from uneven edges.

.4 Building-In:
.1 Build in items required to be built into masonry.
.2 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.
.3 Brace door jambs to maintain plumb. Fill spaces between jambs and masonry with mortar.

.5 Lateral supports:
.1 Provide lateral support at tops of all non-loading bearing masonry walls. Refer to typical details TM-LATS-15 and architectural specifications. Locate maximum 300 mm from wall ends and movement joints.

.6 Support of loads:
.1 Use 30 MPa concrete to Section 03 30 00, where concrete fill is used in lieu of solid units.
.2 Use grout to CAN/CSA-A179-14 where grout is used in lieu of solid units.
.3 Use polypropylene grout screens below bond courses and grouted blocks to isolate grout flow in designated areas. Do not use building paper.

.7 Provision for movement:
.1 Leave 25 mm space between top of non-load bearing walls and partitions and structural elements. Do not use wedges.
.2 Built masonry to tie in with stabilizers, with provision for vertical movement.

.8 Loose steel lintels:
.1 Install loose steel lintels. Center over opening width.

.9 Control joints:
.1 Construct continuous control joints as indicated.

.10 Movement joints:
.1 Build-in continuous movement joints as indicated.
.2 Unless otherwise noted on Contract Drawings, movement joints shall be 12 mm wide.

.11 Interface with other work:
.1 Cut openings in existing work as indicated.
.2 Openings in walls: reviewed by Departmental Representative.
.3 Make good existing work. Use materials to match existing.

3.6 SITE TOLERANCES

.1 Tolerances in notes to CAN/CSA-A371-14 apply.

3.7 FIELD QUALITY CONTROL

.1 Site Tests, Inspection:
.1 Perform field inspection and testing in accordance with Section 01 45 00.
.2 Notify inspection agency minimum of 24 hours in advance of requirement for tests.

3.8 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work area clean at end of each day.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.9 PROTECTION

.1 Temporary Bracing:
.1 Provide temporary bracing of masonry work during and after erection until permanent lateral support is in place.
.2 Bracing approved by Departmental Representative.
.3 Brace masonry walls as necessary to resist wind pressure and lateral forces during construction.

.2 Moisture Protection:
.1 Keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until completed and protected by flashing or other permanent construction.
.2 Cover completed and partially completed work not enclosed or sheltered with waterproof covering at end of each work day. Anchor securely in position.
.3 Air Temperature Protection: protect completed masonry as recommended in Article, SITE CONDITIONS.

END

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International).
.1 CSA A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
.2 CAN/CSA-A179-14, Mortar and Grout for Unit Masonry.
.3 CAN/CSA-A371-14, Masonry Construction for Buildings.
.4 CAN/CSA-A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.2 International Masonry Industry All-Weather Council (IMIAC).
.1 Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.
.2 Recommended Practices and Guide Specifications for Hot Weather Masonry Construction.

.3 South Coast Air Quality Management District (SCAQMD).
.1 SCAQMD Rule 1168-2017, Adhesive and Sealant Applications.

1.2 SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Submit duplicate copies of WHMIS MSDS in accordance with Section 01 35 29. Indicate VOC's mortar, grout, and admixtures. Expressed as grams per litre (g/L).

.3 Samples:
.1 Submit duplicate samples of mortar.
.2 Submit confirmation of source or product data sheet, prior to mixing or preparation of mortars, to Departmental Representative of:
.1 Aggregate.
.2 Cement.
.3 Lime.

.4 Manufacturers' Instructions: submit manufacturer's installation instructions.

.5 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties, and in accordance with Section 04 05 00.

.6 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect masonry mortar and grout.
.3 Replace defective or damaged materials with new.

1.4 SITE CONDITIONS

.1 Ambient Conditions: maintain materials and surrounding air temperature to:
.1 Minimum 5 degrees C prior to, during, and 48 hours after completion of masonry work.
.2 Maximum 32 degrees C prior to, during, and 48 hours after completion of masonry work.

.2 Weather Requirements: CAN/CSA-A371 and International Masonry Industry All-Weather Council (IMIAC) - Recommended Practices and Guide Specifications for Hot and Cold Weather Masonry Construction.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Use same brands of materials and source of aggregate for entire project.

.2 Cement:
.1 Portland Cement: to CAN/CSA-A3000, Type GU - General use hydraulic cement, gray colour.
.1 Use low VOC products in compliance with SCAQMD Rule 1168.
.2 Masonry Cement: to CAN/CSA-A3002 and CAN/CSA-A179, Type S.
.3 Mortar Cement: to CAN/CSA-A3002 and CAN/CSA-A179, Type S, integral water repellents.
.1 Use low VOC products in compliance with SCAQMD Rule 1168.

.3 Aggregate: supplied by one supplier.
.1 Fine Aggregate: to CAN/CSA-A179, natural sand.
.2 Course Aggregate: to CAN/CSA-A179.

.4 Water: clean and potable.

.5 Hydrated Lime: to CAN/CSA-A179, Type S.

2.3 ADMIXTURES

.1 Water Repellent Agents: Polymeric liquid admixture.
  .1 Use low VOC products in compliance with SCAQMD Rule 1168.

2.4 MORTAR MIXES

.1 Mortar for exterior masonry above grade:
  .1 Load Bearing: type S based on proportion specifications.

2.5 MORTAR MIXING

.1 Mix mortar ingredients in accordance with CAN/CSA-A179 in quantities needed for immediate use.

.2 Maintain sand uniformly damp immediately before mixing process.

.3 Add mortar admixtures in accordance with manufacturer's instructions. Provide uniformity of mix.

.4 Do not use anti-freeze compounds including calcium chloride or chloride based compounds.

.5 Do not add air entraining admixture to mortar mix.

.6 Use a batch type mixer in accordance with CAN/CSA-A179.

.7 Re-temper mortar only within two hours of mixing, when water is lost by evaporation.

.8 Use mortar within 2 hours after mixing at temperatures of 32 degrees C, or 2-1/2 hours at temperatures under 5 degrees C.

2.6 GROUT MIXES

.1 Bond Beams: grout mix 10 to 12.5 MPa strength at 28 days; 200-250 mm slump; mixed in accordance with CAN/CSA-A179, coarse grout.

.2 Lintels: grout mix 10 to 12.5 MPa strength at 28 days; 200-250 mm slump; mixed in accordance with CAN/CSA-A179, coarse grout.

.3 Grout: Minimum compressive strength of 12.5 MPa at 28 days; coarse grout, maximum aggregate size and grout slump: CAN/CSA-A179.

2.7 GROUT MIXING

.1 Mix grout ingredients in quantities needed for immediate use in accordance with CAN/CSA-A179, fine or coarse grout.

.2 Add admixtures in accordance with manufacturer's instructions; mix uniformly.

.3 Do not use calcium chloride or chloride based admixtures.

2.8 MIX TESTS

.1 Testing Mortar Mix:
.1 Test mortar to requirements of Section 01 45 00, and in accordance with CAN/CSA-A179, for mortar based proportion specification. Test prior to construction and during construction for:
.1 Compressive strength.
.2 Consistency.
.3 Mortar aggregate ratio.
.4 Sand/cement ratio.
.5 Water content and water/cement ratio.
.6 Air content.
.7 Splitting tensile strength.

.2 Testing Grout Mix:
.1 Test grout to requirements of Section 01 45 00 and in accordance with CAN/CSA-A179, for grout based on proportion specification. Test prior to construction and during construction for:
.1 Compressive strength.
.2 Sand/cement ratio.
.3 Water content and water/cement ratio.
.4 Slump.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for masonry installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

.1 Plug clean-out holes with block masonry units. Brace masonry for wet grout pressure.

3.3 CONSTRUCTION

.1 Do masonry mortar and grout work in accordance with CAN/CSA-A179 except where specified otherwise.

3.4 MIXING

.1 Clean all mixing boards and mechanical mixing machine between batches.

.2 Mortar must be weaker than the units it is binding.

.3 Contractor to appoint one individual to mix mortar, for duration of project. In the event that this individual must be changed, mortar mixing must cease until the new individual is trained, and mortar mix is tested.

3.5 MORTAR PLACEMENT

.1 Install mortar and grout to requirements of CAN/CSA-A179.

.2 Remove excess mortar from grout spaces.

3.6 GROUT PLACEMENT

.1 Install grout in accordance with CAN/CSA-A179. Refer to additional grout placement requirements as specified in Section 04 22 00.

.2 Work grout into masonry cores and cavities to eliminate voids.

.3 Use low lift grouting procedure unless otherwise approved in writing by the Departmental Representative. Place grout in lifts not exceeding 1500 mm height. Terminate each lift 40 mm below top of masonry unit.

.4 Do not displace reinforcement while placing grout.

.5 Refer to typical details for grouting under steel beam bearings. Prefill voids in masonry units receiving post installed anchors with grout extending minimum 200 mm around each anchor. Fully grout all wall pockets after installation of steel beams or joists.

3.7 FIELD QUALITY CONTROL

.1 Site Tests, Inspection: in accordance with Section 04 05 00 supplemented as follows:
.1 Test and evaluate mortar prior to construction and during construction in accordance with CAN/CSA-A179.
.2 Test and evaluate grout prior to construction and during construction to CAN/CSA-A179; test in conjunction with masonry unit sections specified.

3.8 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work area clean at end of each day.

.2 Remove droppings and splashings using clean sponge and water.

.3 Clean masonry with low pressure clean water and soft natural bristle brush.

.4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.5 Waste Management: separate waste materials for reuse and recycling in

accordance with Section 01 74 20.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.9 PROTECTION

.1 Cover completed and partially completed work not enclosed or sheltered with waterproof covering at end of each work day. Anchor securely in position.

.1 Mortar:

.1 Concrete Masonry Units.

END

PART 1 - GENERAL

1.1 REFERENCES

.1 ASTM International.
.1 ASTM A36/A36M-14, Standard Specification for Carbon Structural Steel.
.2 ASTM A307-14, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength.
.3 ASTM A641/A641M-09a(2014), Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
.4 ASTM A1064/A1064M-17, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

.3 Canadian Standards Association (CSA International).
.1 CSA A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
.2 CAN/CSA-A179-14, Mortar and Grout for Unit Masonry.
.3 CAN/CSA-A370-14, Connectors for Masonry.
.4 CAN/CSA-A371-14, Masonry Construction for Buildings.
.5 CSA G30.18-09(R2014), Carbon Steel Bars for Concrete Reinforcement.
.6 CSA S304-14, Design of Masonry Structures.
.7 CSA W186-M1990(R2016), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.4 Reinforcing Steel Institute of Canada (RSIC).
.1 Reinforcing Steel Manual of Standard Practice, 2004.

1.2 SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for anchorage and reinforcing materials and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
.2 Submit drawings detailing bar bending details, anchorage details lists and placement drawings.
.3 On placement drawings, indicate sizes, spacing, location and quantities of reinforcement and connectors.

.4 Samples:
.1 Submit duplicate samples of each masonry anchor and tie.

.5 Manufacturers' Instructions: submit manufacturer's installation instructions.

.6 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties, and in accordance with Section 04 05 00.

.7 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.3 SITE MEASUREMENTS

.1 Make site measurements necessary to ensure proper fit of members.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect anchorage and reinforcing materials from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return of pallets, crates, padding and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Bar reinforcement:
.1 Masonry partitions: Steel to CAN/CSA-A371 and CSA G30.18, Grade 400.

.2 Connectors: to CAN/CSA-A370 and CSA S304.

.3 Corrosion protection: to CSA S304, galvanized finish to CSA S304 and CAN/CSA-A370.

.4 Fasteners: installed post-construction:
.1 Screw Shields and Plugs: To CAN/CSA-A371.
.2 Bolts and Screws: size and type to suit application, locate where indicated.
.3 Nails: case-hardened cut or spiral nails, size and type to suit fastening application.

.5 Ties: to CAN/CSA-A370.
.1 Unit ties, to CAN/CSA-A370: Z style, fabricated form galvanized cold-drawn steel wire for typical applications, size to suit application.
.2 Adjustable Unit Ties: to CAN/CSA-A370: proprietary type ties, type, style and size to suit application in accordance with manufacturer's recommendations.
.3 Joint Reinforcement Ties: to CAN/CSA-A370:
.1 Single Wythe Joint Reinforcement: typical truss type for standard wall areas and corner ladder type for corners and intersections:
.1 Steel wire, hot dip galvanized: to ASTM A641/A641M, after fabrication.
.2 Cold drawn steel wire conforming to ASTM A1064/A1064M.

.6 Anchors: to CAN/CSA-A370, galvanized steel for typical applications.

.7 Conventional Bolts:
.1 Bolts: to ASTM A36/A36M.
.2 Plate anchors: steel to ASTM A36/A36M, weld square of circular steel plate perpendicular to axis of steel bar threaded on opposite end.
.3 Through bolt rods: to ASTM A307 threaded rod or threaded ASTM A36/A36M bar stock.

2.2 FABRICATION

.1 Fabricate reinforcing in accordance with CSA A23.1/A23.2 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.

.2 Splices for masonry wall reinforcing to be:
Wire reinforcing - 300 mm
- 10M BARS 450 mm
- 15M BARS 650 mm

.3 Fabricate connectors in accordance with CAN/CSA-A370.

.4 Obtain Departmental Representative's approval for locations of reinforcement splices other than shown on placing drawings.

.5 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186.

.6 Ship reinforcement and connectors, clearly identified in accordance with drawings.

2.3 SOURCE QUALITY CONTROL

.1 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcement steel and connectors, showing physical and chemical analysis, minimum 5 weeks prior to commencing reinforcement work.

.2 Upon request inform Departmental Representative of proposed source of material to be supplied.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for anchorage and reinforcing materials installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

.1 Direct and coordinate placement of metal anchors for masonry supplied to other Sections.

3.3 INSTALLATION

.1 Supply and install masonry connectors and reinforcement in accordance with CAN/CSA-A370, CAN/CSA-A371, CSA A23.1-14/A23.2 and CSA S304 unless indicated otherwise.

.2 Prior to placing concrete, mortar or grout, obtain Departmental Representative's approval of placement of reinforcement and connectors.

.3 Supply and install additional reinforcement to masonry as indicated or required to meet seismic requirements. Refer to additional reinforcing requirements as specified in Section 04 22 00.

3.4 BONDING AND TYING

.1 Install where indicated and in accordance with CAN/CSA-A370 and CAN/CSA-A371 and manufacturer's instructions.
.2 Install horizontal joint reinforcement 400 mm on centre. Stagger laps minimum 750 mm from course to course. Clip off cross rods at laps to keep wires in one plane.
.3 Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 600 mm each side of opening.
.4 Place joint reinforcement continuous in first and second joint below top of walls.
.5 Lap joint reinforcement ends minimum 150 mm.
.6 Use corner type ladder reinforcing at masonry wall corners and intersections.

3.5 REINFORCED LINTELS AND BOND BEAMS

.1 Reinforce masonry beams, masonry lintels and bond beams as indicated.

.2 Place and grout reinforcement in accordance with CSA S304.1, CAN/CSA-A371 and CAN/CSA-A179.

.3 Support and position reinforcing bars in accordance with CAN/CSA-A371.

.4 Carry horizontal reinforcing in bond beams located immediately below floor or roof levels continuously through movement joints (where applicable).

3.6 GROUTING

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

3.7 ANCHORS

.1 Supply and install metal anchors in accordance with CAN/CSA-A370 and CAN/CSA-A371.

3.8 LATERAL SUPPORT AND ANCHORAGE

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

3.9 MOVEMENT JOINTS

.1 Reinforcement will not be continuous across movement joints unless otherwise indicated.

3.10 FIELD BENDING

.1 Do not field bend reinforcement and connectors except where indicated or authorized by Departmental Representative.

.2 When field bending is authorized, bend without heat, applying a slow and steady pressure.

.3 Replace bars and connectors which develop cracks or splits.

3.11 FIELD QUALITY CONTROL

.1 Site inspections in accordance with Section 04 05 00.

.2 Obtain Departmental Representative approval of placement of reinforcement and connectors, prior to placing mortar and grout.

3.12 FIELD TOUCH-UP

.1 Touch up damaged and cut ends of galvanized reinforcement steel and connectors with compatible finish to provide continuous coating.

3.13 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
  .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
  .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END

PART 1 - GENERAL

1.1 REFERENCES

.1 ASTM International (ASTM).
.1 ASTM D2000-18, Standard Classification System for Rubber Products in Automotive Applications.
.2 ASTM D2240-15, Standard Test Method for Rubber Property - Durometer Hardness.

.2 Canadian Standards Association (CSA International).
.1 CAN/CSA-A371-14, Masonry Construction for Buildings.

1.2 SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for masonry accessories and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:
.1 Submit duplicate samples of masonry accessories as follows:
.1 Materials: Cured and coloured samples, illustrating colour and colour range. Include:
.1 Movement joint fillers.
.2 Flashing material samples, illustrating colour and colour range, size, shape, and profile. Include as specified:
.1 Rubberized flashings.

.4 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties, and in accordance with Section 04 05 00.

.5 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.6 Manufacturer's Instructions: submit manufacturer's instructions as follows:
.1 Submit installation instructions for fillers and flashings.

1.3 SITE MEASUREMENTS

.1 Make site measurements necessary to ensure proper fit of members.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect masonry accessories.
.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return of pallets, crates, padding and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Movement joint filler: purpose-made elastomer, 80 durometer hardness to ASTM D2240 of size and shape indicated.
.1 Use low VOC products in compliance with the SCAQMD Rule 1168.
.2 Material type: Prefabricated extruded rubber joint to suit wall thickness, conforming to ASTM D2000.

2.2 FLASHINGS

.3 Rubberized Flashings:
.1 Rubberized asphalt: Self-adhering, reinforced SBS rubberized asphalt compound laminated to cross-laminated polyethylene film, 1.0 mm thick, complete with primer and adhesive recommended by flashing manufacturer meeting the following critera:
.1 Elongation to ASTM D412: 200% min.
.2 Tensile strength to ASTM ASTM D412: 3400 kPa min.
.3 Puncture resistance to ASTM E154: 180N min.
.4 Water vapour permeance to ASTM E96: 1.6 ng/Pa.s.m^2
.5 Moisture absorption to ASTM D570: 0.1% max.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for masonry accessories installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION: MATERIALS

.1 Install continuous movement joint fillers in movement joints at locations indicated on drawings.

3.3 INSTALLATION: FLASHINGS

.1 Install dampproof flashing beneath first masonry bearing course on slabs-on-grade. Trim dampproofing to conceal it.

.2 Lap dampproofing 150 mm and seal in accordance with manufacturer's instructions.

.3 Before masonry work begins, place dampproof flashing under first course of masonry. Install continuous dampproof flashing with ends lapped and cut flush with exterior face of wall. Place similar dampproofing over top course.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International).
.1 CSA A165 Series-14, CSA Standards on Concrete Masonry Units (consists: A165.1, A165.2, A165.3).
.2 CSA S304-14, Design of Masonry Structures.

.2 National Building Code of Canada (NBC), 2015.

.3 South Coast Air Quality Management District (SCAQMD).
.1 SCAQMD Rule 1168-2017, Adhesive and Sealant Applications.

.4 Underwriters Laboratories of Canada (ULC).
.1 CAN/ULC-S101-14, Standard Methods of Fire Endurance Tests of Building Construction and Materials.

1.2 SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for concrete masonry units and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties, and in accordance with Section 04 05 00.

.4 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
.1 Offload concrete unit masonry packages using equipment that will not damage the surfaces.
.2 Do not use brick tongs to move or handle masonry.

.3 Storage and Handling Requirements:
.1 Store materials indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Do not double stack cubes of concrete unit masonry.
.3 Cover masonry units with non-staining waterproof membrane covering.
.4 Allow air circulation around units.
.5 Installation of wet or stained masonry units is prohibited.
.6 Keep concrete unit masonry in individual cardboard packaging provided by manufacturer until units are ready to be installed.
.7 Store and protect concrete unit masonry from nicks, scratches, and blemishes.
.8 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return of pallets, crates, padding and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Standard concrete block units: to CSA A165 Series (CSA A165.1).
.1 Classification as follows:
.1 H/15/A/M.
.2 SS/15/A/M.
.3 SF/15/A/M.
.2 Dimensions: sizes as indicated on Contract Drawings.
.3 Special shapes: provide bull-nosed or double bull-nosed units for exposed corners. Provide purpose-made shapes for lintels, beams and bond beams. Provide additional special shapes as indicated.
.4 Colour: Natural grey.

.2 Fire rated concrete block units: to CSA A165 Series (CSA A165.1) as modified below.
.1 Classification: H/15/B/M except as modified by fire resistance requirements specified below.
.2 Fire resistant characteristics: aggregate used in units and equivalent thickness of units to the National Building Code of Canada, and in accordance with CAN/ULC-S101, for fire-resistance ratings indicated.
.3 Size: modular.
.4 Special shapes: provide bull-nosed units for exposed corners. Provide purpose-made shapes for lintels and bond beams and provide additional shapes as indicated.

2.2 REINFORCEMENT

.1 Reinforcement in accordance with Section 04 05 19.

2.3 CONNECTORS

.1 Connectors in accordance with Section 04 05 19.

2.4 FLASHING

.1 Dampproof flashing: in accordance with Section 04 05 23.

2.5 MORTAR MIXES

.1 Mortar and mortar mixes in accordance with Section 04 05 12.

2.6 GROUT MIXES

.1 Grout and grout mixes in accordance with Section 04 05 12.

2.7 CLEANING COMPOUNDS

.1 Use low VOC products in compliance with SCAQMD Rule 1168.

.2 Compatible with substrate and acceptable to masonry manufacturer for use on products.

.3 Cleaning compounds compatible with concrete unit masonry and in accordance with manufacturer's written recommendations and instructions.

2.8 TOLERANCES

.1 Tolerances for standard concrete unit masonry tolerances in accordance with CSA A165.1, supplemented as follows:
.1 Maximum variation between units within specific job lot not to exceed 2 mm.
.2 No parallel edge length, width or height dimension for individual unit to differ by more than 2 mm.
.3 Out of square tolerance not to exceed 2 mm.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for concrete unit masonry installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

.1 Protect adjacent finished materials from damage due to masonry work.

3.3 INSTALLATION

.1 Construct masonry work as required by jurisdictional authorities.

.2 Construct masonry fire protection and fire separations of the thickness indicated on Drawings for the fire resistant ratings as noted on Drawings, and conforming to the Fire-Performance Ratings, Appendix 'D' to the NBC and CAN/ULC-S101.

.3 Fire Separations and Fire Separations with Fire Resistance Ratings: Construct walls tightly to construction above and at perimeter, and without openings or voids. Do not reduce the thickness of walls to less than the thickness indicated on the Drawings or for the required fire resistance rating where required.

.4 Concrete block units:
.1 Bond: running.
.2 Coursing height: As indicated.
.3 Jointing: concave where exposed or where paint or other finish coating is specified.

.5 Special Shapes:
.1 Install special units to form corners, returns, offsets, reveals and indents without cut ends being exposed and without losing bond or module.
.2 Install reinforced concrete block lintels over openings in masonry where steel or reinforced concrete lintels are not indicated.
.3 End bearing: not less than 200 mm.
.4 Install special shaped units.

3.4 REINFORCEMENT

.1 Install reinforcing in accordance with Section 04 05 19.

.2 Do not place conduits in, nor allow over-hanging mortar or debris inside, masonry cells to be reinforced.

.3 For non-load bearing masonry, see typical detail TM-Wall-01 for minimum seismic masonry reinforcing.

.4 Locate vertical bars accurately within cells as indicated on drawings. Hold in position top and bottom. Use rebar positioners as required.

.5 Locate top/bottom horizontal bars in masonry beams and lintels 50 mm clear from top/underside of beam.

.6 Extend all vertical reinforcing to within 50 mm from top of wall.

.7 Carry all vertical reinforcing continuously through bond beams and masonry lintels.

.8 Provide vertical dowels at base of walls to match vertical reinforcing. unless otherwise noted on drawings, embed into slab with standard hooks or provide Class B lap into foundation walls below (as applicable).

.9 Reinforce sides of all wall openings exceeding 1000 mm in width with additional 1-15 vertical. Carry full height of wall. Where steel or precast concrete lintels are used, offset verticals to clear lintel bearings.

.10 Unless otherwise noted, add 1-15 vertical at wall ends, and at each side of movement joints.

.11 The additional reinforcing specified in the clauses above is not noted on plans.

.12 Refer to typical details for additional reinforcing under steel beam bearings.

.13 Unless otherwise noted, provide minimum 390 mm deep bond beams at tops of all walls and where indicated. Construct bond beams with low web masonry units. Reinforce as shown on plans and sections and grout solid. Bend and lap reinforcing at masonry corners and intersections.

3.5 CONNECTORS

.1 Install connectors in accordance with Section 04 05 19.

3.6 FLASHING

.1 Install damproof flashings: in accordance with Section 04 05 23.

3.7 MORTAR PLACEMENT

.1 Place mortar in accordance with Section 04 05 12.

3.8 GROUT PLACEMENT

.1 Place grout in accordance with Section 04 05 12.

.2 Do not use mortar where grout is specified over-hanging mortar or debris inside, masonry cells to be reinforced.

3.9 CONSTRUCTION

.1 Cull out masonry units, in accordance with CSA A165 and reviewed range of colour samples, with chips, cracks, broken corners, excessive colour and texture variation.

.2 Build in miscellaneous items such as bearing plates, steel angles, bolts, anchors, inserts, sleeves and conduits.

.3 Construct masonry walls using running bond unless otherwise noted.

.4 Build around frames previously set and braced. Fill behind hollow frames within masonry walls with mortar or grout and embed anchors.

.5 Fit masonry closely against electrical and plumbing outlets so collars, plates and covers overlap and conceal cuts.

.6 Install movement joints and keep free of mortar where indicated.

.7 Hollow Units: spread mortar setting bed from outside edge of face shells. Gauge amount of mortar on top and end of unit to create full joints, equivalent to shell thickness. Avoid excess mortar.

.8 Solid Units: apply mortar over entire vertical and horizontal surfaces. Avoid bridging of airspace between brick veneer and backup wall with mortar.

.9 Ensure compacted head joints. Use full or face-shell joint as indicated.

.10 Tamp units firmly into place.

.11 Do not adjust masonry units after mortar has set. Where resetting of masonry is required, remove, clean and reset units in new mortar.

.12 Tool exposed joints concave; strike concealed joints flush.

.13 After mortar has achieved initial set up, tool joints.

.14 Do not interrupt bond below or above openings.

3.10 REPAIR/RESTORATION

.1 Upon completion of masonry, fill holes and cracks, remove loose mortar and repair defective work.

3.11 FIELD QUALITY CONTROL

.1 Site Tests, Inspection: in accordance with Section [04 05 00] supplemented as follows:
.1 Concrete masonry units will be sampled and tested by independent testing agency appointed and paid by Departmental Representative in accordance with CSA S304.
.2 Notify inspection agency minimum of 24 hours in advance of requirement for tests.

3.12 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work area clean at end of each day.
.2 Standard Concrete Unit Masonry:
.1 Allow mortar droppings on masonry to partially dry then remove by means of trowel, followed by rubbing lightly with small piece of block. Clean wall surface with suitable brush or burlap.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.13 PROTECTION

.1 Brace and protect concrete unit masonry in accordance with Section 04 05 00.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

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

.2 Section 05 50 00: Metal Fabrications.

.3 Section 09 91 00: Painting.

.4 Section 31 66 15: Helical Foundation Piles.

1.2 REFERENCES

.1 All referenced standards shall be the current edition or the edition referenced by the 2015 National Building Code.

.2 Canadian Standards Association (CSA International):
.1 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
.2 CSA S16-14, Limit States Design of Steel Structures.
.3 CSA S136-16, North American Specifications for the Design of Cold Formed Steel Structural Members.
.4 W47.1-09 (R2014), Certification of Companies for Fusion Welding of Steel.
.5 CSA W48-18, Filler Metals and Allied Materials for Metal Arc Welding.
.6 W55.3-08 (R2013), Certification of Companies for Resistance Welding of Steel and Aluminum.
.7 W59-18, Welded Steel Construction (Metal Arc Welding).
.8 W186-M1990 (R2016), Welding of Reinforcing Bars in Reinforced Concrete Construction.
.9 CSA W178.1-18, Certification of welding inspection organizations.
.10 CSA W178.2-18, Certification of welding inspectors.

.3 ASTM International Inc.:
.1 ASTM A123/A123M-17, Standard Specification for Zinc (Hot Dip Galvanized) coating on Iron and Steel Products.
.2 ASTM A36/A36M-14, Standard Specification for Carbon Structural Steel.
.3 ASTM F3125/F3125M-15a, Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPA) Minimum Tensile Strength, Inch and Metric dimensions.
.4 ASTM A500/A500M-18, Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
.5 ASTM A53/A53M-18, Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc-Coated, Welded and Seamless.
.6 ASTM A1011/A1011M-18, Standard Specifications for Steel, Sheet and Strip, Hot Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability and Ultra High Strength.

.7 ASTM A1085/A1085M-15, Standard Specification for Cold Formed Welded Carbon Steel Hollow Structural Sections (HSS).
.8 ASTM A992- 11(2015), Standard Specifications for Structural Steel Shapes.
.9 ASTM F1554-17e1, Standard Specification for Anchor Bolts, Steel 36, 55 and 105 ksi Yield Strength.

.4 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturers Association (CPMA):
.1 CISC Handbook of Steel Construction-Eleventh Edition 2016.
.2 CISC/CPMA Standard 1-73a, A Quick-drying One-coat Paint for Use on Structural Steel.
.3 CISC/CPMA Standard 2-75, Quick-drying Primer for Use on Structural Steel.
.4 CISC Code of Standard Practice, Appendix I, Architecturally Exposed Structural Steel (AESS).

.5 The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers (NACE) International:
.1 SSPC-SP 1, Solvent Cleaning.
.2 NACE No. 3 / SSPC-SP 6, Commercial Blast Cleaning.
.3 NACE No.4 / SSPC-SP 7, Brush Off Blast Cleaning.
.4 NACE No.2 / SSPC-SP 10, Near White Blast Cleaning.
.5 SSPC Technology Guide No.14 – Guide for the Repair of Imperfections in Galvanized, Organic or Inorganic Zinc-Coated Steel Using Organic Zinc Rich Coating.
.6 SSPC Paint Specification No. 20 – Zinc Rich Coating, Type I – Inorganic and Type II - Organic.

1.3 QUALITY ASSURANCE

.1 Qualifications
.1 Structural steel fabricator to have at least five years experience with structural steel for buildings.
.2 Structural steel fabricator and erector to be certified by the Canadian Welding Bureau under the requirements of CSA W47.1, Division 1 or 2 for fusion welding and/or CSA W55.3 for resistance welding of structural steel components, and to have CWB approved procedure for welding rebar (Grade 400W) to structural steel.
.3 Welders to be CWB approved, working under supervision of a CWB approved firm.
.4 Engage a Professional Engineer licensed in the place where the project is located to be responsible for design, detailing and installation of all connections related to structural steel work.

1.4 QUALITY CONTROL

.1 Submit in accordance with Section 01 45 00.

.2 Source Quality Control Submittals:
.1 Provide all submittals 4 weeks prior to starting fabrication of structural steel.
.2 Mill test reports:
.1 Provide upon request from Departmental Representative

mill test reports to include ladle analysis and physical test results, and to show chemical and physical properties and other details of steel to be incorporated in project.

.2 The reports to be correlated to the materials or products to which they pertain

.3 Tolerances

.1 Conform to the fabrication and erection tolerances of CAN/CSA S16-14.

.2 Comply with more stringent tolerances if specified elsewhere to suit interfacing materials or AESS members

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Shop Drawings:

.1 Provide drawings stamped and signed by the Professional Engineer responsible for steel connections.

.2 If additional information is required from Departmental Representative, allow a minimum of five working days for Departmental Representative to review and respond to the request for information.

.3 It is advisable to submit erection diagrams for review before preparing shop details. Copies of plans and section details developed by Departmental Representative will not be accepted as erection diagrams.

.3 Erection drawings:

.1 Submit erection drawings indicating details and information necessary for assembly and erection purposes including:

.1 Description of erection methods.

.2 Sequence of erection.

.3 Temporary bracings.

.4 Beam sizes (in addition to beam marks).

.5 Connections where threads must be excluded from shear plane.

.6 Details of all field welded connections

.2 Provide setting drawings showing dimensions and details for placing steel assemblies which are set in concrete,

.4 Fabrication drawings:

.1 Submit fabrication drawings showing designed assemblies, member sizes, components and connections. Show on drawings:

.1 Material specifications.

.2 Surface preparation.

.3 Shop painting / galvanizing.

.4 Section splices.

.5 Types of shop and field connections.

.6 Net weld lengths.

.7 Precautions which will be taken to exclude threads from shear planes of bearing type bolted connections (where applicable).

.8 Vent holes required for galvanizing process.

.9 Architectural clearance lines and finishes where

connections could encroach other works.

.2 Show details by which steel assemblies, which are set in concrete, are to be connected to the formwork.

.3 Substitution of alternative sections will only be allowed provided the new members have equal or greater capacity and stiffness and their dimensions are approved by Departmental Representative.

.5 When requested, submit sketches and design calculations stamped and signed by the Professional Engineer responsible for connection design.

.6 On completion of erection, submit a letter signed and sealed by the Professional Engineer responsible for structural steel connections certifying that the work has been completed in accordance with all contract documents.

PART 2 - PRODUCTS

2.1 DESIGN AND DETAILING REQUIREMENTS

.1 Design details and connections in accordance with requirements of CSA S16-14 and CSA S136-16 to resist forces and to allow for movements indicated. Consider load effects due to fabrication, erection and handling. Connect beams for the forces shown; if no force is indicated, connect non-composite beams for the reaction due to maximum uniformly distributed load capacity of the beam in bending

.2 Connection design to include consideration of all pass-through forces, including tension, compression, moment and shear. Provide local reinforcement at connection or joint as required.

.3 Follow conceptual connection details if shown on structural drawings. Do not change without Departmental Representative written approval. If welds are defined on drawings, the sizes shown are minimum requirements which might need to be increased to suit connection design.

.4 Assume that bolt threads are intercepted by shear plane, unless special measures are indicated on shop drawings to exclude threads from shear plane.

.5 Beams:

.1 Select beam end connections from CISC "Handbook of Steel Construction" when connection for shear only (standard connection) is required.

.2 Typical beam to spandrel beam and beam to column connections to be two sided or end plate connections.

.3 Select or design beam end connections for factored shear indicated on plans.

.4 When shears are not indicated, select or design non-composite beam end connections to resist reaction due to maximum uniformly distributed load capacity of the beam in bending.

.5 Where axial forces occur in beams framing to opposite sides of a supporting member, design connections for a pass-through force equal to the smaller axial force. If beam sizes differ, assume the axial force

is centred in the smaller beam.

.6 Where axial forces occur in beams framing into columns, connect beams at both sides of columns for the axial force shown.

.7 Where no axial force is shown for beam to column connection, design to resist horizontal tension / compression equivalent to 2% of the factored axial force in column, in addition to all other loads.

.8 Seated beam connections to have top clip angles.

.9 End bearing connections of inclined members to have horizontal bearing plane at supported member.

.10 Extend beams bearing on walls for the full length of bearing plates.

.11 For beams continuous over supports and for beams supporting columns, provide min. 6 mm (1/4”) stiffener plates at each side of web at point of concentrated load, unless thicker stiffeners are required by connection design or different details are shown on drawings.

.12 Provide all spandrel beams and all floor beams not fully braced by floor construction with top and bottom flange connections for torsional restraint.

.6 Columns:

.1 In addition to all other loads, connect columns to base plates to transfer horizontal load equal to 2% of the column vertical load.

.2 In addition to all other loads, connect columns to base plates to transfer tensile load equal to the capacity of all anchor bolts,

.3 Provide seat angles for joist support at sides of columns continuous through floor.

.4 Provide connection for tie joist bottom chord at all columns supporting joists; coordinate with joist supplier.

.5 Unless otherwise noted on drawings, provide 102 x 102 x 9.5 seat angles attached to sides of columns to support masonry lintels adjacent to columns. Length of seat to equal width of lintel minus 25 mm (1").

.6 Provide connection for masonry wall steel lintels adjacent to columns.

.7 Provide diagonal or cantilevered angles at sides of columns where required to support deck or slab.

.8 Provide cap plates at tops of columns where required for support of deck, slab, joists, beams or roof anchors.

.7 Moment connections:

.1 Provide moment connections at splices to maintain continuity of cranked beams. Provide header plates or stiffener plates to resist unbalanced flange forces at splices.

.2 Where moment connections are called for but values are not indicated, design for moment capacity of the smaller member in the connection.

.3 Install web and flange stiffener plates at moment connections as required by connection design and detail but in every case when indicated on the drawings. If the shear generated in column web exceeds its shear capacity, reinforce the web.

.8 Holes:

.1 Where holes for services are required through webs of beams or columns, coordinate size and location with Architectural, Mechanical

and Electrical drawings, and show on fabrication drawings. Reinforce in accordance with Typical Detail. Alternatively, design reinforcing in accordance with the procedure set forth in the CISC Handbook of Steel Construction, and provide calculations for Departmental Representative review.

.2 Provide holes in beam flanges or weld threaded studs as required for attachment of wood nailers.

.3 Provide 16 mm (5/8”) diameter weep holes in base plates of HSS columns which are not made watertight.

.4 Provide vent holes in HSS sections where required for galvanizing process. Locate so that any water inside HSS will drain away when HSS is in its final position. Maximum size – 16 mm (5/8”) diameter. Fill holes with vent hole plugs after galvanizing.

.5 Provide 19 mm (3/4”) dia. vent holes at centerline of all cast in plates supporting columns.

.9 Provide slotted holes long enough to allow for deflection indicated on drawings plus construction tolerance, assuming bolts are centred in slots. Bolts are to be finger-tight with burred threads to allow for movement during the life of structure without bolts loosening.

.10 Do not oversize anchor rod holes for site tolerances. Use hole sizes suggested in the CISC Handbook of Steel Construction.

.11 Provide closure plates for all exposed and for all exterior tubular members.

2.2 MATERIALS

.1 Structural steel: to CSA G40.20-13/G40.21-13, with the following Grades:

.1 W, WWF and S sections, channels and angles: 350W, or ASTM A992/A992M-11(2015), Grade 50(345MPa).

.2 Plates, bars:300W.

.3 Hollow Structural Sections: 350W (Class 'C” OR “H') or ASTM A500/A500M-18 (Grade 'C').

.4 Pipe: ASTM A53/A53M-18, 240W.

.2 Anchor rods: 300W to CSA G40.20-13/G40.21-13, or ASTM F1554-17e1.

.3 Bolts, nuts and washers: to ASTM F3125/F3125M-15a, grade A325M.

.4 Weldable reinforcing steel: to CSA G30.18-09, deformed bars.

.5 Welding materials: to CSA W48-18 and CSA W59-18, certified by Canadian Welding Bureau. For members in seismic force resisting system, refer to additional brittleness requirements in CSA S16.

.6 Shop paint: to CISC/CPMA 1-73a.

.7 Shop paint primer: to CISC/CPMA 2-75, solvent reducible alkyd, red oxide, compatible with specified topcoat.

.8 Zinc-rich coating: to SSPC Paint Specification No.20, compatible with top coat (where specified).

.9 Hot dip galvanizing: to ASTM A123/A123M-17, minimum zinc coating of 600 g/m².

.10 Epoxy coating: pre-mixed, 2 components, high-solids (volume of solids 87 ±3%), self-priming,

.11 Galvanizing vent hole plug: Grade 6061 Aluminum circular plug.

2.3 FABRICATION

.1 Fabricate structural steel in accordance with CSA S16-14 and with reviewed shop drawings.

.2 Continuously seal hollow members exposed to weather by intermittent welds and plastic filler unless continuous welds are indicated on drawings.

.3 Position beams having permissible mill camber so that the camber is up.

.4 HSS members which require galvanizing to either be per CSA G40.21, grade 350W, Class H, or to be stress relieved prior to galvanizing.

.5 Mill column bearing plates as required to provide full contact bearing and develop column bearing strength.

.6 Complete welded shop connections prior to galvanizing.

.7 Mark materials in accordance with CSA G40.20/G40.21. Do not use die stamping. When steel is to be left unpainted, place marking at locations not visible from exterior.

.8 Match marking: shop mark bearing assemblies and splices for fit and match.

2.4 SHOP PAINTING

.1 Clean all members to SSPC-SP 1 - Solvent Cleaning, remove loose mill scale, rust, oil, dirt and foreign matter using any suitable method.

.2 In addition for members receiving shop primer paint: Clean steel to SSPC-SP 7 Brush-Off Blast Cleaning.

.3 In addition for members receiving intumescent coating: Clean steel to SSPC-SP 6 Commercial Blast Cleaning

.4 In addition for members receiving zinc-rich coating: Clean steel to SSPC-SP 10 Near White Blast Cleaning.

.5 Apply one coat of shop paint CISC/CPMA 1-73a to steelwork in the shop with the exception of:
.1 Members to receive spray fireproofing.
.2 Members to receive a finish coat of paint on site for which a CISC/CPMA 2-75 shop primer is required.
.3 Members to receive intumescent coating for which a compatible

shop primer is required.
.4 Members to receive zinc-rich coating.
.5 Galvanized members.
.6 Surfaces encased in or in contact with cast-in-place concrete including top flanges of beams supporting slabs.
.7 Surfaces and edges to be field welded for a distance of 50 mm (2") from joints.

.6 Apply one coat of compatible primer paint (CISC/CPMA 2-75) in the shop to steelwork to receive a finish coat of paint on site.

.7 Apply galvanizing in the shop to all structural steel located beyond the vapour barrier, including:
.1 Shelf angles and hangers in exterior walls.
.2 Lintels in exterior walls.
.3 Exposed exterior steel members.
.4 Exposed anchor rods.
.5 Other steel noted on drawings.

.8 If galvanized steel is to be painted, use only non passivated galvanizing process (without chromate coating).

.9 Apply paint under cover, on dry surfaces when surface and air temperatures are above 5°C.

.10 Maintain dry condition and 5°C minimum temperature until paint is thoroughly dry.

.11 Strip paint from bolts, nuts, sharp edges and corners before prime coat is dry.

PART 3 - EXECUTION

3.1 GENERAL

.1 Structural steel work: in accordance with CSA S16-14.

.2 Welding: in accordance with CSA W59-18.

3.2 ERECTION

.1 Erect structural steel in accordance with CSA S16-14 and reviewed erection drawings.

.2 Do not field cut or alter any members without Departmental Representative approval.

.3 Make adequate provision for all loads acting on the structure during erection. Provide erection bracing to keep the structure stable, plumb and in true alignment during construction. Bracing members or connections shown on Structural Drawings are those required for the completed structure, and may not be sufficient for erection purposes. For load bearing masonry construction, maintain bracing until completion of masonry work and floor / roof decks which together provide permanent

bracing. Do not remove erection bracings without written approval from the Engineer who designed it.

.4 Steel framing to be plumb at temperature of 20°C. If erection is carried out at temperatures greatly differing from 20°C, make adequate provisions; some members may need to be +erected out of plumb in order to become plumb when the temperature stabilizes at 20°C.

.5 Set column base plates to the elevation required for grouting using steel shims or leveling screws attached to sides of base plates. Do not fasten leveling nuts to anchor rods. Alternatively, for base plates equal or smaller than 350 mm x 350 mm (14” x 14”), leveling plates set with grout and level to within 1.5 mm (1/16") across the plate can be used. Do not erect columns upon plates exceeding this tolerance. Lift base plates for inspection when directed.

.6 Grout under column base plates and beam bearing plates as soon as steelwork is completed with 40 MPa Grout. Do not add load on steelwork until grouting is completed and grout strength has reached at least 20 MPa.

.7 Do not make permanent connections until structure has been properly aligned.

.8 Install bolts which are not pre-tensioned to be snug tight.

.9 Where slotted connections are shown on structural drawings, finger tighten bolts to a snug fit and burr threads to prevent nuts from working loose.

.10 Apply dry lubricant to threads of all galvanized bolts prior to installation.

.11 Weld beams to bearing plates unless otherwise noted on drawings.

.12 Adjust and finalize connections at wall supporting elements affected by floor beam deflections after concrete is poured.

.13 Provide dissimilar metal separators at connections between aluminum members and structural steel.

.14 Report ill-fitting connections to Departmental Representative before taking corrective measures.

.15 Distribute hanger loads from mechanical and heavy electrical services suspended from steelwork uniformly along members. Alternate hanger position on either side of members.

.16 When welding after galvanizing is in place, grind away galvanizing at areas to be welded.

.17 Do not weld in an ambient temperature below -17°C. Preheat material adjacent to welding areas when ambient temperature is between -17°C and +4°C.

.18 Remove slag from all completed welds so that they may be visually inspected.

.19 Seal members by continuous welds where indicated.

.20 Remove field connection aids from all surfaces which will be exposed to view and where interfering with clearances required by other trades.

.21 Connect hangers for mechanical and electrical services and other non-structural elements not to cause twisting of steel members or excessive bending of member flanges.

.22 Do not apply lateral loads to members unless approved by the departmental representative.

3.3 FIELD PAINTING

.1 Paint in accordance with Sections 09 91 13 - Exterior Painting and 09 91 23 - Interior Painting.

.2 Touch up damaged surfaces with the same paint as the shop coat.

.3 Repair any galvanized or zinc rich painted surfaces which have been damaged or field welded in accordance with SSPC Technology Guide No.14.

.4 Clean and prepare surfaces of bolts, which will receive a finished coat of paint in the same manner as the connected steelwork.

.5 Clean non galvanized steel surfaces which will be in contact with ground to SSPC SP-3 (Power Tool Cleaning) and apply two coats of epoxy paint to achieve dry film thickness between 0.20 mm and 0.35 mm (8 mils and 14 mils).

3.4 INSPECTION AND TESTING

.1 An Inspection and Testing Agency (certified to CSA W178.1 & 2) will be appointed to carry inspection and testing of all structural steel.

.2 Do not commence fabrication until details of inspection have been worked out with the Agency.

.3 Assist the Inspection and Testing Agency in its work. Notify as to the Work Schedule and provide safe access to the work area as required.

.4 The Inspection Agency will submit reports to Departmental Representative, Contractor and Municipal Authorities covering the Work inspected and provide details of errors or deficiencies observed.

.5 Work will be inspected in shop and when erected. Store fabricated members in shop so that they are accessible for inspection.

.6 Provide Inspection and Testing Agency with a copy of reviewed shop drawings.

.7 Welding inspection:
.1 Welding inspection will be conducted in field.
.2 The Inspector will check welders' CWB certification.
.3 The Inspector will review welding procedures for conformance with CWB requirements, manufacturers' requirements and standard practice.
.4 The inspector will visually check all welds in moment connections, all welds of roof anchors to the base structure, 50% of welds in hanger connections and 20% of all other welds for:
.1 Size, length and profile
.2 Joint preparation, including cleaning and removal of any paint.
.3 Fit up and alignment.
.4 Penetration and fusion.
.5 Slag removal.
.6 Distortion.
.7 Porosity.
.8 Cracks.

.8 Field inspection:
.1 Arrange for the Inspector to start field inspection as soon as each section of the Work is completed, plumbed, bolts tightened and field welding finished.
.2 The Inspector will sample erection procedures for general conformity with Contract requirements.
.3 The Inspector will check general fit-up and tolerances and report any apparent distortions and misalignments.
.4 Minimum 10% of columns and 10% of beams will be checked by instruments for plumbness, alignment and elevation.
.5 Field inspection will include:
.1 Checking individual frame members for twisting, sweep and local damage.
.2 Checking levelness of leveling plates.
.3 Inspection of grouting under base plates and bearing plates.
.4 Checking column bearings on cast in plates.
.5 Checking bearings on steel and masonry.
.6 Inspection of bolting and post installed anchors as described below.
.7 Checking that column connections are adjusted to keep the columns plumb after supported structure has deflected due to dead loads applied to floor and roof deck.
.8 Inspection of field painting.
.9 Inspection of field touch-up.
.6 Bolting inspection:
.1 The Inspector will visually check all bolts in bearing connections. Where erection drawings indicate bolts with threads excluded from the shear plane, he will remove nuts from 1% of all bearing bolts and check that thread is excluded from the shear planes.

PART 1 - GENERAL

1.1 REFERENCES

.1 ASTM International (ASTM).
.1 ASTM A123/A123M-17, Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
.2 ASTM A307-14e1, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.

.2 Canadian Standards Association (CSA International).
.1 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
.2 CSA S16-14, Design of Steel Structures.
.3 CSA S136-16, North American Specification for the Design of Cold Formed Steel Structural Members.
.4 CSA W48-18, Filler Metals and Allied Materials for Metal Arc Welding.
.5 CSA W59-18, Welded Steel Construction (Metal Arc Welding).

.3 Green Seal Environmental Standards (GS).
.1 GS-11-2015, Paints and Coatings.

.4 The Master Painters Institute (MPI).
.1 Architectural Painting Specification Manual - current edition.

1.2 DESIGN REQUIREMENTS

.1 Design details and connections, where not shown on Drawings, in accordance with CAN/CSA-S16 and CSA S136.

1.3 SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for finishes, coatings, primers, and fasteners and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Submit two copies of WHMIS MSDS.
.1 For finishes, coatings, primers, and paints applied on site: indicate VOC concentration in g/L.

.3 Shop Drawings:
.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
.2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

.4 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

.5 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return of pallets, crates, padding and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Steel sections and plates: to CSA G40.20/G40.21, Grade 350W, minimum 30% recycled content.

.2 Welding materials: to CSA W59.

.3 Welding electrodes: to CSA W48 Series.

.4 Bolts and anchor bolts: to ASTM A307.

.5 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

2.2 FABRICATION

.1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

.2 Use self-tapping shake-proof screws on items requiring assembly by screws or as indicated.

.3 Where possible, fit and shop assemble work, ready for erection.

.4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

2.3 FINISHES

.1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m^2, Coating Grade 85, to ASTM A123/A123M.

.2 Shop coat primer: In accordance with MPI-EXT and INT 5.1B and chemical component limits and restrictions requirements and VOC limits of GS-11.

.3 Zinc primer: zinc rich, ready mix in accordance with MPI-EXT and INT 5.2C and chemical component limits and restrictions requirements and VOC limits of GS-11.

2.4 SHOP PAINTING

.1 Primer: VOC limit 250 g/L maximum to GS-11.

.2 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.

.3 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 degrees C.

.4 Clean surfaces to be field welded; do not paint.

2.5 MISCELLANEOUS STEEL BRACKETS, SUPPORTS AND ANGLES

.1 Supply and install or supply for installation by trades responsible, all loose steel brackets, supports and angles where indicated, except where such brackets, supports and angles are specified under work of other Sections. Drill for countersunk screws, expansion anchors and anchor bolts.

.2 Unless otherwise specified, prime paint for interior installation; galvanized finish for exterior and humid area installation.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for metal fabrications installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 ERECTION

.1 Install metal fabrications in accordance with reviewed shop drawings and manufacturer's written instructions.

.2 Do welding work in accordance with CSA W59 unless specified otherwise.

.3 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.

.4 Provide suitable means of anchorage acceptable to Departmental Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.

.5 Exposed fastening devices to match finish and be compatible with material through which they pass.

.6 Supply components for work by other trades in accordance with shop drawings and schedule.

.7 Make field connections with screws and bolts to CSA S16 for interior connections. Weld field connections for exterior work, unless otherwise found unacceptable by the Departmental Representative.

.8 Deliver items over for casting into concrete and building into masonry together with setting templates to appropriate location and construction personnel.

.9 Prior to installing angles at new louvres and scuppers in former lighthouse dwelling, scan concrete for rebar and obtain Engineers review to locate in existing walls.

.10 Touch-up field welds, bolts and burnt or scratched surfaces with primer after completion of:
.1 Primer: maximum VOC limit 250 g/L to GS-11.

.11 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.
.1 Primer: maximum VOC limit 250 g/L to GS-11.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by metal fabrications installation.

END

PART 1 - GENERAL

1.1 REFERENCES

.1 ASTM International (ASTM):
.1 ASTM A123/A123M-17, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
.2 ASTM A307-14e1, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
.3 ASTM E84-18, Standard Test Method for Surface Burning Characteristics of Building Materials.

.2 American Wood Protection Association (AWPA):
.1 AWPA P5-15, Standard for Waterborne Preservatives.
.2 AWPA P8-14, Standard for Oil-Borne Preservatives.

.3 Canadian Standards Association (CSA International):
.1 CSA O80 Series-15, Wood Preservation.
.2 CSA O112 Series M1977(R2006), CSA Standards for Wood Adhesives.
.3 CSA O121-17, Douglas Fir Plywood.
.4 CSA O141-91(R2004), Softwood Lumber.
.5 CSA O151-17, Canadian Softwood Plywood.

.4 South Coast Air Quality Management District (SCAQMD):
.1 SCAQMD Rule 1168-2017, Adhesive and Sealant Applications.

.5 National Building Code of Canada (NBC), 2015.

.6 National Lumber Grades Authority Standard Grading Rules for Canadian Lumber, GR-2017.

1.2 DESIGN REQUIREMENTS

.1 Design to the referenced Building Code for loads provided on the structural drawings.

.2 Design for the maximum deflections noted in plan notes.

1.3 QUALITY ASSURANCE

.1 Quality control requirements shall be in accordance with Section 01 45 00.

.2 Lumber by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

.3 Plywood in accordance with CSA and ANSI standards.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions and Section 01 61 00.

.2 Protect all wood products from the elements as required to maintain their integrity.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Lumber: grade marked to conform to CSA O141; kiln dried; SPF no. 2 or better; moisture content not to exceed 19% at time of manufacture and installation; unless noted otherwise.

.2 Plywood decking: to CSA O151, softwood spruce or CSA O121 Douglas Fir, urea formaldehyde free adhesive, good one side grade. Thickness as indicated on drawings.

.3 Wood connectors: Installed in accordance with manufacturer's requirements.

.4 Fastenings: to CSA 086.
- .1 Nails:
  - .1 Common round steel wire nails.
  - .2 Substitution of common nails with power driven nails of the same length and diameter is acceptable. Substitution of power driven nails of smaller diameter must be approved in writing by the Departmental Representative prior to use. Power driven nails shall not be over-driven into wood or sheathing.
- .2 Wood bolts: ASTM A307.

.5 Field applied wood preservative: copper napthenate to AWPA P8, green colour.

.6 Preservative treated plywood: Douglas Fir to CSA O121, G1S good one side, pressure treated with CCA to CSA O80.9, minimum retention 4.0 kg/m3 by assay.
- .1 Preservative: chromated copper arsenate (CCA) to AWPA P5 as amended by CSA O80-Series.

.7 Fire retardant treated plywood: Douglas Fir to CSA O121, G1S, fire retardant treated to CSA O80.27, maximum flame spread 25, maximum smoke developed 25 in accordance with ASTM E84.
- .1 Backboard: Thickness as indicated, sanded, to Table E-1. Provide fire rated plywood (PLY) in thickness of 12.7 mm in locations as indicated.

.8 Sealant: one-component, acrylic base, solvent curing to CGSB 19-GP-5M, Ecologo certified.

.9 Construction adhesive: to CSA O112 Series, cartridge loaded.
- .1 Maximum allowable VOC limit 140 g/L.
- .2 SCAQMD Rule 1168, Adhesives and Sealants Applications.

.10 Hot dip galvanizing: ASTM A123/A123M, minimum zinc coating of 600 g/m². for all exterior steel timber connection components, unless noted otherwise.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for carpentry installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Unless noted otherwise, all wood framing details to be in accordance with Part 9, Division B of the National Building Code.

.2 Apply wood preservative to wood in contact with roofing, concrete and masonry.

.3 Treat surfaces of pressure treated wood and plywood which are cut or bored after pressure treatment with field applied wood preservative.

.4 Set items in place plumb, straight and level to a tolerance of 1:600 and rigidly secure in place.

.5 Construct continuous members from pieces of longest practical length.

.6 Install spanning members with "crown-edge" up.

.7 Secure exterior work with galvanized or non-ferrous fasteners.

.8 Apply continuous bead of sealant at junction between roof deck and abutting parapet wall.

.9 Install plywood backboards to height as indicated on drawings with countersunk screws.

.10 Proposed notching and drilling of joist members must be submitted to the Departmental Representative for their review.

.11 Connect hangers for mechanical and electrical services and other non-structural elements not to cause twisting of steel members or excessive bending of member flanges.

.12 Do not apply lateral loads to members unless approved by the Departmental Representative.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
  .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
  .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

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

.2 Section 04 05 12: Masonry Mortar and Grout.

.3 Section 04 05 19: Masonry Anchorage and Reinforcing and Grout.

.4 Section 04 22 00: Concrete Unit Masonry.

.5 Section 05 12 23: Structural Steel for Buildings.

1.2 REFERENCES

.1 All referenced standards shall be the current edition or the edition referenced by the 2015 National Building Code.

.2 Canadian Standards Association (CSA International):
.1 CAN/CSA O80 Series-08 (R2012), Wood Preservation.
.2 CSA O86-14, Engineering Design in Wood.
.3 CSA 0141-05 (R2014), Softwood Lumber.
.4 CSA S307-M1980(R2006), Load Test Procedure for Wood Roof Trusses for Houses and Small Buildings.
.5 CSA S347-14, Method of Test for Evaluation of Truss Plates Used in Lumber Joints.
.6 W47.1-09 (R2014), Certification of Companies for Fusion Welding of Steel.
.7 CAN/CSA-Z809-16, Sustainable Forest Management.

.3 Forest Stewardship Council (FSC):
.1 FSC-STD-01-001-(V4-0), FSC Principle and Criteria for Forest Stewardship.

.4 National Lumber Grades Authority (NLGA):
.1 Standard Grading Rules for Canadian Lumber 2017.

.5 National Research Council (NRC)/Institute for Research in Construction (IRC) - Canadian Construction Materials Centre (CCMC):
.1 CCMC, Registry of Product Evaluations.

.6 Truss Plate Institute of Canada (TPIC)
.1 TPIC-2014, Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses (Limit States Design).

.7 Sustainable Forestry Initiative (SFI)
.1 SFI-2015-2019 Standard

1.3 QUALITY ASSURANCE

.1 Qualifications
.1 Fabricator for trusses to show evidence of quality control

program such as provided by regional wood truss associations, or equivalent and to have at least five years' experience.
.2 Fabricator for welded steel connections to be certified by the Canadian Welding Bureau under the requirements of CSA W47.1, Division 1 or 2 for fusion welding and/or CSA W55.3 for resistance welding of structural steel components.
.3 Welders to be CWB approved, working under supervision of a CWB approved firm.
.4 Engage a Professional Engineer licensed in the place where the project is located to be responsible for design, detailing and installation of all Shop Fabricated Wood Trusses.

1.4 QUALITY CONTROL

.1 Submit in accordance with Section 01 45 00.

.2 Source Quality Control Submittals:
.1 Provide all submittals 4 weeks prior to starting fabrication of wood trusses.
.2 Identify lumber by grade stamp of an agency certified by Canadian Lumber Standards Administration Board.
.3 Certify by agency accredited by Standards Council of Canada that treated wood is in accordance with CAN/CSA O80 Series.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Shop Drawings:
.1 Provide drawings stamped and signed by the Professional Engineer responsible for wood truss design.

.3 Show on drawings:
.1 Submit erection drawings indicating details and information necessary for assembly and erection purposes including:
.1 Material specifications.
.2 Truss geometry.
.3 Truss spacing.
.4 Truss camber.
.5 Member sizes.
.6 Joint details.
.7 Bearing and anchorage details.
.8 Lateral bracing, including anchorage details at ends of bracing lines.
.9 Temporary bracings.
.10 Indicate TPIC Truss Design Procedure and CSA O86 Engineering Design in Wood and specific CCMC Product Registry number of the truss plates
.11 Indicate arrangement of webs or other members to accommodate ducts and other specialties.
.12 Instructions: submit manufacturer's installation instructions.

.4 When requested, submit sketches and design calculations stamped and

signed by the Professional Engineer responsible for truss design.

PART 2- PRODUCTS

2.1 DESIGN AND DETAILING REQUIREMENTS

.1 Design light metal plate connected wood trusses in accordance with TPIC truss design procedures for wood truss chords and webs in accordance with engineering properties in CSA O86.

.2 Design light metal plate connected wood trusses in accordance with TPIC truss design procedures for truss joint designs to test engineering properties in accordance with CSA S347 and listed in CCMC Registry of Product Evaluations.

.3 Design trusses and bracing in accordance with CSA O86.1 for loads indicated and minimum uniform and minimum concentrated loadings stipulated in NBC commentary.

.4 Limit live load deflection to 1/360th of span.

.5 Provide camber for trusses as indicated

2.2 MATERIALS

.1 Lumber: SPF species, #1, #2 grade, softwood, with maximum moisture content of 19% at time of fabrication and to following standards:
.1 CSA O141.
.2 NLGA (National Lumber Grading Association), Standard Grading Rules for Canadian Lumber.
.3 CAN/CSA-Z809 or FSC or SFI certified.

.2 Fastenings: to CSA O86.

2.3 FABRICATION

.1 Fabricate wood trusses in accordance with reviewed shop drawings.

.2 Provide for design camber and roof slopes when positioning truss members.

PART 3- EXECUTION

3.1 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements Welding:

.1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect wood trusses from [nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.
.4 Provide bearing supports and bracings. Prevent bending, warping and overturning of trusses

3.2 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's written instructions.
.1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.2 Proceed with installation only after unacceptable conditions have been remedied.

3.3 MANUFACTURER'S INSTRUCTIONS

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

3.4 ERECTION

.1 Erect wood trusses in accordance with reviewed shop drawings reviewed erection drawings.

.2 Handling, installation, erection, bracing and lifting in accordance with manufacturer’s instructions.

.3 Make adequate provisions for handling and erection stresses.

.4 Exercise care to prevent out-of-plane bending of trusses.

.5 Install temporary horizontal and cross bracing to hold trusses plumb and in safe condition until permanent bracing and decking are installed.

.6 Install permanent bracing in accordance with reviewed shop drawings, prior to application of loads to trusses.

.7 Do not cut or remove any truss material without approval of Departmental Representative.

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

3.5 INSPECTION AND TESTING

.1 Manufacturer's Field Services:
.1 Have manufacturer of products supplied under this Section review work involved in handling, installation/application, protection and

cleaning of its products, and submit written reports, in acceptable format, to verify compliance of work with Contract

.2 Manufacturer's field services: provide manufacturer's field services, consisting of product use recommendations and periodic site visits for inspection of product installation, in accordance with manufacturer's instructions.

PART 1 - GENERAL

1.1 REFERENCES

.1 Architectural Woodwork Manufacturers Association of Canada (AWMAC).
.1 AWMAC/WI NAAWS 3rd Edition-2017.

.2 Canadian Standards Association (CSA).
.1 CSA B651-12(R2017), Accessible Design for the Built Environment.
.2 CSA O112 Series M1977(R2006), CSA Standards for Wood Adhesives.
.3 CSA O121-17, Douglas Fir Plywood.
.4 CSA Z204-94(R1999), Guideline for Managing Indoor Air Quality in Office Buildings.

.3 National Lumber Grading Rules (NLGA).
.1 Standard Grading Rules for Canadian Lumber, 2017.

1.2 IAQ - INDOOR AIR QUALITY

.1 Comply with CSA Z204, Guideline for Managing Indoor Air Quality in Office Buildings and CSA B651.

1.3 SUBMITTALS

.1 Submit in accordance with Section 01 33 00 and AWMAC/WI NAAWS Section 1.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for architectural woodwork and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Submit two copies of WHMIS MSDS.

.3 Shop Drawings:
.1 Submit two copies of drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
.2 Indicate details of construction, profiles, jointing, fastening and other related details.
.1 Scales: profiles full size, details half full size.
.3 Indicate materials, thicknesses, finishes and hardware.
.4 Indicate locations of service outlets in casework, typical and special installation conditions, and connections, attachments, anchorage and location of exposed fastenings.

.4 Samples:
.1 Submit for review and acceptance of each unit.
.2 Samples will be returned for inclusion into work.
.3 Submit duplicate samples of hardwood, softwood, plywood and MDF sample size 300 x 300 mm or 300 mm long.
.4 Submit duplicate samples of laminated plastic for colour selection.
.5 Submit duplicate samples of laminated plastic joints, edging, cutouts and postformed profiles.

.5 Certifications: submit AWMAC GIS certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.1 Architectural woodwork shall be manufactured and/or installed to the current AWMAC/WI NAAWS and shall be subject to an inspection at the plant and/or site by an appointed AWMAC Certified Inspector.

.2 Inspection costs shall be included in the bid price for this project. Contact your local AWMAC Chapter for details of inspection costs.

.3 Shop drawings shall be submitted to the AWMAC Chapter office for review before work commences.

.4 Work that does not meet the AWMAC/WI NAAWS, as specified, shall be replaced, reworked and/or refinished by the architectural woodwork contractor, to the approval of AWMAC, at no additional cost to the. Departmental Representative.

.5 If the woodwork contractor is an AWMAC Manufacturer member in good standing, a two (2) year AWMAC Guarantee Certificate will be issued.

.6 The AWMAC Guarantee shall cover replacing, reworking and/or refinishing any deficient architectural woodwork due to faulty workmanship or defective materials supplied by the woodwork contractor, which may appear during a two (2) year period following the date of issuance.

.7 If the woodwork contractor is not an AWMAC Manufacturer member they shall provide the Departmental Representative with a two (2) year maintenance bond, in lieu of the AWMAC Guarantee Certificate, to the full value of the architectural woodwork contract.

1.4 ACCESSIBILITY

.1 Comply with CSA B651, Accessible Design for the Built Environment.

1.5 QUALITY ASSURANCE

.1 Perform work in accordance with AWMAC, Quality Standards, Premium Grade, except as indicated otherwise.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle architectural woodworking in accordance with Section 01 61 00 and AWMAC Quality Standard.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 11.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Exposed hardwood: to AWMAC/WI NAAWS, Section 3: kiln dried wood, moisture content 6-12%, premium grade, White Ash, unless otherwise indicated. Rope storage rod brackets to be pine.

.2 Concealed blocking and framing: S-DRY, graded and stamped to NLGA, Standard Grading Rules for Canadian Lumber, SPF, 121c. "STUD" and 101d. "D" FINISH.

.3 Exposed plywood (WV): hardwood plywood to AWMAC/WI NAAWS, Section 4 Sheet Products, Premium Grade, White Ash.
.1 Wood veneer cut: White Ash.
.2 Panel adhesive: Type to suit condition.

.4 Sealant: In accordance with Section 07 92 00.

.5 Construction adhesive: to CSA O112 Series, cartridge loaded.
.1 Maximum allowable VOC limit 140 g/L.
.2 SCAQMD Rule 1168, Adhesives and Sealants Applications.

2.2 FABRICATION

.1 Finished millwork shall be free from bruises, blemishes, mineral marks, knots, shakes and other defects and shall be selected for uniformity in colour, grain and texture.

.2 Match grain and colour of adjoining exposed natural finished wood.
.1 Before finishing exposed surfaces of woodwork: remove handling marks or effects of exposure to moisture by thorough final sanding over all surfaces of exposed portions, using appropriate grit sandpaper and clean before applying sealer or finish.

.3 Provide rope storage rod brackets as indicated.

.4 Fabricate sills, surrounds, frames, and similar carpentry items as required for this work and as shown on Contract Drawings.

.5 Seal all surfaces for site finishing to AWMAC/WI NAAWS Section 5.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for architectural woodwork installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Set items in place, plumb, straight and level to a tolerance of 1:400 and rigidly secure in place in accordance with AWMAC/WI NAAWS.

.2 Completely assemble units.

.3 Install door and window casings level, plumb and even in locations as indicated and ensure that sills are securely fastened.

.4 Fastening:
.1 Coordinate wall securement, anchorage, and blocking for architectural woodwork items.
.2 Position items of architectural woodwork accurately, level, plumb, true and fasten or anchor securely.
.3 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.
.4 Provide heavy duty fixture attachments for wall mounted cabinets.
.5 Set finishing nails to receive filler. Where screws are used to secure members, countersink screw in round cleanly cut hole and plug with wood plug to match material being secured.

.5 Remove and replace damaged, marked, or stained architectural woodwork.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 11.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by architectural woodwork installation.

END

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International).
.1 CAN/CSA-A123.4-04(R2013), Asphalt for Construction of Built-Up Roof Coverings and Waterproofing Systems.

.2 Health Canada / Workplace Hazardous Materials Information System (WHMIS).
.1 Material Safety Data Sheets (MSDS).

1.2 SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for bituminous dampproofing application and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Submit 2 copies of WHMIS MSDS.

.3 Manufacturer's Instructions: provide to indicate special handling criteria, installation sequence and cleaning procedures.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect dampproofing materials.
.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return of pallets, crates, padding and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 20.

1.4 SITE CONDITIONS

.1 Ambient Conditions: temperature, relative humidity, moisture content.
.1 Apply dampproofing materials only when surfaces and ambient temperatures are within manufacturers' prescribed limits.
.2 Do not proceed with Work when wind chill effect would tend to set bitumen before proper curing takes place.

.3 Maintain air temperature and substrate temperature at dampproofing installation area above 5 degrees C for 24 hours before, during and 24 hours after installation.
.4 Do not apply dampproofing in wet weather.

.2 Safety: comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of asphalt, sealing compounds, primers and caulking materials.

.3 Ventilation:
.1 Ventilate enclosed spaces in accordance with Section 01 51 00.
.2 Provide continuous ventilation during and after dampproofing application. Run ventilation system 24 hours per day during installation; provide continuous ventilation for 7 days after completion of dampproofing installation.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Asphalt:
.1 For application and curing at temperatures above 5 degrees C: to CAN/CSA-A123.4, type to suit condition and temperature.
.1 Package label or bill of lading for bulk hot liquid asphalt must indicate type, flash point, equiviscous temperature range and final blowing temperature.
.2 For application and curing at temperatures above 0 degrees C but below 5 degrees C: to CAN/CSA-A123.4, type to suit condition and temperature.
.1 Package label or bill of lading for bulk hot liquid asphalt must indicate type, flash point, equiviscous temperature range and final blowing temperature.

.2 Sealing compound: Polymer modified sealing compound, type as recommended by bituminous dampproofing manufacturer.

.3 Asphalt primer: Penetrating asphalt primer, type as recommended by bituminous dampproofing manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for bituminous dampproofing application installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 WORKMANSHIP

.1 Keep hot asphalt:
.1 Below its flash point.
.2 At or below its final blowing temperature.
.3 Within its equiviscous temperature range at place of application.

3.3 PREPARATION

.1 Before applying dampproofing:
.1 Seal exterior joints between foundation walls and footings, joints between concrete floor slab and foundation and around penetrations through dampproofing with sealing compound.

3.4 APPLICATION

.1 Do dampproofing in accordance with manufacturer’s written instructions.

.2 Do sealing and priming work in accordance with manufacturer’s written instructions.

.3 Apply continuous, uniform coating to entire exterior faces of foundation walls from 50 mm below finished grade level to and including tops of foundation wall footings.

.4 Apply continuous, uniform coating to exterior side of foundation walls enclosing rooms below finished grade. Include exterior portion of interior walls where floors in adjacent rooms are at different elevations.

.5 Apply two additional coats of dampproofing to vertical corners and construction joints for a minimum width of 230 mm on each side, and all around and for 230 mm along pipes passing through walls.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by dampproofing application.

END

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian General Standards Board (CGSB).
.1 CGSB 71-GP-24M-AMEND-77(R1983), Adhesive, Flexible, for Bonding Cellular polystyrene Insulation.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
.1 Material Safety Data Sheets (MSDS).

.3 Underwriters Laboratories of Canada (ULC).
.1 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings.

1.2 SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for board insulation and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Submit duplicate copies of WHMIS MSDS. Indicate VOC's during application and curing.

.3 Samples:
.1 Submit 300 x 300 mm sample of each board insulation.

.4 Certificates:
.1 Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.5 Test Reports:
.1 Submit certified test reports showing compliance with specified performance characteristics and physical properties.

.6 Manufacturer's Instructions:
.1 Submit manufacturer's installation instructions.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect specified materials from damage.
.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return of pallets, crates, padding and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 INSULATION

.1 Extruded polystyrene (XPS): to CAN/ULC-S701.
.1 Type: 4.
.2 Compressive strength: 207 kPa.
.3 Thickness: as indicated.
.4 Thermal value: Minimum RSI of 0.87 per 25 mm.
.5 Edges: shiplapped.

.2 Cement faced insulation:
.1 CAN/ULC-S701, Type 4; extruded, closed-cell, cellular, foamed polystyrene with ship-lapped edges, prefinished with a cement facing.
.2 Provide 8 mm thick latex modified concrete face having a slightly broomed finish.
.3 Compressive strength: 241 kPa.
.4 Thickness: as indicated.
.5 Thermal value: Minimum RSI of 0.88 per 25 mm.

2.2 ACCESSORIES

.1 Adhesive (for polystyrene): to CGSB 71-GP-24M and as recommended by insulation manufacturer.

.2 Insulation fasteners (semi-rigid insulation): Stick clip/pin fasteners as recommended by insulation manufacturer suitable for intended condition.

.3 Foundation insulation fastening system: Provide purpose made galvanized steel clips and continuous galvanized steel flashing as recommended by insulation manufacturer.

.4 Drainage board: High-strength, non-woven drainage panel consisting of a polypropylene core with a factory-laminated geotextile complete with adhesive or fasteners as required for installation.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for board insulation application in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Install insulation after building substrate materials are dry.

.2 Install insulation to maintain continuity of thermal protection to building elements and spaces.

.3 Fit insulation tight around electrical boxes, plumbing and heating pipes and ducts, around exterior doors and windows and other protrusions.

.4 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures.

.5 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.

.6 Offset both vertical and horizontal joints in multiple layer applications.

.7 Do not enclose insulation until it has been inspected and approved by Departmental Representative.

3.3 PERIMETER FOUNDATION AND UNDER SLAB INSULATION

.1 Perimeter foundation insulation (exterior application):
.1 Unless otherwise indicated, extend boards from top of foundation wall down to top of footing. Install on exterior face of perimeter foundation wall with clips and adhesive.
.2 Provide rigid insulation below grade and cement faced insulation with caulked joints extending down minimum 600 mm below finished grade. Caulking of cement faced insulation to be grey to match concrete face colour.
.3 Protect entire face of insulation exposed to backfill (below grade) with drainage board.

.2 Under slab application (extruded polystyrene):
.1 Extend boards below floor slab and on interior surfaces of foundation wall as indicated.

.2 Lay boards on level compacted fill.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END

PART 1 - GENERAL

1.1 REFERENCES

.1 American Architectural Manufacturers Association (AAMA).
.1 AAMA 501-15, Methods of Test for Exterior Walls.

.2 American Society for Testing and Materials (ASTM).
.1 ASTM E96/E96M-16, Standard Test Methods for Water Vapor Transmission of Materials.
.2 ASTM E330/E330M-14, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

.3 Canadian General Standards Board (CGSB).
.1 CGSB 71-GP-24M-1977, Adhesive, Flexible, for Bonding Cellular Polystyrene Insulation.

1.2 SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Submit WHMIS MSDS - Material Safety Data Sheets.
.3 For adhesives, primers and sealants, indicate VOC in g/L during application and curing.

.3 Quality Assurance Submittals: submit following in accordance with Section 01 45 00.
.1 Existing Substrate Condition: report deviations, as described in PART 3 -EXAMINATION in writing to Departmental Representative.
.2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
.3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.
.4 Manufacturer's Field Reports: submit manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

1.3 QUALITY ASSURANCE

.1 Qualifications:
.1 Applicator: company specializing in performing work of this section with minimum 5 years documented experience with installation of air/vapour barrier systems.
.1 Completed installation must be approved by the material manufacturer.

.2 Mock-Up:
.1 Construct mock-up in accordance with Section 01 45 00.
.2 Construct 3 m^2 typical exterior wall panel, demonstrating as a minimum one lap joint, one inside corner, one window interface, and one electrical box; illustrating materials interface with adjacent construction and seals.
.3 Locate where directed by the Departmental Representative.
.4 Mock-up may remain as part of finished work if accepted by the Departmental Representative.
.5 Allow 24 hours for inspection of mock-up by Departmental Representative before proceeding with air/vapour barrier Work.

.3 Site Meetings: as part of Manufacturer's Services described in PART 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed.
.1 After delivery and storage of products, and when preparatory Work is complete, but before installation begins.
.2 Twice during progress of Work at 25% and 60% complete.
.3 Upon completion of Work, after cleaning is carried out.

1.4 INSPECTION

.1 Air/vapour barriers installation must be inspected by Departmental Representative before work is covered. Notify Departmental Representative when complete installation is ready for inspection.

.2 Repair punctures, rips and tears to ensure continuity of air/vapour barrier.

.3 Where punctures and tears are extensive, replace entire damaged section.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.3 Do not store material on roof.

.4 Under cover on elevated platform.

.5 In original package, labels intact.

.6 Remove and replace damaged, wet or broken material.

.7 Stand rolls on end, protect edges.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

1.7 SITE CONDITIONS

.1 Weather and surfaces dry.

.2 Imminent weather forecast, dry.

.3 Install solvent curing sealants and adhesive materials in open spaces with ventilation.

.4 Ventilate enclosed spaces in accordance with Section 01 51 00.

.5 Maintain temperature and humidity recommended by materials manufactures before, during and after installation.

1.8 SEQUENCING

.1 Sequence work in accordance with Section 01 32 16.

.2 Sequence work to permit installation of materials in conjunction with related materials and seals.

PART 2 - PRODUCTS

2.1 MATERIAL

.1 Asphalt primer for self-adhesive membrane: synthetic rubber, 40% solids by weight, type as recommended by membrane manufacturer.

.2 Air/vapour barrier membrane (self-adhesive): Styrene Butadiene Styrene (SBS) self-adhesive bitumen laminated to high-density polyethylene film, nominal total thickness of 1 mm and as follows:
.1 Air permeance: no leakage up to 3000 Pa or <0.01 $l/m^2.s$ at 75 Pa pressure differential to AAMA 501.
.2 Water vapour permeance: maximum 2.8 $ng/Pa.s.m^2$ to ASTM E96/E96M, procedure B.
.3 Peel adhesion: to ASTM E330/E330M-14.
.1 0 delamination at 3000 Pa for 5 sec.
.2 10.9 delamination at 1000 Pa for 1 hour.

.3 Adhesive: synthetic rubber, solvent type, trowel consistency to CGSB 71-GP-24M, compatible with air/vapour barrier membrane.

.4 Joint filler: extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, outsized 30 to 50%, CFC free.

.5 Fastening bar: Continuous 25 mm wide x 3 mm thick aluminum bar, predrilled for mechanical attachment.

.6 Fasteners: As specified herein or manufacturer's recommended fastener for attaching to substrate.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for air/vapour barrier application in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 PREPARATION

.1 Remove loose material and scrape surface smooth.

.2 Remove water and condensation from surfaces.

.3 Clean surfaces of foreign and bituminous substances.

.4 Roll on primer at 2 to 8 m^2/l in accordance with manufacturer's recommendations. Allow 30 minutes drying to a tacky surface. Re-prime areas not covered with membrane in 24 hours.

.5 Fill gaps and joints over 6 mm wide with joint filler. Reinforce with 305 mm wide strip of membrane.

3.4 APPLICATION

.1 Ensure services are installed and inspected prior to installation of air/vapour barrier.

.2 Install air/vapour barrier and associated materials in accordance with manufacturer's written instructions.

.3 Reinforce inside and outside corners with 305 mm membrane.

.4 Apply self-adhesive membrane to intended substrates to maintain continuity of air/vapour barrier in accordance with manufacturer's written instructions and details.

.5 Lap side and end joints minimum 50 mm. Roll air/vapour barrier and laps for continuous adhesion over entire substrate area; use manufacturer's recommended roller

.6 Cut membrane around projections, ensuring continuous adherence to substrate. Seal self-adhesive membrane with adhesive to manufacturer's instructions.

.7 Extend air/vapour barrier as required to connect to roof parapets, windows, doors frames, and other components of Work comprising air/vapour barrier system.

.8 Mechanically attach membrane to window and door frames with pressure strips.

.9 At end of days' work, trowel sealant water cut-off along uppermost edge of incomplete air/vapour barrier assembly, to prevent loss of adhesion and damage to air/vapour barrier.

.10 Supply and install continuous mechanical fastening bar to clamp air/vapour barrier both sides of unfilled gaps, cracks, and joints.

3.5 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:
.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion and verification of performance of installation, remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 PROTECTION

.1 Protect finished work in accordance with Section 01 61 00.

.2 Do not permit adjacent work to damage work of this section.

.3 Ensure finished work is protected from climatic conditions.

END

PART 1 - GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials (ASTM).
.1 ASTM E1643-18a, Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs
.2 ASTM E1745-17, Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.

1.2 SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data: Submit manufacturer's printed product literature, specifications and datasheet and include:
.1 Product characteristics.
.2 Performance criteria.
.3 Limitations

.3 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS).

.4 Quality assurance submittals:
.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
.2 Laboratory Test Results: submit full set of actual test results as per paragraph 8.3 of ASTM E1745 (including all after conditioning permeance tests).
.3 Instructions: submit manufacturer's installation instructions and comply with written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

.2 Store materials in a clean, dry area in accordance with manufacturer's instructions.

.3 Stack membrane on smooth ground or wood platform to eliminate warping.

.4 Protect materials during handling and application to prevent damage or contamination.

.5 Ensure membrane is stamped with manufacturer's name, product name, and membrane thickness.

1.4 ENVIRONMENTAL REQUIREMENTS

.1 Product not intended for uses subject to abuse or permanent exposure to the elements.

.2 Do not apply on frozen ground.

PART 2 - PRODUCTS

2.1 SHEET VAPOUR BARRIER

.1 Plastic Vapour Barrier: Vapour Barrier membrane must have the following properties:
- .1 Permeance as tested after conditioning (to ASTM E1745 paragraphs 7.1.2 - 7.1.5): less than 0.57 ng/(Pa*s*m2) (0.01 perms (gr/ft2/hr/in-Hg)).
- .2 Strength: Class A, ASTM E1745.
- .3 Minimum thickness: 0.38 mm (15 mils).

2.2 ACCESSORIES

.1 Seam tape: high-density polyethylene film and a rubber-based, pressure-sensitive adhesive, specially designed to seal seams and penetration, approximate width 100 mm, by vapour barrier manufacturer.

.2 Pipe Boots: Where slab penetrations occur, construct pipe boots from vapor barrier material and pressure sensitive tape per manufacturer's instructions.

.3 Vapour-Proofing Mastic: use mastic provided by vapour barrier manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Examine surfaces to receive membrane. Notify Departmental Representative if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.

3.2 SURFACE PREPARATION

.1 Prepare surfaces in accordance with manufacturer's instructions.

.2 Level and tamp or roll aggregate.

3.3 INSTALLATION

.1 Ensure services are installed and inspected prior to installation of vapour barrier.

.2 Install in accordance with manufacturer's instructions and ASTM E1643.

.3 Unroll vapour barrier over the entire area where the slab is to be poured. Unroll vapour barrier with the longest dimension parallel with the direction of the pour. Completely cover concrete placement area.

.4 Lap vapour barrier over footings and seal to foundation walls.

.5 Overlap all joints 150 mm and seal with manufacturer's tape.

.6 Seal all penetrations (including but not limited to pipes, ducting, rebar) with manufacturer's pipe boot, or tape and mastic.

.7 No penetration of the vapour barrier is allowed except for reinforcing steel and permanent utilities.

.8 Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed. Repair damaged areas by cutting patches of vapour barrier, overlapping damaged area 150mm. Clean all adhesion areas of dust, dirt and moisture. Tape all four sides with tape.

.9 Do not proceed until repair work has been inspected and approved by Departmental Representative.

3.4 CLEANING

.1 Upon completion and verification of performance of installation, remove surplus materials, rubbish, tools and equipment.

END

PART 1 - GENERAL

1.1 REFERENCES

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

.2 American National Standards Institute (ANSI).
.1 ANSI B18.6.4-1998(R2005), Screws, Tapping and Metallic Drive, Inch Series, Thread Forming and Cutting.

.3 American Society for Testing and Materials International (ASTM).
.1 ASTM D523-14(2018), Standard Test Method for Specular Gloss.
.2 ASTM D822/D822M-13, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
.3 ASTM D1781-98(2012), Standard Test Method for Climbing Drum Peel for Adhesives.
.4 ASTM D4214-07(2015), Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.

.4 Green Seal Environmental Standards.
.1 Standard GC-03-93, Anti-Corrosive Paints.
.2 Standard GS-11-2015, Architectural Paints.

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
.1 Material Safety Data Sheets (MSDS).

.6 South Coast Air Quality Management District (SCAQMD), California State
.1 SCAQMD Rule 1168-2017, Adhesives and Sealants Applications.

.7 Underwriters Laboratories of Canada (ULC).
.1 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings.

1.2 DESIGN REQUIREMENTS

.1 Design exterior metal wall panel system and soffit as a “dry joint system” and to withstand live, dead, lateral, wind, seismic, handling, transportation, and erection loads, imposed and other loads.

.2 Design metal cladding and soffit to allow for thermal movement of component materials caused by variation in ambient temperature range of 80 degrees C without causing oil canning, buckling, delamination, failure of joint seals, undue stress on fasteners or other detrimental effects.

.3 Prevent rain penetration through wall system. Incorporate means of draining to the exterior.

.4 Design composite panel and soffit system to prevent rattling and vibration of panels, overstressing of fasteners and clips, and other detrimental effects on the system.

.5 Panel removal: System design to allow removal of individual panels within wall system.

.6 Design miscellaneous, additional structural framing members as required to complete composite panel system, where not indicated on Contract Drawings.

.7 Maximum deviation from vertical and horizontal alignment of erected panels: 1 to 1000.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's printed product literature for cladding system materials, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Submit duplicate copies WHMIS MSDS - Material Safety Data Sheets.

.3 Shop Drawings:
.1 Shop drawings: submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
.2 Indicate dimensions and thickness of panels, fastening and anchoring methods, detail and location of joints and gaskets, thermal movement provision, wall openings, head, jamb and sill details, materials and finish, compliance with design criteria and requirements of related work.

.4 Samples:
.1 Submit duplicate 100 x 100 mm samples of wall and soffit system and insulated panels, representative of materials, finishes and colours.

.5 Quality assurance submittals: submit following in accordance with Section 01 45 00.
.1 Certificates: submit certificates signed by manufacturer certifying that composite wall panels comply with specified performance characteristics and physical properties.
.2 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures.
.3 Manufacturer's Field Reports: submit to manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

.6 Closeout submittals: Provide maintenance instructions for incorporation into Operation and Maintenance Manual, specified in Section 01 78 00.

1.4 QUALITY ASSURANCE

.1 Manufacturer: company specializing in producing composite wall panels with 5 years' documented experience with sufficient capacity to produce and deliver required units without causing delay in work.

.2 Installer: person specializing in composite wall panel installations with 5 years' documented experience and is approved by manufacturer.

.3 Mock-ups: construct mock-ups in accordance with Section 01 45 00 and to requirements supplemented as follows:

.1 Provide mock-up for evaluation of surface finishes and workmanship.

.2 Provide initial production units for job-site assembly with other materials for review.

.3 Co-ordinate type and location of mock-ups with project requirements.

.4 Accepted units will be used as standard for acceptance of production units.

.5 Remove and replace units which are not accepted.

.6 Do not proceed with remaining work until workmanship, colour, and finish are reviewed by Departmental Representative.

.7 Refinish mock-up area as required to produce acceptable work.

.8 When accepted, mock-up will demonstrate minimum standard of quality required for this work.

.4 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section, with contractor's representative and Departmental Representative in accordance with Section 01 32 16 to:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Co-ordination with other building subtrades.

.4 Review manufacturer's installation instructions and warranty requirements.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00.

.2 Deliver, store and protect material in accordance with panel manufacturer's recommendations.

.3 Do not expose panels with strippable film to direct sunlight or extreme heat.

.4 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

1.6 EXTENDED WARRANTY

.1 Submit an extended warranty for composite panel and soffit work for a warranty period of 3 years from date of Substantial Performance of the Work.

.1 Warrant against leaking, warping, twisting, joint, and finish failure.

.2 Coverage: Complete replacement including affected adjacent parts.

2. Manufacturer's Warranty: Provide panel manufacturer's written warranty naming Owner as beneficiary and covering failure of factory-applied exterior finish on composite metal panels within the warranty period; warrant finish per ASTM D4214 for chalk not in excess of 8 NBS units and fade not in excess of 5 NBS units. Warranty period for finish: 10 years from date Work is certified as substantially performed.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Composite panels:
- .1 Thickness: 4 mm.
- .2 Core: thermoplastic resin core.
- .3 Bond integrity testing to adhere to ASTM D1781.
- .4 Colour: refer to Exterior Finish Schedule.

.2 Aluminum face sheets:
- .1 Thickness: 0.51 mm.
- .2 Alloy: AA-3003.

.3 Panel weight: 5.38 kg/m².

.4 Metal panel insulation: CAN/ULC-S701, extruded polystyrene boards in thickness as indicated on drawings.

.5 Aluminum extrusions: alloy AA-6063-T5.

.6 Air/vapour barrier: In accordance with Section 07 25 00.

.7 Sub-girts, Z girts and C channels: CSA S136-16; Minimum 1.2 mm, Z275 galvanized Z girts and C channels. Depth: As indicated.

.8 Flashings, closure pieces, trim: Same material and colour as panels.

.9 Sealants: one-component, silicone base, solvent curing, colour to match panel. Maximum VOC limit 250 g/L to SCAQMD Rule 1168.

.10 Insulation: ASTM C553, 32 kg/m3, mineral wool blanket. Thickness as indicated and having the following minimum criteria.
- .1 Flame spread: 0.
- .2 Smoke developed: 0.
- .3 RSI/25 mm: 0.70 m2K/W.
- .4 Moisture absorption: 0.03%

.11 Accessories:
- .1 Fasteners: ANSI B18.6.4, concealed, thermally broken, stainless steel Type 316, in accordance with manufacturer's recommendations.
- .2 Touch-up paint: as recommended by panel manufacturer.
- .3 Isolation coating: Bituminous coating, acid and alkali resistant material.
- .4 Insulated metal panel adhesive: as recommended by panel manufacturer.

2.2 FABRICATION

.1 Composition: two sheets of aluminum sandwiching core of extruded thermoplastic formed in continuous process with no glues or adhesives.

.2 Factory fabricated.

.3 Fabricate panels flat, true, free of marks, without visible distortion and with edges straight and true. Make all planes true, and corners square and bend of minimum radius.

.4 Tolerances:
.1 Panel bow: maximum 0.8% of panel dimension in width and length.
.2 Panel dimensions: where final dimensions cannot be established by field measurement before completion of panel manufacturing, make allowance for field adjustments as recommended by manufacturer.
.3 Panel lines, breaks and angles: sharp, true and surfaces free from warp or buckle.

.3 Insulated metal panel: Bond aluminum face sheet to insulation board with adhesive as recommended by manufacturer.

2.3 PAINTED FINISHES

.1 Prefinished sheet with factory applied polyvinyl chloride.
.1 Class F2S.
.2 Colour: Colour indicated on Finish Schedule on drawing A022.
.3 Specular gloss: 30 units +/-5 in accordance with ASTM D523.
.4 Coating thickness: not less than 200 micrometres.
.5 Resistance to accelerated weathering for chalk rating of 8, colour fade 5 units or less and erosion rate less than 20% to ASTM D822/D822M as follows:
.1 Outdoor exposure period 5000 hours.
.2 Humidity resistance exposure period 5000 hours.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Before installation examine alignment of substrate and notify Departmental Representative in writing if substrate does not comply with requirements of panel installer.

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 INSTALLATION

.1 Install composite panels, insulated metal panels, soffits, support and anchoring systems in accordance with manufacturer's written instructions and shop drawings.
.1 Allow for thermal movement.

.2 Supply and install miscellaneous, additional structural framing members, required to complete composite panel system, where not indicated on Contract Drawings.

.3 Finished work shall be securely anchored, free of distortion, free of surface imperfections and uniform in colour.

.4 Cut and flash wall penetrations.

.5 Install insulation in continuous contact with air/vapour retarder and neatly fitted between girts, supports, and anchoring system. Adhere insulation with temporary adhesive recommended by air/vapour retarder manufacturer.

.6 Erect wall panels in straight lines, true, level, and plumb.

.7 Maintain following installation tolerances:
.1 Maximum variation from plane or location shown on shop drawings: 10 mm/10 m of length and up to 20 mm/100 m.
.2 Maximum deviation for vertical member: 3 mm in an 8.5 m run.
.3 Maximum deviation for a horizontal member: 3 mm in an 8.5 m run
.4 Maximum offset from true alignment between two adjacent members abutting end to end, in line: 0.75 mm.

.8 Remove strippable coating from panels as they are erected.

.9 Remove damaged, dented, defaced, defectively finished, or tool marked components and replace with new, unless minor blemishes are approved by Departmental Representative.

3.4 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:
.1 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.5 CLEANING

.1 Proceed in accordance with Section 01 74 11.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

.3 Leave work areas clean, free from grease, finger marks and stains.

3.6 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by composite panels installation.

END

PART 1 - GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).
.1 ASTM A653/A653M-17, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
.2 ASTM C920-18, Specification for Elastomeric Joint Sealants.
.3 ASTM D523-14, Standard Test Method for Specular Gloss.
.4 ASTM D2244-16, Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
.5 ASTM D4214-07(2015), Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films

.2 Canadian Standards Association (CSA International)
.1 CSA S136-16, North American specification for the design of cold-formed steel structural members.

1.2 SUBMITTALS

.1 Manufacturer's Instructions: Provide to indicate special handling criteria, installation sequence, cleaning procedures and wind uplift requirements.

.2 Submit product data in accordance with Section 01 33 00.

.3 Submit product data sheets for waterproofing membrane, insulation, roof supports, roof panels, and accessories. Include:
.1 Product characteristics.
.2 Performance criteria.
.3 Limitations.

.4 Submit shop drawings in accordance with Section 01 33 00 indicating.
.1 Arrangements of sheets and joints, materials, thicknesses, dimensions, layouts, wind uplift requirements, types and locations of supports and fasteners and special shapes.
.2 Relationship of panels to structural frame.
.3 Relationship and details of PV panels on metal roof system and metal roof framing and support system including all penetrations and connections to or through roof system.
.4 Details of waterproofing membrane, insulation, connections, and all other components in the system.

.5 Submit samples in accordance with Section 01 33 00. Submit duplicate 300 x 300 mm samples of each sheet metal material.

1.3 QUALITY ASSURANCE

.1 Installer qualifications: company or person specializing in application of modified bituminous roofing systems with 5 years documented experience

.2 Retain a Professional Engineer, licensed in Province of Ontario, with experience in metal roofing work of comparable complexity and scope to perform following services as part of work of this Section:
.1 Design of metal roof system and PV attachment system in accordance with Performance Criteria and details indicated.
.2 Review, stamp, and sign shop drawings.
.3 Conduct shop and on-Site inspections and prepare and submit inspection reports.

.3 Mock-up:
.1 Submit mock-ups in accordance with Section 01 45 00.
.2 Fabricate 1200 x 1200 mm sample roofing panel for each roof system using identical project materials and methods to include typical seam.
.3 Mock-up will be used: To judge quality and workmanship, substrate preparation, and material application.
.4 Locate where directed.
.5 Allow 24 hours for inspection of mock-up by Departmental Representative before proceeding with roofing work.
.6 When accepted, mock-up will demonstrate minimum standard of quality and workmanship required for this Work. Approved mock-up may remain as part of finished Work.

.4 Convene pre-installation meeting two weeks prior to beginning roofing Work, with roofing contractor's representative, room panel manufacturer, and Departmental Representative in accordance with Section 01 32 16 to:
.1 Verify project requirements.
.2 Review wind uplift, installation and substrate conditions.
.3 Co-ordination with other building subtrades.
.4 Review manufacturer's installation instructions and warranty requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions and Section 01 61 00.

.2 Storage and Handling Requirements:
.1 Safety: comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of asphalt, sealing compounds, primers and caulking materials.
.2 Provide and maintain dry, off-ground weatherproof storage.
.3 Remove only in quantities required for same day use.
.4 Store sealants at +5 degrees C minimum.
.5 Store insulation protected from weather and deleterious materials.

.3 Waste Management and disposal: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 20.
.1 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
.2 Fold up metal banding, flatten and place in designated area for recycling.

.3 Place materials defined as hazardous or toxic in designated containers.
.4 Handle and dispose of hazardous or toxic materials in accordance with Authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 PERFORMANCE CRITERIA

.1 Compatibility between components of roofing system is essential. Provide written declaration to Departmental Representative stating that materials and components, as assembled in system, meet this requirement.

.2 Design roofing elements to withstand live, dead, lateral, wind, seismic, handling, transportation and erection loads.

.3 Design metal roofing elements in accordance with following Climatic Design Data for Port Weller contained in Ontario Building Code:
.1 Design temperature: January 1%, July 2 1/2%.
.2 Wind (Hourly wind pressures): 1 in 50 year occurrence.
.3 Earthquake: Seismic Data as listed.

.4 Design metal roofing system to limit deflection under design loads to 360.

.5 Design metal roofing system to prevent restriction of thermal induced movement which would induce deformation such as warping, buckling, and failure of joint seals and fasteners.

.6 Design metal roofing system to prevent the infiltration of water into the roof system and to prevent roofing system components from vibrating due to design wind loads.

.7 Design metal roof system to accommodate installation of PV panels.

2.2 SHEET METAL MATERIALS

.1 Sheet steel: Zinc coated steel sheet to ASTM A653/A653M, prefinished commercial quality, with Z275 zinc coating, surface profile as indicated on drawings, 0.6 mm minimum base metal thickness.

2.3 PREFINISHED STEEL SHEET

.1 Prefinished sheet steel with factory applied polyvinylidene fluoride.
.1 Class F2S.
.2 Colour selected by Departmental Representative from manufacturer's custom standard range.
.3 Specular gloss: 30 units +/-5 to ASTM D523.
.4 Coating thickness: not less than 22 micrometres.
.5 Resistance to accelerated weathering: Will not chalk in excess of a number 8 in accordance with ASTM D-4214-98 method D659.
.6 Will not change colour more than five (5.0) Hunter ΔE units as determined by ASTM method D-2244.

.7 Colour: QC2897 Light Pewter.

.2 Fascia, trim, closure, and flashings: Material, finish, colour, fasteners and thickness to match metal roofing material.

2.4 WATERPROOF/ UNDERLAYMENT MEMBRANE

.1 Waterproof membrane: Minimum 1.0 mm thick, self-adhesive high temperature membrane consisting of SBS modified bitumen adhesive bottom and tri-laminated woven polyethylene top with silicone release film having the following minimum criteria.
- .1 Breaking strength (MD): 10.7 kN/m.
- .2 Elongation at Break (MD): 16%.
- .3 Tear resistance (MD): 400N.
- .4 Static puncture: 140N.
- .5 Water vapour permeance: 1.2 ng/Pa•s•m^2.

2.5 INSULATION

.1 Insulation: ASTM C553, 32 kg/m3, mineral wool blanket. Thickness as indicated and having the following minimum criteria.
- .1 Flame spread: 0.
- .2 Smoke developed: 0.
- .3 RSI/25 mm: 0.70 m^2K/W.
- .4 Moisture absorption: 0.03%

2.6 GIRTS, CHANNELS AND CLIPS

.1 Sub-girts, Z girts and C channels: CSA S136-16; Minimum 1.2 mm, Z275 galvanized Z girts and C channels. Depth: As indicated.

.2 Seam clips: ASTM A653/A653M-17; Z275 galvanized steel, thermal clip system.

2.7 ACCESSORIES

.1 Isolation coating: alkali resistant bituminous paint.

.2 Sealant: ASTM C920, Type S, Grade NS, Class 25; High-performance, medium-modulus, one-part, neutral-cure silicone sealant. Colour to match roofing finish colour.

.3 Manufactured ridge profile for top of gable.

.4 Fasteners: Concealed, screw type, ANSI B18.6.4, stainless steel Type 304. In location where exposed fasteners have to be used, fasteners to be complete with coloured heads to match metal roofing.

.5 Washers: of same material as sheet metal, 1 mm thick with rubber packings.

.6 Touch-up paint: as recommended by sheet metal roofing manufacturer.

2.8 FABRICATION

.1 Fabricate roof components in accordance with reviewed shop drawings factory-ready for field installation.

.2 Form individual pieces in 2400 mm maximum lengths. Make allowances for expansion at joints.

.3 Fabricate metal roofing panels square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.4 Notch Z girts and C channels as required to allow for drainage of rain screen cavity.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Departmental Representative. Commencement of work of this Section means acceptance of existing conditions.

3.2 WATERPROOF MEMBRANE

.1 Install primer and waterproof membrane continuously over deck, in accordance with manufacturer's instructions.

.2 Overlap waterproof membrane 50 mm along sidelaps and 75 mm on end laps and lap in direction of waterflow.

3.3 GIRTS AND CHANNELS

.1 Install Z girts, fastened through waterproof membrane and into structural framing beneath. Orient Z girts to drain water from rainscreen cavity.

.2 Frame roofing system edges, with C channels and orient channel webs to face outwards.

3.4 INSULATION

.1 Prior to installation of insulation, examine waterproofing membrane and make good damage.

.2 Install metal roof insulation in continuous contact with waterproof membrane and fitted between Z girts and C channels. Butt boards together with no spaces between boards. Areas of insulation system having voids will be rejected.

.3 When cutting insulation board, cut completely though board thickness and trim to provide plain but joints. Do not break or tear insulation board to fit detail.

3.5 FASCIA, TRIM, CLOSURES, AND FLASHINGS

.1 Form and profile fascia and trim including inside and outside corners, flashing, edgings, cap strips, drips, fillers, closure strips, and starter strips in accordance with the drawings.

.2 Flashings to utilize an "S" locking joint for concealed fastening.

.3 Cut neat holes in metal roofing to accommodate roof penetrations and install flashing for a watertight installation.

3.6 METAL ROOF INSTALLATION

.1 Install metal roofing in accordance with reviewed shop drawings and manufacturer's written instructions.

.2 Use concealed fastenings except where approved by Departmental Representative before installation.

.3 Install seam clips spaced as indicated on reviewed shop drawings to comply with design criteria. Secure cleats with two fasteners each minimum, into Z girts or metal deck.

.4 Fold lower end of each panel 19 mm to underside, and upper end of each panel 50 mm onto topside. Slit fold 25 mm away from corner to form tab where panel turns up to make standing seam. Interlock lower and upper ends of panels.

.5 Apply sheet metal roofing beginning at eaves. Loose lock pans to valley flashing and edge strips at eaves and gable rakes.

.6 Install standing seams complete with snap on caps in accordance with reviewed shop drawings.

.7 Install metal roofing panels in one piece, for entire slope, except as indicated otherwise. In locations that roof panels cannot be installed in one piece, provide 100 mm starter strip to join the panels together. Provide a continuous sealant bead under starter strip.

.8 Metal roof panels terminating at eaves or valleys shall not have a raw metal edge or exposed fasteners. Fold panel ends and install in accordance with reviewed shop drawings

.9 Insert metal roof panels terminating at hips or ridges into concealed metal closures. Metal closures shall allow for expansion of the metal roof panel and also act as a starter strip for hip or ridge flashings.

.10 Install valley sheets not exceeding 3 m in length. Shingle lap joints 150 mm in direction of flow. Extend valley sheet minimum 150 mm under roofing sheets. Double fold valley and roofing sheets and secure at 450 mm oc.

.11 Apply isolation coating to metal surfaces in contact with concrete or mortar.

.12 Remove and replace damaged metal roofing. Do not touch-up damaged panels.

.13 Seal where necessary to form weathertight seal between flashing and adjoining surfaces and between flashing and other work. Sealing work consists of bedding between members where possible. Tool sealant to concave profile where exposed.

.14 Clean exposed finished surfaces of complete installation free of dirt, grease and smudges. Touch-up scratches with air dry formulation of coating system to match original factory finish.

END

PART 1 - GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
.1 ASTM A653/A653M-17, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
.2 ASTM C920-18, Specification for Elastomeric Joint Sealants.
.3 ASTM D523-14, Standard Test Method for Specular Gloss.
.4 ASTM D822/D822M-13, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.

.2 Canadian Roofing Contractors Association (CRCA)
.1 Roofing Specifications Manual.

.3 Canadian Standards Association (CSA International)
.1 CSA A123.1/A123.2-14(R2018), Precast concrete paving slabs/Precast concrete pavers.
.2 CSA A123.3-05(R2015), Asphalt Saturated Organic Roofing Felt.
.3 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.

1.2 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's printed product literature for sheet metal flashing systems materials, wind uplift requirements, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Submit two copies WHMIS MSDS - Material Safety Data Sheets.

.3 Shop Drawings:
.1 Shop drawings: submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

.4 Samples:
.1 Submit duplicate 50 x 50 mm samples of each type of sheet metal material, finishes and colours.

.5 Quality assurance submittals: submit following in accordance with Section 01 45 00.
.1 Manufacturer's Instructions: submit manufacturer's installation instructions, wind uplift requirements, and special handling criteria, installation sequence, and cleaning procedures.

1.3 QUALITY ASSURANCE

.1 Pre-Installation Meeting: convene pre-installation meeting two weeks prior to beginning on-site installation, with contractor's representative and Departmental Representative in accordance with Section 01 32 16 to:

.1 Verify project and wind uplift requirements.
.2 Review installation and substrate conditions.
.3 Co-ordination with other building subtrades.
.4 Review manufacturer's installation instructions and warranty requirements.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00.

.2 Waste Management and Disposal:
.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

.1 Zinc coated steel sheet: 0.60 mm thickness, commercial quality to ASTM A653/A653M, with Z275 designation zinc coating.

2.2 PREFINISHED STEEL SHEET

.1 Prefinished steel with factory applied polyvinylidene fluoride.
.1 Class F2S.
.2 Colour: Colour indicated on Finish Schedule on drawing A022.
.3 Specular gloss: 30 units +/- in accordance with ASTM D523.
.4 Coating thickness: not less than [22] micrometres.
.5 Resistance to accelerated weathering for chalk rating of 8, colour fade 5 units or less and erosion rate less than 20% to ASTM D822/D822M as follows:
.1 Outdoor exposure period 2500 hours.
.2 Humidity resistance exposure period 5000 hours.

2.3 ACCESSORIES

.1 Isolation coating: alkali resistant bituminous paint.

.2 Plastic cement: to CAN/CGSB-37.5.

.3 Underlay for metal flashing: No. 15 perforated asphalt felt to CSA A123.3.

.4 Sealants: ASTM C920, Type S, Grade NS, Class 25, SWRI validated; High-performance, medium-modulus, one-part, neutral-cure silicone sealant. Colour to match flashing finish colour.

.5 Cleats: of same material, and temper as sheet metal, minimum 50 mm wide. Thickness 1.2 mm.

.6 Fasteners: of same material as sheet metal, to CSA B111, ring thread flat head roofing nails of length and thickness suitable for metal flashing application.

.7 Washers: of same material as sheet metal, 1 mm thick with rubber packings.

.8 Touch-up paint: as recommended by prefinished material manufacturer.

.9 Precast concrete pad: to CSA A231.1/A231.2, minimum 87 kg/m2, maximum 107 kg/m2, 5% air-entrainment, 610 x 610 x 57 mm thick natural precast concrete with minimum 55MPa compressive strength and shotblast finish.

2.4 FABRICATION

.1 Fabricate metal flashings and other sheet metal work in accordance with applicable CRCA 'FL' series details.

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

.3 Hem exposed edges on underside 12 mm. Mitre and seal corners with sealant.

.4 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.5 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

2.5 METAL FLASHINGS

.1 Form flashings, copings and fascias to profiles indicated of 0.6 mm thick prefinished sheet steel.

2.6 REGLETS AND CAP FLASHINGS

.1 Form recessed reglets and metal cap flashing of 0.6 mm thick in accordance with CRCA FL series details.
  .1 Provide slotted fixing holes and steel/plastic washer fasteners.
  .2 Cover face and ends with plastic tape.

2.7 EAVES TROUGHS AND DOWNPIPES

.1 Form eaves troughs and downpipes from 0.6 mm thick prefinished sheet metal.

.2 Sizes and profiles as indicated.

.3 Provide goosenecks, outlets, strainer baskets and necessary fastenings.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install sheet metal work in accordance with CRCA FL series details and as detailed.

.2 Use concealed fastenings except where approved before installation.

.3 Provide underlay under sheet metal. Secure in place and lap joints 100 mm.

.4 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs.
.1 Flash joints using S-lock seams forming tight fit over cleat strips and as detailed.

.5 Lock end joints and caulk with sealant.

.6 Turn top edge of flashing into recessed reglet or mortar joint minimum of 25 mm. Lead wedge flashing securely into joint.

.7 Caulk flashing at reglet and cap flashing with sealant.

3.3 EAVES TROUGHS AND DOWNPIPES

.1 Install eaves troughs and secure to building at 750 mm on centre with eaves trough screws through spacer ferrules. Slope eaves troughs to downpipes as indicated.

.2 Install downpipes and provide goosenecks back to wall. Secure downpipes to wall with straps at 1800 mm on centre; minimum two straps per downpipe.

.3 Install one splash pad for each downpipe, angled away from building.

3.4 CLEANING

.1 Proceed in accordance with Section 01 74 11.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

.3 Leave work areas clean, free from grease, finger marks and stains.

END

PART 1 - GENERAL

1.1 REFERENCES

.1 ASTM International
.1 ASTM A123/A123M-17, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
.2 ASTM A500/A500M-18, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

.2 CSA International
.1 CSA G40.20-13/G40.21-13 (R2018), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
.2 CSA W47.1-09(R2014), Certification of Companies for Fusion Welding of Steel.
.3 CSA W55.3-08(R2013), Certification of Companies for Resistance Welding of Steel and Aluminum.

.3 The Master Painters Institute (MPI)
.1 Architectural Painting Specification Manual.
.1 MPI #101, Primer, Epoxy, Anti-Corrosive, for Metal.

.4 The Society for Protective Coatings (SSPC)
.1 SSPC-SP 2-04, Hand-Tool Cleaning.

1.2 SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data: Submit manufacturer's instructions, printed product literature and data sheets for roof anchors and safety restraints and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
.1 Indicate component profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
.2 Indicate welded connections using standard welding symbols include net weld lengths.
.2 Submit design data and calculations.

1.3 QUALITY ASSURANCE

.1 Design structural support framing components and site inspect installation under direct supervision of Professional Structural Engineer experienced in design of this Work and licensed in the Province of Ontario, Canada.

.2 Qualifications:
.1 Welder's qualifications: welders certification to CSA W55.3
.1 Employ qualified and licensed welders possessing certificates for each procedure to be performed.
.2 Each welder to possess identification symbol issued by authority having jurisdiction.
.2 Welding company certification: certified for fusion welding of steel structures to CSA W47.1
.3 Manufacturer Qualifications: company specializing in manufacturing products specified in this section with minimum 3 years documented experience.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect roof anchors and safety restraints from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

.1 Personal Restraint Assembly: Posts, anchors and attachments to resist lateral forces of 3 kN at any point and in all directions, without damage or permanent set.

2.2 MATERIALS

.1 Steel Sections and Plates: CSA G40.20M/G40.21.

.2 Steel Tubing: ASTM A500/A500M, Grade B.

.3 Steel Rings: forged steel, ring thickness determined by imposed loads.

.4 Bolts, Nuts, and Washers for Stainless Steel: stainless steel, matte finish.

.5 Gaskets Under Anchors: neoprene pads, compatible with roof membrane, cut to size.

.6 Welding Materials: CSA W47.1 for materials being welded.

.7 Shop Primer: MPI #101, 2 coats.

2.3 FABRICATION

.1 Fit and shop assemble items in largest practical sections, for delivery to site.

.2 Fabricate items with joints tightly fitted and secured.

.3 Continuously seal joined members by intermittent welds and plastic filler.

.4 Grind exposed joints flush and smooth with adjacent finish surface.
- .1 Make exposed joints butt tight, flush, and hairline.
- .2 Ease exposed edges to small uniform radius.

.5 Exposed Mechanical Fastenings: screws or bolts; consistent with design of component.

.6 Furnish and install components required for anchorage of fabrications.

.7 Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.4 FABRICATION TOLERANCES

.1 Squareness: 3 mm maximum difference in diagonal measurements.

.2 Maximum Deviation from Plane: 1.5 mm from 1 m.

2.5 FINISHES

.1 Prepare uncoated steel (restraint post) surfaces: SSPC-SP 2, no more than 4 hours before applying epoxy primer.

.2 Concealed steel anchors, clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

.3 Do not prime surfaces in direct contact with concrete or where field welding is required.

.4 Concealed Structural Components and Anchors: galvanize after fabrication to ASTM A123/A123M Coating Grade 85 to minimum 600 g/sq m galvanized coating.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for roof anchors and safety restraint installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

.2 Verify dimensions, tolerances, and method of attachment with other work.

3.2 PREPARATION

.1 Supply and install steel items required to be attached to steel support framing as clean uncoated metal, with setting templates to appropriate sections.

3.3 ERECTION TOLERANCES

.1 Maximum Variation from Plumb: 3 mm.

3.4 INSTALLATION

.1 Install items plumb and level, accurately fitted, free from distortion or defects.

.2 Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

.3 Field weld components as indicated on shop drawings.

.4 Obtain approval from Departmental Representative prior to site cutting or making adjustments not scheduled.

.5 After erection, apply primer in accordance with MPI Painting Manual to: welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by roof anchors and safety restraint installation.

END

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Materials, preparation and application for caulking and sealants.

.2 Text to complete other various Sections containing sealant or caulking specifications.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)
.1 ASTM C834-17, Standard Specification for Latex Sealants.
.2 ASTM C920-18, Standard Specification for Elastomeric Joint Sealants.

.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-19.17-M90, One-Component Acrylic Emulsion Base Sealing Compound.

.3 Department of Justice Canada (Jus)
.1 Canadian Environmental Protection Act, 1999 (CEPA).

.4 Transport Canada (TC)
.1 Transportation of Dangerous Goods Act, 1992 (TDGA).

1.3 SUBMITTALS

.1 Submit product data in accordance with Section 01 33 00.

.2 Manufacturer's product to describe.
.1 Caulking compound.
.2 Primers.
.3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.

.3 Submit samples in accordance with Section 01 33 00.

.4 Submit duplicate samples of each type of material and colour.

.5 Cured samples of exposed sealants for each color where required to match adjacent material.

.6 Submit manufacturer's instructions in accordance with Section 01 33 00.
.1 Instructions to include installation instructions for each product used.

1.4 QUALITY ASSURANCE/MOCK-UP

.1 Construct mock-up in accordance with Section 01 45 00.

.2 Construct mock-up to show location, size, shape and depth of joints complete with back-up material, primer, caulking and sealant.

.3 Mock-up will be used: To judge workmanship, substrate preparation, operation of equipment and material application.

.4 Locate where directed.

.5 Allow 24 hours for inspection of mock-up by Departmental Representative before proceeding with sealant work.

.6 When accepted, mock-up will demonstrate minimum standard of quality required for this Work. Approved mock-up may remain as part of finished Work.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, handle, store and protect materials in accordance with Section 01 61 00.

.2 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Place materials defined as hazardous or toxic in designated containers.

.5 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.

.6 Unused sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.

.7 Divert unused joint sealing material from landfill to official hazardous material collections site approved by Departmental Representative.

.8 Empty plastic joint sealer containers are not recyclable. Do not dispose of empty containers with plastic materials destined for recycling.

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

1.7 PROJECT CONDITIONS

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

.2 Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

.3 Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.8 ENVIRONMENTAL REQUIREMENTS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Labour Canada.

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

PART 2 - PRODUCTS

2.1 SEALANT MATERIALS

.1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.

.2 When low toxicity caulks are not possible, confine usage to areas which offgas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize offgas time.

.3 Where sealants are qualified with primers use only these primers.

2.2 SEALANT MATERIAL DESIGNATIONS

.1 Silicones One Part:
.1 **Type A**: Primerless To ASTM C920, Type S, Grade NS, Class 50, SWRI validated.

.2 Acrylic Latex One Part (**Type C**): Primerless to CAN/CGSB-19.17-M and ASTM C834, Type OP, Grade -18 deg. C, Class 12.5.

.3 Acoustical Sealant. Primerless, to ASTM C920, Type S, Grade NS, Class 25, SWRI validated.

.4 Preformed Compressible and Non-Compressible back-up materials:
.1 Polyethylene, Urethane, Neoprene or Vinyl Foam.
.1 Extruded open or closed cell foam backer rod.
.2 Size: oversize 30 to 50%.
.2 Bond Breaker Tape: Polyethylene bond breaker tape which will not bond to sealant.

2.3 SEALANT SELECTION

.1 Perimeters of exterior openings where frames meet exterior facade of building (i.e. brick, block, precast masonry): **Type A**.

.2 Expansion and control joints in exterior surfaces of masonry and poured-in-place concrete walls: **Type A.**

.3 Coping joints and coping-to facade joints: **Type A**.

.4 Cornice and wash (or horizontal surface joints): **Type A**.

.5 Seal interior perimeters of exterior openings as detailed on drawings: **Type C**.

.6 Control and expansion joints on the interior of masonry and exterior poured-in place concrete walls: **Type A**.

.7 Interior control and expansion joints in floor surfaces: **Type A**.

.8 Interior masonry vertical control joints (block-to-block, block-to-concrete, and intersecting masonry walls): **Type C**.

2.4 JOINT CLEANER

.1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant recommended by sealant manufacturer.

.2 Primer: as recommended by manufacturer.

PART 3 - EXECUTION

3.1 PROTECTION

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

3.2 SURFACE PREPARATION

.1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.

.2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.

.3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

.4 Ensure joint surfaces are dry and frost free.

.5 Prepare surfaces in accordance with manufacturer's directions.

3.3 PRIMING

.1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.

.2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

3.4 BACKUP MATERIAL

.1 Apply bond breaker tape where required to manufacturer's instructions.

.2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

3.5 MIXING

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

3.6 APPLICATION

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

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

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

END

PART 1 - GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
.1 ASTM A653/A653M-17, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
.2 CGSB 41-GP-19Ma-84, Rigid Vinyl Extrusions for Windows and Doors.

.3 Canadian Standards Association (CSA International)
.1 CSA G40.20-13/G40.21-13 (R2018), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
.2 CSA W59-18, Welded Steel Construction (Metal Arc Welding).

.4 Canadian Steel Door Manufacturers' Association (CSDMA)
.1 CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, 2006.
.2 CSDMA, Selection and Usage Guide for Commercial Steel Door and Frame Products, 2009.

.5 Underwriters' Laboratories of Canada (ULC)
.1 CAN/ULC-S704-11, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

1.2 SYSTEM DESCRIPTION

.1 Design Requirements:
.1 Design exterior frame assembly to accommodate to expansion and contraction when subjected to minimum and maximum surface temperature of -35 degrees C to 35 degrees C.
.2 Maximum deflection for exterior steel entrance screens under wind load of 1.2 kPa not to exceed 1/175th of span.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Provide product data: in accordance with Section 01 33 00.

.3 Provide shop drawings: in accordance with Section 01 33 00.
.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
.2 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, arrangement of hardware and finishes.
.3 Indicate each type of frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings, reinforcements, and finishes.

.4 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.

.4 Provide samples in accordance with Section 01 33 00.

.5 Submit one 300 x 300 mm corner sample of each type of door and frame.
.1 Show butt cutout, glazing stops, and snap-on trim with clips.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00.

.2 Waste Management and Disposal: Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Hot dipped galvanized steel sheet: to ASTM A653/A653M, Z275, minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts, minimum 30% recycled content.

.2 Reinforcement channel: to CSA G40.20/G40.21, Type 44W, coating designation to ASTM A653/A653M, Z275, minimum 30% recycled content.

2.2 DOOR CORE MATERIALS

.1 Stiffened: face sheets laminated to polyurethane core and steel stiffened for insulated and fire rated cores.

.2 Exterior doors: Polyurethane: to CAN/ULC-S704 rigid, closed cell board, density 32 kg/m³.

2.3 ADHESIVES

.1 Polyurethane cores: heat resistant, epoxy resin based, low viscosity, contact cement.

2.4 PRIMER

.1 Touch-up prime CAN/CGSB-1.181.

2.5 PAINT

.1 Field paint steel doors and frames in accordance with Section 09 91 00. Protect weatherstrips from paint. Provide final finish free of scratches or other blemishes.

2.6 ACCESSORIES

.1 Door silencers: single stud rubber/neoprene type.

.2 Exterior top and bottom caps: rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19Ma.

.3 Fabricate glazing stops as formed channel, minimum 16 mm height, accurately fitted, butted at corners and fastened to frame sections with counter-sunk oval head sheet metal screws.

.4 Metallic paste filler: to manufacturer's standard.

.5 Fire labels: metal riveted.

.6 Sealant: in accordance with Section 07 92 00.

.7 Glazing: in accordance with Section 08 80 00.

.8 Weatherstripping: Manufacturer's standard heavy duty, durable, non-absorbing material resistant to deterioration by aging and weathering.

.9 Make provisions for glazing as indicated and provide necessary glazing stops and retainers.
.1 Provide removable stainless steel glazing beads for use with glazing tapes and compounds and secured with countersunk tamperproof stainless steel screws.

2.7 FRAMES FABRICATION GENERAL

.1 Fabricate frames in accordance with CSDMA specifications.

.2 Fabricate frames to profiles and maximum face sizes as indicated.

.3 Exterior frames: 1.6 mm, welded, thermally broken type construction.

.4 Blank, reinforce, drill and tap frames for mortised, templated hardware, using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.

.5 Prepare frame for door silencers, 3 for single door, 2 at head for double door.

.6 Manufacturer's nameplates on frames and screens are not permitted.

.7 Conceal fastenings except where exposed fastenings are indicated.

.8 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.

.9 Insulate exterior frame components with polyurethane insulation.

2.8 FRAME ANCHORAGE

.1 Provide appropriate anchorage to floor and wall construction.

.2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.

.3 Provide 2 anchors for rebate opening heights up to 1520 mm and 1 additional anchor for each additional 760 mm of height or fraction thereof.

.4 Locate anchors for frames in existing openings not more than 150 mm from top and bottom of each jambs and intermediate at 660 mm on centre maximum.

2.9 FRAMES: WELDED TYPE

.1 Welding in accordance with CSA W59.

.2 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.

.3 Cope accurately and securely weld butt joints of mullions, centre rails and sills.

.4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.

.5 Securely attach floor anchors to inside of each jamb profile.

.6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.

2.10 DOOR FABRICATION GENERAL

.1 Doors: swing type, flush, with provision for glass and/or louvre openings as indicated.

.2 Exterior doors: hollow steel construction.

.3 Fabricate doors with longitudinal edges welded. Seams: grind welded joints to a flat plane, fill with metallic paste filler and sand to a uniform smooth finish.

.4 Blank, reinforce, drill doors and tap for mortised and templated hardware.

.5 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.

.6 Reinforce doors where required, for surface mounted hardware. Provide flush steel top caps to exterior doors.

.7 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.

.8 Manufacturer's nameplates on doors are not permitted.

2.11 HOLLOW STEEL CONSTRUCTION

.1 Form face sheets for exterior doors from 1.6 mm sheet steel.

.2 Reinforce doors with vertical stiffeners, securely welded to face sheets at 150 mm on centre maximum.

.3 Fill voids between stiffeners of exterior doors with polyurethane core.

2.12 THERMALLY BROKEN DOORS AND FRAMES

.1 Fabricate thermally broken doors by using insulated core and separating exterior parts from interior parts with continuous interlocking thermal break.

.2 Thermal break: rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19Ma.

.3 Fabricate thermally broken frames separating exterior parts form interior parts with continuous interlocking thermal break.

.4 Apply insulation.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION GENERAL

.1 Install doors and frames to CSDMA Installation Guide.

3.3 FRAME INSTALLATION

.1 Set frames plumb, square, level and at correct elevation.

.2 Secure anchorages and connections to adjacent construction.

.3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.

.4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.

.5 Caulk perimeter of frames between frame and adjacent material.

.6 Maintain continuity of air barrier and vapour retarder.

3.4 DOOR INSTALLATION

.1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 00.

.2 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows.
- .1 Hinge side: 1.0 mm.
- .2 Latchside and head: 1.5 mm.
- .3 Finished floor, noncombustible sill and thresholds: 13 mm.

.3 Adjust operable parts for correct function.

.4 Install louvres.

3.5 FINISH REPAIRS

.1 Touch up with primer finishes damaged during installation.

.2 Fill exposed frame anchors with metallic paste filler and sand to a uniform smooth finish.

3.6 GLAZING

.1 Install glazing for doors and frames in accordance with Section 08 80 00.

END

PART 1 - GENERAL

1.1 REFERENCES

.1 ASTM International (ASTM)
.1 ASTM A653/A653M-09 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
.2 ASTM A123/A123M-17, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
.3 ASTM A1008/A1008M-16, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
.4 ASTM D523-14, Standard Test Method for Specular Gloss.
.5 ASTM D822/D822M-13, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.

.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-1.105-M91, Quick-Drying Primer.
.2 CAN/CGSB-1.181-99, Ready-Mixed, Organic Zinc-Rich Coatings.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Installation Meetings:
.1 Convene pre-installation meeting 2 weeks prior to beginning work of this Section and on-site installation, with Contractor's Representative and Departmental Representative in accordance with Section 01 31 19 to:
.1 Verify project requirements.
.2 Review installation and substrate conditions.
.3 Co-ordination with other construction subtrades.
.4 Review manufacturer's written installation instructions and warranty requirements.

.2 Hold project meetings as required by Departmental Representative.

.3 Ensure key personnel, contractor's site supervisor, and subcontractor representatives attend.

.4 Departmental Representative will submit written notification of change to meeting schedule established upon contract award 24 hours prior to scheduled meeting.

1.3 SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data: Submit manufacturer's instructions, printed product literature and data sheets for doors, hardware, and accessories and include preparation instructions, product characteristics, performance criteria, physical size, installation instructions, finish and limitations.

.3 Shop Drawings:
.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
.2 Indicate sizes, service rating, types, materials, operating mechanisms, glazing locations and details, hardware, and accessories, required clearances.

.4 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.5 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

.6 Manufacturers Reports: Manufacturer's Field Reports: submit manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in Part 3 - FIELD QUALITY CONTROL.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00.

.2 Operation and Maintenance Data: submit operation and maintenance data for sectional metal doors for incorporation into manual.

1.5 MAINTENANCE MATERIAL SUBMITTALS

.1 Submit in accordance with Section 01 78 00.

1.6 QUALITY ASSURANCE

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

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect sectional metal doors, hardware and accessories from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section 01 74 20.

.5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

.1 Design exterior door assembly to withstand wind load of 1.2 kPa with a maximum horizontal deflection of 1/240 of opening width and a minimum safety factor of 1.5 times wind load.

.2 Design door panel assemblies with thermal insulation factor 3.24 RSI.

.3 Design door assembly to withstand minimum 50,000 cycles per annum, and 10 years total life cycle.

2.2 MATERIALS

.1 Galvanized steel sheet: to ASTM A653/A653M commercial quality Z275 zinc coating.

.2 Steel sheet: commercial quality to ASTM A1008/A1008M, exposed (E), with galvanized finish.

.3 Primer: to CAN/CGSB-1.105 for steel and CAN/CGSB-1.181, for galvanized steel surfaces.

.4 Insulation: Foam in place polyurethane to meet specified RSI value.

.5 Cable: multi-strand galvanized steel aircraft cable.

2.3 DOORS

.1 Fabricate 51 mm thick insulated, flush doors of interlocking steel sections as indicated.

.2 Door skins:
.1 Exterior: minimum 0.912 mm.
.2 Interior: minimum 0.417 mm.

.3 Fabricate panel frames in a continuous box frame with vertical stiffeners at 600 mm centres.

.4 Assemble components by means of spot or arc welding or coated rivet system or adhesive and self tapping screws to manufacturer's recommendations.

.5 Fabricate doors from prepainted steel stock.

2.4 STANDARD DUTY INDUSTRIAL HARDWARE

.1 Track: standard lift hardware with 75 mm size minimum 2.28 mm core thickness galvanized steel track.

.2 Track Supports: 2.3 mm core thickness continuous galvanized steel angle track supports.

.3 Spring counter balance: heavy duty oil tempered torsion spring with manufacturers standard brackets.
.1 Drum: 133 mm diameter die cast aluminum.
.2 Shaft: 40 mm diameter solid steel.

.4 Top roller carrier: galvanized steel minimum 2.28 mm thick adjustable.

.5 Rollers: full floating, grease packed hardened steel, ball bearing minimum 75 mm diameter, stamped tire.

.6 Roller brackets: adjustable, galvanized steel, minimum 2.5 mm thick.

.7 Hinges: standard duty industrial 2.28 mm thick galvanized.

.8 Cable: minimum 4 mm diameter galvanized steel aircraft cable.

2.5 ACCESSORIES

.1 Overhead horizontal track and operator supports: galvanized steel, type and size to suit installation.

.2 Track guards: 5 mm thick formed sheet 1500 mm high track guards.

.3 Pusher springs.

.4 Handles:
.1 Flat bar door latch with night latch.
.2 Handles: handle operated from outside, handle operated from inside.

.5 Two horizontal sliding lock bolts on interior.

.6 Weatherstripping:
.1 Sills: bulb type full width extruded neoprene weatherstrip.
.2 Jambs and head: extruded aluminum and arctic grade vinyl weatherstrip to manufacturer's standard.

.7 Finish ferrous hardware items with minimum zinc coating of 300 g/m^2 to ASTM A123/A123M.

2.6 PREFINISHED STEEL SHEET

.1 Prefinished steel with factory applied polyvinylidene fluoride.
.1 Class F2S.
.2 Colour as indicated on Contract Drawings.
.3 Specular gloss: 30 units +/- in accordance with ASTM D523.
.4 Coating thickness: not less than 22 micrometres.

.5 Resistance to accelerated weathering for chalk rating of 8, colour fade 5 units or less and erosion rate less than 20% to ASTM D822/D822M as follows:
.1 Outdoor exposure period 2500 hours.
.2 Humidity resistance exposure period 5000 hours.

2.7 OPERATORS

.1 Equip doors for operation by:
.1 Hand, two handles on inside face of door.
.2 Chain hoist with galvanized steel chain.

.2 Cable fail safe device. Able to stop door immediately if cable breaks on door free fall. Braking capacity 500 kg.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for sectional metal doors installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

.2 Install doors and hardware in accordance with manufacturer's instructions.

.3 Rigidly support rail and operator and secure to supporting structure.

.4 Touch-up steel doors with primer where galvanized finish damaged during fabrication.

.5 Adjust weatherstripping to form a weather tight seal.

.6 Adjust doors for smooth operation.

3.3 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:
.1 Obtain written reports from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product within 3 days of review.
.2 Submit manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
.3 Schedule site visits to review Work at stages listed:
.1 After delivery and storage of products, and when preparatory Work on which Work of this Section depends is complete, but before installation begins.
.2 Twice during progress of Work at 50% and 75% complete.
.3 Upon completion of Work, after cleaning is carried out.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
.1 Remove traces of primer; clean doors and frames.
.2 Clean glass and glazing materials with approved non-abrasive cleaner.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 11. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by sectional metal door installation.

END

PART 1 - GENERAL

1.1 REFERENCES

.1 American National Standards Institute (ANSI).
.1 ANSI H35.1/H35.1M-17, Alloy and Temper Designation Systems for Aluminum (Metric).

.2 American Society for Testing and Materials International, (ASTM)
.1 ASTM B221M-13, Standard Specification for Aluminum-Alloy Extruded Bars, Rods, Wires, Profiles and Tubes (metric).
.2 ASTM E331-00(2016), Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.

.3 Canadian Standards Association (CSA) International.
.1 AAMA/WDMA/CSA-101/I.S.2/A440-11(R2016), NAFS - North American Fenestration Standard/ Specification for Windows, Doors and Skylights.
.2 CSA A440S1-09, Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440-08, NAFS - North American Fenestration Standard/Specification for windows, doors, and skylights.

.4 Insulating Glass Manufacturers Association of Canada (IGMAC)
.1 North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use - 2004.

.5 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-79.1-M91, Insect Screens.

.6 South Coast Air Quality Management District (SCAQMD).
.1 SCAQMD Rule 1168-2017, Adhesives and Sealants.

.7 Underwriters Laboratories of Canada (ULC)
.1 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.2 DESIGN REQUIREMENTS

.1 Design aluminum window work to accommodate following without producing detrimental effect:
.1 Cyclic 40 degrees C daily thermal swing of components.
.2 Cyclic, dynamic loading and release of loads such as wind loads.
.3 13 mm vertical deflection in supporting structure and movement of supporting structure due to live, dead load, and creep or deflections, seismic load, sway displacement and similar items.

.2 Design window system to prevent accumulation of condensate on interior side of aluminum work framing under the service conditions respective to Place of Work.

.3 Design and detail controlled drainage path to actively discharge water, which enters into or forms within steel work, to exterior; prevent accumulation or storage of water within steel work. Prevent water from entering interior when tested in accordance with ASTM E331.

.4 Design aluminum windows in accordance to AAMA/WDMA/CSA -101/I.S.2/ A440, to meet performance levels as follows:
- .1 Performance class: CW.
- .2 Minimum performance grade (PG): 30.
- .3 Minimum positive design pressure: 1440 Pa.
- .4 Minimum negative design pressure: - 1440 Pa.
- .5 Minimum water penetration test pressure: 220 Pa.
- .6 Minimum air infiltration/exfiltration: A3.

.5 Design triple glazed window system, including glazing, to meet the following minimum performance criteria:
- .1 Visible light transmittance (LT): 58%.
- .2 Solar energy transmittance: 27%.
- .3 UV light transmittance: 12%.
- .4 Centre of glass U-Value (winter): 0.18.
- .5 Solar heat gain coefficient (SHGC): 0.33.
- .6 Shading coefficient: 0.38.

.6 Design and detail air barrier, vapour retarder, and rainscreen products and assemblies into continuous and integrated steel work envelope. Optimize aluminum work design to align envelope layers and to minimize thermal bridges.

.7 Prevent deflection and permanent or progressive glazing displacement. Restrict horizontal and vertical mullion deflection to less than L/175 (under uniformly distributed positive design wind load), and 10 mm maximum regardless of span.

.8 Design anchorage inserts for installation as part of other Sections of Work. Design anchorage assemblies to accommodate construction and installation tolerances.

1.3 SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for aluminum windows and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
- .2 Indicate materials and details in full size scale for head, jamb and sill, profiles of components, elevations of unit, anchorage details, location of isolation coating, description of related components, exposed finishes fasteners, caulking and juncture with adjacent construction. Indicate location of manufacturer's nameplates.

.4 Samples:
- .1 Submit for review and acceptance of each unit.
- .2 Samples will be returned for inclusion into work.
- .3 Submit one complete full size window sample of each type window.

.4 Include frame, sash, sill, glazing and weatherproofing method, insect screens, surface finish and hardware. Show location of manufacturer's nameplates.
.5 Include 150 mm long samples of head, jamb, sill, mullions to indicate profile.

.5 Test and Evaluation Reports:
.1 Submit test reports from approved independent testing laboratories, certifying compliance with specifications.
.2 All test reports that reference the NAFS must include, on the first page, a summary of the results including, at minimum:
.1 The product manufacturer.
.2 The type of product.
.3 The model number/series number.
.4 The primary product designation.
.5 The secondary product designation.
.1 Positive design pressure.
.2 Negative design pressure.
.3 Water penetration resistance test pressure.
.4 Canadian air infiltration and exfiltration levels.
.6 The test completion date.
.3 The report will also contain the following information:
.1 Test dates.
.2 Report preparation dates.
.3 Test information retention period.
.4 Location of testing facilities.
.5 Full description of test samples, including:
.1 Anodized finish, weathering characteristics.
.2 Condensation resistance.
.3 Sash strength and stiffness - operable window.
.4 Forced entry resistance.
.6 Complete description of amendments, as applicable.
.7 Conclusion.
.8 Drawings signed by the testing laboratory, if provided.

.6 Certifications: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.7 Closeout submittals:

.1 Submit in accordance with Section 01 78 00.

.2 Operation and Maintenance Data: submit operation and maintenance data for windows for incorporation into manual.

1.4 QUALITY ASSURANCE

.1 Qualifications:
.1 Manufacturer: company specializing in performing work of this section with minimum 10 years documented experience with manufacture of aluminum windows.
.2 Installer: company specializing in performing work of this section with minimum 5 years documented experience with installation of aluminum windows.
.1 Completed installation must be approved by the window manufacturer.

.2 Mock-Up:
.1 Construct mock-up in accordance with Section 01 45 00.
.2 Construct one full scale mock-up of an aluminum window demonstrating full range of products, finishes, textures, quality of fabrication, and workmanship.
.3 Locate where directed by the Departmental Representative.
.4 Mock-up may remain as part of finished work if accepted by the Departmental Representative.
.5 Allow 24 hours for inspection of mock-up by Departmental Representative before proceeding with aluminum window work.

1.5 STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions and IGMAC recommendations.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect aluminum windows from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return of pallets, crates, padding, and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 20.

1.6 EXTENDED WARRANTY

.1 Submit an extended warranty for aluminum window work for a period of five (5) years.

.1 Warrant against failure to meet the design criteria and requirements such as interior leakage, insulating glass unit failure, finish degradation, and frame condensation.

.2 Coverage: Complete replacement including affected adjacent work.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 General:
.1 Materials: to AAMA/WDMA/CSA 101/I.S.2/A440 supplemented as specified herein.
.2 All windows by same manufacturer.

.2 Aluminum materials:
.1 Aluminum extrusions: ASTM B221 and ANSI H35.1, AA6063 alloy, T6 temper.

.2 Aluminum alloy and finish: to AAMA/WDMA/CSA-101/I.S.2/A440 and CSA A440S1, clear anodized, Class 1, per Aluminum Association Designation System for Aluminum Finishes AA-M12C22A31, minimum 50% recycled content.

.3 Thermal break: cork-neoprene composition or extruded or poured rigid polyvinyl chloride.

.5 Airseal transition membrane: Identical to, or compatible with, building air/vapour barrier materials under Section 07 25 00 and meet requirements as specified herein.

.6 Sealants:
.1 VOC limit 250 g/L maximum to SCAQMD Rule 1168.
.2 Airseal sealant: ASTM C920; One part silicone, neutral cure, elastomeric sealant. Colour as later selected by Departmental Representative.
.3 Aluminum work sealant: ASTM C920; Single-Component, silicone sealant; Colour as selected by Departmental Representative.
.4 Sealant primer and joint backing: type recommended by sealant manufacturer.

.7 Insulation: expanded polystyrene to CAN/ULC-S701, Type 3, Ecologo certified.

.8 Bituminous paint: acid and alkali resistant.

.9 Screens: to CAN/CGSB-79.1, Type 2 heavy duty, to suit window type, aluminum screening, 18 x 14 mesh; clear anodized aluminum Class 1 finish, heavy duty S2, screen strength rating to AAMA/WDMA/CSA-101/I.S.2/A440 and CSA A440S1.

.10 Fasteners: stainless steel, type 316.

.11 Weatherstripping: to AAMA/WDMA/CSA-101/I.S.2/A440 and CSA A440S1.

.12 Window hardware:
.1 Manually operated window hardware: Manufacturer's standard heavy duty corrosion resistant hardware, to provide security and permit easy operation of units.
.2 Automatic window hardware:
.1 Conforming to AAMA/WDMA/CSA-101/I.S.2/A440.
.2 Windows are to be electrically controlled from the ground level where shown on Contract Drawings.
.3 Provide complete remote operation system with wiring by Division 26.
.4 Motorized system to be complete with features such as rain sensor, built-in thermostat, power conversion, power blind system compatibility, protected memory and safety reversal.
.5 System to have wall mounted control panels and hand held remotes as required by Departmental Representative.

.13 Operable Vent: Thermally broken, aluminum framed, awning, triple glazed with concealed tamperproof fasteners. Design aluminum components to CAN/CSA S157 and window classification to CAN/CSA A440.
.1 Air tightness: A2.
.2 Water Tightness: B7.
.3 Window Load Resistance: C5.
.4 Condensation Resistance: I58.

.5 Forced Entry: F10.

.14 Wood sills, head, and jamb: in accordance with Section 06 40 01.

2.2 FABRICATION

.1 Fabricate in accordance with AAMA/WDMA/CSA 101/I.S.2/A440, reviewed shop drawings and manufacturer's written instructions.

.2 Fabricate fixed, awning and casement windows as required for work of this Project to meet requirements of AAMA/WDMA/CSA-101/I.S.2/A440.

.3 Fabricate, fit, and secure framing joints and corners accurately, with flush surfaces, and hairline joints. Apply frame sealant at joints to provide continuity of water and air barrier.

.4 Fabricate continuous sill flashings with intermediate anchor clips, and joint reinforcing, form to profile shown. Fabricate filler and closure pieces as necessary for a complete and weather tight installation.

.6 Certify aluminum windows as complying with the AAMA/WDMA/CSA 101/I.S.2/A440 design criteria and requirements using an easily removable label located on the inside face of glazing.

.7 Position operable windows on main frame to provide direction of opening specified, free and smooth operation, without binding or sticking against main frame members.

.8 Face dimensions detailed are maximum permissible sizes.

.9 Units square and true with maximum tolerance of plus or minus 1.5 mm for units with a diagonal measurement of 1800 mm or less and plus or minus 3 mm for units with a diagonal measurement over 1800 mm.

.10 Form flashing to profiles indicated.

.11 Build in structural deflection allowance to prevent transfer of structural load to windows.

.12 Build thermal expansion allowance to withstand 85°C temperature difference without stressing sealants.

.13 Double weatherstrip windows. Install weatherstripping in specially extruded ports and secure to prevent shrinkage or movement.

2.3 AIRSEAL TRANSITION MEMBRANE

.1 Equip window frames with site installed airseal transition membrane material for sealing to building air/vapour barrier as follows:
- .1 Material: identical to, or compatible with, building air/vapour barrier materials to provide required air tightness and vapour diffusion control throughout exterior envelope assembly.
- .2 Material width: adequate to provide required air tightness and vapour diffusion control to building air/vapour barrier from interior.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for aluminum window installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Install aluminum windows in accordance with AAMA/WDMA/CSA 101/I.S.2/A440, reviewed shop drawings and manufacturer’s written instructions.

.2 Apply bituminous paint to aluminum in contact with concrete and masonry.

.3 Units plumb, square and level to 1:400; free of warp, twist and superimposed loads; weathertight.

.4 Securely anchor units in place with concealed fasteners.

.5 Fill voids between aluminum framing and adjacent construction with foam insulation in accordance with Section 07 21 29.03.

.6 Sills:
- .1 Install sills in maximum lengths possible. For sills over 1200 mm in length, maintain 3 mm to 6 mm space at each end.
- .2 Fix sills in place, level, with uniform wash to exterior.
- .3 Install drip deflectors.

.7 Caulking:
- .1 Seal joints between windows and window sills with sealant. Bed sill expansion joint cover plates and drip deflectors in bedding compound. Caulk between sill upstand and window-frame. Caulk butt joints in continuous sills.
- .2 Apply sealant in accordance with manufacturer’s written instructions. Conceal sealant within window units except where exposed use is permitted by Departmental Representative.
- .3 Tool sealant. Remove excess sealant.

.8 Adjust opening sash and hardware to operate smoothly and for correct function.

3.3 GLAZING

.1 Window: in accordance with AAMA/WDMA/CSA-101/I.S.2/A440 and CSA A440S1, Glazing Recommendations for Sealed Insulating Glass Units and requirements of Section 08 80 00.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
  .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
  .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by window installation.

END

PART 1 - GENERAL

1.1 REFERENCES

.1 American National Standards Institute (ANSI) / Builders Hardware Manufacturers Association (BHMA)
.1 ANSI/BHMA A156.1-2016, American National Standard for Butts and Hinges.
.2 ANSI/BHMA A156.4-2013, Door Controls - Closers.
.3 ANSI/BHMA A156.6-2015, Architectural Door Trim.
.4 ANSI/BHMA A156.8-2015, Door Controls - Overhead Stops and Holders.
.5 ANSI/BHMA A156.13-2017, Mortise Locks.
.6 ANSI/BHMA A156.16-2013, Auxiliary Hardware.
.7 ANSI/BHMA A156.18-2016, Materials and Finishes.
.8 ANSI/BHMA A156.21-2014, Thresholds.
.9 ANSI/BMHA A156.22-2017, Door Gasketing and Edge Seal Systems.

.2 Canadian Steel Door Manufacturers' Association (CSDMA)
.1 CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames - 2009.

.3 Canadian Standards Association (CSA)
.1 CSA B651-12(R2017), Accessible Design for the Built Environment.

.4 Door Hardware Institute (DHI)

.5 Underwriter’s Laboratory (UL)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for door hardware and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:
.1 Submit for review and acceptance of each “Heritage Hardware” component listed on hardware schedule.
.2 Samples will be returned for inclusion into work.
.3 Identify each sample by label indicating applicable specification paragraph number, finish and hardware package number.
.4 After approval samples will be returned for incorporation in Work.

.4 Hardware List:
.1 Submit contract hardware list.
.2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.

.5 Manufacturer's Instructions: submit manufacturer's installation instructions.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00.

.2 Operation and Maintenance Data: submit operation and maintenance data for door hardware for incorporation into manual.

1.4 QUALITY ASSURANCE

.1 Regulatory Requirements:

.1 Hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Package items of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.

.4 Storage and Handling Requirements:
.1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect door hardware from nicks, scratches, and blemishes.
.3 Protect prefinished surfaces with strippable coating.
.4 Replace defective or damaged materials with new.

.5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 HARDWARE ITEMS

.1 Use one manufacturer's products only for similar items.
.2 All hardware to be grade 1.

2.2 DOOR HARDWARE

.1 Locks and latches:
- .1 Bored and preassembled locks and latches: to ANSI/BHMA A156.2, series 2000 preassembled lock, grade 1, designed for function as stated in Hardware Schedule.
- .2 Mortise locks and latches: to ANSI/BHMA A156.13, series 1000 mortise lock, grade 1, designed for function as stated in Hardware Schedule.
- .3 Flush Blots: to ANSI/BHMA A156.16, L04251.
- .4 Dust Proof Strikes: to ANSI/BHMA 156.16, L14011.
- .5 Lever handles: special straight and tapered level handle design, no return.
- .6 Roses: round.
- .7 Normal strikes: box type, lip projection not beyond jamb.
- .8 Cylinders: key into keying system as directed.
- .9 Finished to 622 (Flat - black) or 626 (Brass) as indicated on hardware schedule.

.2 Butts and hinges:
- .1 Butts and hinges: to ANSI/BHMA A156.1. Five (5) knuckle, ball bearing, heavy weight full mortise hinge. Finished to 622 (Flat - black) or 652 (Brass) as indicated on hardware schedule.

.3 Door Closers and Accessories:
- .1 Door controls (closers surface - Office Building and Residence Building): to ANSI/BHMA A156.4, as listed in Hardware Schedule, size in accordance with ANSI/BHMA A156.4, table A1, finished to 693 (Painted Black).
- .2 Door controls (Utility Building): to ANSI/BHMA A156.4, as listed in Hardware Schedule, size in accordance with ANSI/BHMA A156.4, table A1, finished to 689 (Aluminum).

.4 Architectural door trim: to ANSI/BHMA A156.6, size and finish listed in Hardware Schedule.

.5 Door bottom seal: door seal of extruded aluminum frame and solid closed cell neoprene weather seal, surface mounted, closed ends.

.6 Thresholds: 127mm wide x full width of door opening, extruded aluminum mill finish, serrated surface, with thermal break of rigid PVC.

.7 Weather-stripping:
- .1 Head and jamb seal:
  - .1 Adhesive backed neoprene material.

.8 Wall Stops to ANSI/BHMA 156.16 L52101. Finish listed in hardware schedule.

.9 Viewer: One-way wide angle viewer to ANSI/BHMA A156.16 L23172. Finish as listed on the hardware schedule.

2.3 FASTENINGS

.1 Use only fasteners provided by manufacturer. Failure to comply may void warranties and applicable licensed labels.

.2 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.

.3 Exposed fastening devices to match finish of hardware.

.4 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.

.5 Use fasteners compatible with material through which they pass.

2.4 KEYING

.1 Doors and cabinet locks to be as directed. Prepare detailed keying schedule in conjunction with Departmental Representative.

.2 Supply keys in duplicate for every lock in this Contract.

.3 Stamp keying code numbers on keys and cylinders.

.4 Supply construction cores.

.5 Hand over permanent cores and keys to Departmental Representative.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

.2 Supply metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.

.3 Supply manufacturers' instructions for proper installation of each hardware component.

.4 Install hardware to standard hardware location dimensions in accordance with CSDMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction).

.5 Where door stop contacts door pulls, mount stop to strike bottom of pull.

.6 Use only manufacturer's supplied fasteners.
.1 Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.

.7 Remove construction cores when directed by Departmental Representative.
.1 Install permanent cores and ensure locks operate correctly.

3.2 ADJUSTING

.1 Adjust door hardware, operators, closures and controls for optimum, smooth operating condition, safety and for weather tight closure.

.2 Lubricate hardware, operating equipment and other moving parts.

.3 Adjust door hardware to ensure tight fit at contact points with frames.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work area clean at end of each day.
.2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturer's instructions.
.3 Remove protective material from hardware items where present.
.4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 DEMONSTRATION

.1 Maintenance Staff Briefing:
.1 Brief maintenance staff regarding:
.1 Proper care, cleaning, and general maintenance of projects complete hardware.
.2 Description, use, handling, and storage of keys.
.3 Use, application and storage of wrenches for door closers and locksets.

.2 Demonstrate operation, operating components, adjustment features, and lubrication requirements.

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by door hardware installation.

3.6 SCHEDULE

.1 See attached schedule

END

PART 1 - GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials International (ASTM).
- .1 ASTM C920-18, Specification for Elastomeric Joint Sealants.
- .2 ASTM D2240-15el, Test Method for Rubber Property - Durometer Hardness.
- .3 ASTM E2190-10, Standard Specification for Insulating Glass Unit Performance and Evaluation.

.2 Canadian General Standards Board (CGSB).
- .1 CAN/CGSB-12.1-2017, Safety Glazing.
- .2 CAN/CGSB-12.8-97, Insulating Glass Units.

.3 Glass Association of North America (GANA).
- .1 GANA Glazing Manual (50th Anniversary Edition).

.4 Insulated Glass Manufacturers Association of Canada (IGMA).

1.2 DESIGN REQUIREMENTS

.1 Glass design:
- .1 Design glass using a probability of breakage of 8 lites per 1000 at the first application of design load.
- .2 Perform stress analysis. Design units to accommodate live, dead, lateral, wind, seismic, handling, transportation, and erection loads.
- .3 Perform a thermal stress analysis on each glass unit with Low-E coating and provide heat strengthening and/or tempered units as necessary to prevent thermal breakage.
- .4 Perform a thermal stress analysis on each insulating thermal unit and provide heat strengthening and/or tempered units as necessary to prevent thermal breakage.
- .5 Where required, design glazing units so as not to allow thermal stress fracture due to heat build-up behind insulating units.

.2 Limit glass deflection to flexural limit of glass with full recovery of glazing materials.

.3 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.

.4 Design IGU and framing systems to meet performance requirements as specified and shown on Contract Drawings.

.5 Design triple glazed units as part of a complete window system meeting the Design Requirements specified herein and in Section 08 51 13.

1.3 SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for glass, sealants, and glazing accessories and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings: Submit shop drawings indicating as a minimum:
.1 Fabrication and erection of glazing elements indicating materials, thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

.4 Samples:
.1 Submit duplicate 300 x 300 mm size samples of each type of glass and glass assembly, and sealant material.

.5 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.6 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.7 Closeout submittals: Submit maintenance data for glazing materials to Departmental Representative in accordance with Sections 01 77 00 and 01 78 00.

1.4 QUALITY ASSURANCE

.1 Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in the installation of glazing units of a similar size and nature.

.2 Pre-installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Section 01 31 19.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect glazing and frames from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return of pallets, crates, padding and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 20.

1.6 SITE CONDITIONS

.1 Environmental Requirements:
- .1 Install glazing when ambient temperature is 10°C minimum. Maintain ventilated environment for 24 hours after application.
- .2 Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.7 EXTENDED WARRANTY

.1 In accordance with Section 08 51 13.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Tempered safety glass (TGL): to CAN/CGSB-12.1, Type 2-tempered, Class B, clear, minimum 6 mm thick.

.2 Laminated safety glass (LG):
- .1 Laminated glass (LG1): to CAN/CGSB-12.1, Category II, consisting of two layers of minimum 3 mm thick clear tempered glass, sandwiching a 0.8 mm thick clear PVB interlayer. Total thickness of 6.8 mm.
- .2 Laminated glass (LG2): to CAN/CGSB-12.1, Category II, consisting of two layers of minimum 6 mm thick clear tempered glass, sandwiching a 1.5 mm thick clear PVB interlayer. For use at glass partitions. Interlayer to be complete with logo provided by Owner in locations as indicated. Total thickness of 13.5 mm.
- .3 Laminated glass (LG3): to CAN/CGSB-12.1, Category II, consisting of two layers of minimum 8 mm thick clear tempered glass, sandwiching a 1.5 mm thick clear PVB interlayer. For use at single glazed historic steel windows. Total thickness of 17.5 mm.

.3 Insulating glass units (triple seal):
- .1 To CAN/CGSB-12.8-M and IGMA requirements utilizing approved stainless steel edge spacer. Dual seal with a PIB primary seal and silicone secondary seal.
- .2 To comply with IGMA labelling requirements to be considered certified. Materials, excluding the glass, shall be from the same manufacturer as those employed for the certification of the insulating glass units.

.4 Argon gas: 100% pure. Argon gas to be used to fill air space at all insulated glass units.

.5 Low E coating:
- .1 Conforming to ASTM E2190, high performance sputtered low-E coating.
- .2 Provide insulating glass units with low-E coating edge deletion and low-E coating.

.3 Apply low-E coating to surfaces as required to meet performance characteristics.

.6 Glazing and rebate primers, sealants, sealers, and cleaners: Compatible with each other. Type as recommended by glass manufacturer.

.7 Glazing sealant: Silicone sealant as recommended by glazing manufacturer. Verify compatibility with insulating glass unit secondary sealant.

.8 Setting blocks: neoprene, Shore "A" 80 durometer hardness to ASTM D2240, 100 x 6 mm x width to suit glass.

.9 Edge blocks: EPDM, 60-70 Shore A Durometer hardness, self-adhesive on face, sized with 3 mm clearance from glass edge and spanning glass thickness(es).

.10 Glazing tape: preformed butyl with continuous spacer, Shore "A" 10-15 durometer hardness, paper release, black colour, 3 x 9.5 mm.

.11 Gasket: extruded composite glazing seal, size as recommended by manufacturer.

.12 Sealant: one part silicone to ASTM C920, Type S, Grade NS, Class 50, SWRI validated.

.13 Glass presence markers: Easily removable, non-residue depositing.

.14 Screws, bolts and fasteners: Type 304 stainless steel.

2.2 GLAZING SCHEDULE

.1 General: Glass types shall be as indicated below unless otherwise required due to thermal stress analysis.

.2 Glass Type 1: Minimum 6.8 mm thick clear laminated glass (LG1) outside, argon filled air space, minimum 6 mm thick clear tempered glass (TGL) middle, argon filled air space, minimum 6 mm thick clear tempered glass (TGL) inside, complete with low E coating as required to meet intended performance characteristics. 42.8 mm overall thickness. For use at exterior windows as indicated and exterior doors.

.3 Glass Type 4: Minimum 6.8 mm thick clear tempered/laminated glass, for use as safety glass vision panels in non-rated exterior doors.

2.3 FABRICATION

.1 Verify glazing dimensions on Site.

.2 Clearly label each glass lite with maker's name and glass type. Ensure labels are easily removable, non-residue depositing type. Do not remove labels until after Work is accepted by the Departmental Representative.

.3 Fabricate glazing not less than 3 mm smaller than rebate size in either dimension; allow for edge spacers, shims, and setting blocks as necessary.

.4 Work shall have smooth finished surfaces free from distortion and defects detrimental to appearance and performance.

.5 Carefully make and fit details. Take special care with exposed finished work to produce a neat and correct appearance to the Departmental Representative's acceptance.

.6 Grind and polish a 1.5 mm arris to both edges of exposed glazing at locations where glazing is not encapsulated in framing and where edges are exposed to occupants.

.7 Fabricate argon filled thermal units with air space filled minimum 90% with argon gas.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for glazing installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

.1 Clean contact surfaces with solvent and wipe dry.

.2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.

.3 Prime surfaces scheduled to receive sealant.

3.3 INSTALLATION

.1 Provide glazing in accordance with IGMA recommendations. Provide continuous contact between glazing tapes and gasket to the glazing.

.2 Install glazing in accordance with reviewed shop drawings and manufacturer's written instructions. Install glazing with full contact and adhesion at perimeter. Maintain edge clearance recommended by glass manufacturer.

.3 Glass, general:
.1 Clean and dry surfaces.
.2 Apply glazing tape to fixed stops.

.3 Place setting blocks at 1/3 points.
.4 Set glass on setting blocks against tape.
.5 Apply glazing tape to glass.
.6 Install stops.
.7 Apply sealant behind stop and tool to smooth surface.

.4 Remove, dispose of, and replace broken, cut, abraded glass, and defective glass including but not limited to production dimples, roller wave or marks, tong marks, chips, cracks, etc.

.5 Exterior glass: Glaze units with gasket on exterior side and glazing tape on interior side. Seal gap between glazing and stop with sealant to depth equal to bite of frame. Apply cap head of sealant along void between stop and glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.4 CLEANING

.1 Immediately remove sealant and compound droppings from finished surfaces.

.2 Remove labels, protective material, and glass presence markers from prefinished surfaces.

.3 Clean glass surfaces with cleaning agents and methods in accordance with manufacturer’s written instructions.

.4 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work area clean at end of each day.

.5 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.6 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 After installation, mark each light with an "X" by using removable plastic tape or paste.

.3 Repair damage to adjacent materials caused by glazing installation.

END

PART 1 - GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials International(ASTM).
- .1 ASTM C109/C109M-16a, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens).
- .2 ASTM C156-11, Standard Test Method for Water Loss from a Mortar Specimen Through Liquid Membrane-Forming Curing Compounds for Concrete.

1.2 SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product data: Submit product data indicating:
- .1 Two copies of manufacturer's Product data on characteristics, performance criteria, and limitations.
- .2 Preparation, installation requirements and techniques, Product storage, and handling criteria.

.3 Reports: Submit samples indicating coating and final concrete finish.

.4 Reports: Submit manufacturer's acceptance of substrate prior to installation in writing. Submit verification of moisture content of floor prior to installation.

.5 Closeout submittals: Submit maintenance data for incorporation into manuals in accordance with Section 01 78 00.

1.3 QUALITY ASSURANCE

.1 Perform work of this Section by a company that is approved by manufacturer. Submit to the Departmental Representative, applicator's current certificate of approval by the material manufacturer as proof of compliance.

.2 Mock-up:
- .1 Construct one 2 m^2 mock-up of floor sealer in location acceptable to the Departmental Representative.
- .2 Arrange for the Departmental Representative's review and acceptance, allow 48 hours after acceptance before proceeding with Work.
- .3 Mock-up may remain as part of Work if accepted by Departmental Representative. If sealer application is unacceptable to Departmental Representative, rework sealer in accordance with manufacturer's recommendations to provide a sealed concrete surface acceptable to Departmental Representative.
- .4 Upon acceptance, mock-up shall serve as a minimum standard of quality for the balance of the work of this Section.

.3 Pre-installation meetings: Arrange with manufacturer's representative and the Departmental Representative to inspect substrates, and to review Mock-up and installation procedures 48 hours in advance of installation.

1.4 SITE CONDITIONS

.1 Do not install the work of this Section outside of environmental ranges as recommended by the manufacturer without Product manufacturer's written acceptance.

.2 Install temporary protection and facilities to maintain the Product manufacturer's, and the above specification, environmental requirements for 24 hours before, during, and 24 h after installation.

.3 Post do not enter and appropriate warning signs at conspicuous locations.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Each material used in the application of each flooring system shall be as recommended or manufactured by the supplier of the flooring system.

.2 Concrete floor sealer (CONC): Alkali-silicate, water-soluble, inorganic concrete hardener and dustproofer, meeting the following criteria:
- .1 Compressive strength: ASTM C109/C109M, 41.4 MPa.
- .2 Moisture retention: ASTM C156, 63 gloss.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for metal fabrications installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

.1 Prepare substrate in accordance with manufacturer's written instructions. Diamond grind and vacuum substrate free of debris and dust.

3.3 APPLICATION

.1 Apply concrete floor sealer in accordance with manufacturer's written instructions.

.2 Spray apply concrete sealer to entire surface and keep from drying for 30 minutes as recommended by manufacturer.

.3 Sprinkle surface with water as sealer begins to penetrate (after 30 minutes).

.4 Flush surface with water and drying begins to remove excess material. Allow to harden for 24 hours.

.5 Lightly buff floor with a commercial floor buffer and non-aggressive pad to bring up required sheen.

.6 Apply second coat of concrete sealer following same procedures as first layer.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
  .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
  .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

.1 Erect barriers to prevent the entry and presence of personnel not performing work of this Section during application of floor sealer, and for 48 hours following completion of application.

END

PART 1 - GENERAL

1.1 REFERENCES

.1 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
.1 Material Safety Data Sheets (MSDS).

.2 The Master Painters Institute (MPI).
.1 Architectural Painting Specification Manual - 2010.
.2 Standard GPS-1-12, MPI Green Performance Standard for Painting and Coatings.

.3 National Fire Code of Canada, 2015 (NFC).

.4 Society for Protective Coatings (SSPC).
.1 Systems and Specifications, SSPC Painting Manual, 2008.

1.2 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Submit WHMIS MSDS - Material Safety Data Sheets.

.3 Samples: Provide samples in accordance with Section 01 33 00.
.1 Submit duplicate 300 x 300 mm sample panels of each paint finish with specified paint or coating in colours, gloss/sheen and textures required to MPI Painting Specification Manual standards submitted on the following substrate materials:
.1 3 mm plate steel for finishes over metal surfaces.
.2 50 mm concrete block for finishes over concrete or concrete masonry surfaces.
.3 13 mm gypsum board for finishes over gypsum board and other smooth surfaces.
.2 When approved, samples shall become acceptable standard of quality for appropriate on-site surface with one of each sample retained on-site.
.3 Submit full range of available colours where colour availability is restricted.

1.3 QUALITY ASSURANCE

.1 Qualifications:
.1 Contractor: to have a minimum of five years proven satisfactory experience. When requested, provide list of last three comparable jobs including, job name and location, specifying authority, and project manager.
.2 Qualified journeypersons as defined by local jurisdiction to be engaged in painting work

.3 Apprentices: may be employed provided they work under direct supervision of qualified journeyperson in accordance with trade regulations.

.2 Conform to latest MPI requirements for painting work including preparation and priming.

.3 Materials: in accordance with MPI Painting Specification Manual "Approved Product" listing and from a single manufacturer for each system used.

.5 Retain purchase orders, invoices and documents to prove conformance with noted MPI requirements when requested by Departmental Representative.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00, supplemented as follows:

.1 Deliver and store materials in original containers, sealed, with labels intact.

.2 Labels: to indicate:

.1 Manufacturer's name and address.

.2 Type of paint or coating.

.3 Compliance with applicable standard.

.4 Colour number in accordance with established colour schedule.

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

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

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

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

.7 Store materials and equipment in well ventilated area with temperature range meeting manufacturer’s recommendations.

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

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

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

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

.12 Fire Safety Requirements:

.1 Provide one 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.

.2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.

.3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 11.

.2 Paint, stain and wood preservative finishes and related materials (thinners, solvents, etc.) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.

.3 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.

.4 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.

.5 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into the ground the following procedures shall be strictly adhered to:

.1 Retain cleaning water for water-based materials to allow sediments to be filtered out.

.2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.

.3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.

.4 Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.

.5 Empty paint cans are to be dry prior to disposal or recycling (where available).

.6 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.

.7 Set aside and protect surplus and uncontaminated finish materials:

.8 Deliver to or arrange collection by organizations for verifiable re-use or re-manufacturing.

.9 Close and seal tightly partly used sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.

1.6 SITE CONDITIONS

.1 Heating, Ventilation and Lighting:

.1 Ventilate enclosed spaces in accordance with Section 01 51 00.

.2 Co-ordinate use of existing ventilation system with Departmental Representative and ensure its operation during and after application of paint as required.

.3 Provide minimum lighting level of 323 Lux on surfaces to be painted.

.2 Temperature, Humidity and Substrate Moisture Content Levels:

.1 Apply paint finishes when ambient air and substrate temperatures at location of installation can be satisfactorily maintained during application and drying process, within MPI and paint manufacturer's prescribed limits.

.2 Test concrete, masonry and plaster surfaces for alkalinity as required.
.3 Apply paint to adequately prepared surfaces, when moisture content is below paint manufacturer's prescribed limits.

.3 Additional application requirements:
.1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.

1.7 MAINTENANCE

.1 Extra Materials:
.1 Submit maintenance materials in accordance with Section 01 78 00.

.2 Submit 1, one litre can of each type and colour of finish coating. Identify colour and paint type in relation to established colour schedule and finish system.

PART 2 - PRODUCTS

.1 Supply paint materials for paint systems from single manufacturer.

.2 Conform to latest MPI requirements for painting work including preparation and priming.

.3 Materials in accordance with MPI - Architectural Painting Specification Manual and MPI - Maintenance Repainting Manual "Approved Product" listing.

.4 Mineral based paint: Silicate dispersion paint, 96% natural minerals, odorless, VOC free, breathable, anti-microbial, mildew resistant, highly vapour permeable, non-combustible, opaque finish, and water repellent. Colour to later selection by Departmental Representative.

.5 Colours:
.1 Paint types and colours (PT): Refer to Interior Finish Schedule for selected colour references and paint types.
.2 Where specific products are available in restricted range of colours, selection will be based on limited range.
.3 Second coat in three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.

.6 Mixing and tinting:
.1 Perform colour tinting operations prior to delivery of paint to site, in accordance with manufacturer's written recommendations. Obtain written approval from Departmental Representative for tinting of painting materials.
.2 Use and add thinner in accordance with paint manufacturer's recommendations.
.1 Do not use kerosene or similar organic solvents to thin water-based paints.
.3 Thin paint for spraying in accordance with paint manufacturer's written recommendations.

.4 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

.7 Gloss/sheen ratings:

.1 Paint gloss is defined as sheen rating of applied paint, in accordance with following values:

Gloss Level-Category	Gloss @ 60 degrees	Sheen @ 85 degrees
Gloss Level 1 - Matte Finish	Max. 5	Max. 10
Gloss Level 2 - Velvet	Max.10	10 to 35
Gloss Level 3 - Eggshell	10 to 25	10 to 35
Gloss Level 4 - Satin	20 to 35	min. 35
Gloss Level 5 - Semi-Gloss	35 to 70	
Gloss Level 6 - Gloss	70 to 85	
Gloss Level 7 - High Gloss	More than 85	

.2 Gloss level ratings of painted surfaces [as indicated] [and] [as noted on Finish Schedule].

.8 Exterior painting:

.1 Concrete Vertical Surfaces: (including horizontal soffits)

.1 EXT 3.1B - Latex aggregate latex finish.

.2 Galvanized Metal:

.1 EXT 5.3C - Epoxy finish.

.9 Interior painting:

.1 Concrete Horizontal Surfaces: floors

.2 INT 3.2C Epoxy finish.

.2 Concrete Masonry Units: smooth block

.1 INT 4.2D High performance architectural latex finish.

.2 INT 4.2G Epoxy (tile-like) finish [for wet environments].

.3 Structural Steel and Metal Fabrications: columns, beams, joists, metal fabrications, etc.

.1 INT 5.1R High performance architectural latex finish.

.4 Galvanized Metal: doors, frames, misc. steel, pipes, overhead decking, ducts, etc.

.1 INT 5.3M High performance architectural latex finish.

.5 Dressed Lumber: including door frames, casings, mouldings, etc.

.1 INT 6.3A High performance architectural latex finish.

.2 INT 6.3D Alkyd varnish finish (over stain).

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Departmental Representative damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.

.2 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "cover patch test". Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 PREPARATION

.1 Protection of in-place conditions:
.1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Departmental Representative.
.2 Protect items that are permanently attached such as Fire Labels on doors and frames.
.3 Protect factory finished products and equipment.

.2 Surface Preparation:
.1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.
.2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
.3 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Departmental Representative.
.4 Clean and prepare surfaces in accordance with MPI - Architectural Painting Specification Manual and MPI - Maintenance Repainting Manual specific requirements and coating manufacturer's recommendations.
.5 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.
.6 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements.
.7 Touch up of shop primers with primer as specified.

3.4 APPLICATION

.1 Paint only after prepared surfaces have been accepted by Departmental Representative.

.2 Use method of application approved by Departmental Representative.
.1 Conform to manufacturer's application recommendations.

.3 Apply coats of paint in continuous film of uniform thickness.
.1 Repaint thin spots or bare areas before next coat of paint is applied.

.4 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.

.5 Sand and dust between coats to remove visible defects.

.6 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.

.7 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

.8 Mechanical/Electrical Equipment:
.1 Paint conduits, piping, hangers, ductwork and other mechanical and electrical equipment exposed in finished areas, to match adjacent surfaces, except as indicated.
.2 Do not paint over nameplates.
.3 Paint natural gas piping yellow.
.4 Paint both sides and edges of backboards for telephone and electrical equipment before installation.
.1 Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Place, paint, stains, and primer defined as hazardous or toxic waste, including tubes and containers, in containers or areas designated for hazardous waste.

END

PART 1 - GENERAL

1.1 REFERENCES

.1 ASTM International Inc.
- .1 ASTM B32-08, Standard Specification for Solder Metal.
- .2 ASTM B306-09, Standard Specification for Copper Drainage Tube (DWV).
- .3 ASTM C564-11, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

.2 Canadian Standards Association (CSA International).
- .1 CSA B67-1972(R1996), Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories.
- .2 CSA B70-12, Cast Iron Soil Pipe, Fittings and Means of Joining.
- .3 CAN/CSA-B125.3-11, Plumbing Fittings.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Section 01 61 00.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

.1 Above ground sanitary storm and vent Type DWV to: ASTM B306.
- .1 Fittings.
  - .1 Cast brass: to CAN/CSA-B125.3.
  - .2 Wrought copper: to CAN/CSA-B125.3.
- .2 Solder: tin-lead, 50:50, type 50A.

2.2 CAST IRON PIPING AND FITTINGS

.1 Buried sanitary storm and vent minimum NPS 3, to: CSA B70, with one layer of protective coating of.
- .1 Joints:
  - .1 Mechanical joints:
    - .1 Neoprene or butyl rubber compression gaskets: to CSA B70. ASTM C564 or
    - .2 Stainless steel clamps.
  - .2 Hub and spigot:
    - .1 Caulking lead: to CSA B67.
    - .2 Cold caulking compounds.

PART 3 - EXECUTION

3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 Install in accordance with National Plumbing Code, Provincial Plumbing Code and local authority having jurisdiction.

.2 Provide venting in accordance with the National Building Code.

3.3 TESTING

.1 Pressure test buried systems before backfilling.

.2 Hydraulically test to verify grades and freedom from obstructions.

3.4 PERFORMANCE VERIFICATION

.1 Cleanouts:
- .1 Ensure accessible and that access doors are correctly located.
- .2 Open, cover with linseed oil and re-seal.
- .3 Verify that cleanout rods can probe as far as the next cleanout, at least.

.2 Ensure that fixtures are properly anchored, connected to system and effectively vented.

.4 Affix applicable label (sanitary, vent, etc.) c/w directional arrows every floor or 4.5 m (whichever is less).

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Section Includes:
.1 Materials and installation for plumbing specialties and accessories.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM).
.1 ASTM A126-04(2009), Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
.2 ASTM B62-09, Standard Specification for Composition Bronze or Ounce Metal Castings.

.2 Canadian Standards Association (CSA International).
.1 CSA B79-08, Floor, Area and Shower Drains, and Cleanouts for Residential Construction.
.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
.1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's printed product literature, specifications and datasheet for fixtures and equipment.
.2 Indicate dimensions, construction details and materials for specified items.

PART 2 – PRODUCTS

2.1 TRENCH DRAINS

.1 TD-1: Trench Drain

.1 Precast polymer concrete 150mm (6") wide sloped modular system with interlocking components and heavy duty 82.5mm x 9.5mm (3 ¼″ x 3/8″) slotted stainless steel grates and anchor ribs on the outside of the channel wall. Inside dimension of trench to be 100mm (4"). Trench to be provided with integral channel rail frame. Provide same as slab thickness bedding of concrete all aroundtrench.

.2 Trench to be connected via positive interlocking tongue and groove ends. Length to be as shown on the drawings.

.3 Built in channel slope to be 0.6% complete with radiused bottom.

.4 Provide removable trash bucket within catchbasin. Material of trash bucket to be suitable for mildly acidic and caustic environments.

2.2 CLEANOUTS

.1 Cleanout Plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.

.2 Access Covers:
.1 Floor Access: rectangular round cast iron body and frame with adjustable secured nickel bronze top cast box with anchor lugs and:
.1 Plugs: bolted bronze with neoprene gasket.
.2 Cover for Unfinished Concrete Floors: cast iron nickel bronze round or square, gasket, vandal-proof screws.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install in accordance with National Plumbing Code of Canada provincial codes, and local authority having jurisdiction.

.2 Install in accordance with manufacturer's instructions and as specified.

3.3 CLEANOUTS

.1 Install cleanouts at base of soil and waste stacks, and rainwater leaders, at locations required code, and as indicated.

.2 Bring cleanouts to wall or finished floor unless serviceable from below floor.

3.7 TESTING AND ADJUSTING

.1 Testing and Adjusting as per following:
.1 Timing:
.1 After start-up deficiencies rectified.
.2 Floor drains:
.1 Check operations of flushing features.
.2 Check security, accessibility, removeability of strainer.
.3 Clean out baskets.

.4 Access doors:
.1 Verify size and location relative to items to be accessed.

.5 Cleanouts:
.1 Verify covers are gas-tight, secure, yet readily removable.

END OF SECTION

PART 1 - GENERAL

1.1 TRIAL USAGE

.1 Departmental Representative Owner may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

1.2 PROTECTION OF OPENINGS

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

1.3 PAINTING

.1 Prime and touch up marred finished paintwork to match original.

.2 Restore to new condition, finishes which have been damaged too extensively to be merely primed and touched up.

1.4 DEMONSTRATION AND OPERATING AND MAINTENANCE INSTRUCTIONS

.1 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.2 Where specified elsewhere in Mechanical Divisions, manufacturers to provide demonstrations and instructions.

.3 Use operation and maintenance manual, as-built drawings, audio visual aids, etc. as part of instruction materials.

.4 Instruction duration time requirements as specified in appropriate sections.

.5 Where deemed necessary, Departmental Representative Owner may record these demonstrations on video tape for future reference.

1.5 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00.

.2 Operation and maintenance manual to be approved by, and final copies deposited with, Departmental Representative before final inspection.

.3 Operation data to include:

.1 Control schematics for each system including environmental controls.

.2 Description of each system and its controls.

.3 Description of operation of each system at various loads together with reset schedules and seasonal variances.

.4 Operation instruction for each system and each component.

.5 Description of actions to be taken in event of equipment failure.

.6 Valves schedule and flow diagram.

.7 Colour coding chart.

.4 Maintenance data shall include:
.1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
.2 Data to include schedules of tasks, frequency, tools required and task time.

.5 Performance data to include:
.1 Equipment manufacturer's performance data sheets with point of operation as left after commissioning is complete.
.2 Equipment performance verification test results.
.3 Special performance data as specified elsewhere.
.4 Testing, adjusting and balancing reports as specified in Section 23 05 93.

.6 Approvals:
.1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless so directed by Departmental Representative.
.2 Make changes as required and re-submit as directed by Departmental Representative.

.7 Additional data:
.1 Prepare and insert into operation and maintenance manual when need for same becomes apparent during demonstrations and instructions specified above.

1.6 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 01 33 00.

.2 Shop drawings and product data shall show:
.1 Mounting arrangements.
.2 Operating and maintenance clearances. eg. access door swing spaces.

.3 Shop drawings and product data shall be accompanied by:
.1 Detailed drawings of bases, supports, and anchor bolts.
.2 Acoustical sound power data, where applicable.
.3 Points of operation on performance curves.
.4 Manufacturer to certify as to current model production.
.5 Certification of compliance to applicable codes.

.4 In addition to transmittal letter referred to in Section 01 33 00: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

1.7 CLEANING

.1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

1.8 AS-BUILT DRAWINGS

.1 Site records:

.1 Departmental Representative will provide one (1) set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of the work. Mark there on all changes as work progresses and as changes occur. This shall include changes to existing mechanical systems, control systems and low voltage control wiring.

.2 On a weekly basis, transfer information to reproducibles, revising reproducibles to show all work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection at all times.

.2 As-built drawings:

.1 Prior to start of Testing, Adjusting and Balancing (TAB), finalize production of as-built drawings.

.2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (date).

.3 Submit to Departmental Representative for approval and make corrections as directed.

.4 TAB to be performed using as-built drawings.

.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

.3 Submit copies of as-built drawings for inclusion in final TAB report.

.4 As-built drawings for inclusion in final TAB report.

.5 As-built drawings shall be all converted to AutoCAD with PWGSC layering system.

.6 Submit as-built AutoCAD and PDF CD/DVD/Flash Drive. Allow for minimum two (2) sets.

.7 All TAB reports shall be in PDF format and copied to CD/DVD/Flash Drive and folder prints.

1.9 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 11 00.

.2 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative.

.3 Dispose of unused paint material at official hazardous material collections site approved by Departmental Representative.

.4 Do not dispose of unused paint material into sewer system, into streams, lakes, onto ground or in other locations where it will pose health or environmental hazard.

.5 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.6 Dispose of corrugated cardboard, polystyrene, plastic packaging material in appropriate on-site bin for recycling in accordance with site waste management program.

1.10 EXAMINE SITE

.1 Examine the site and the local conditions and Conditions affecting the work. Examine carefully the Architectural, Structural, and Mechanical, Electrical and all other drawings and the complete specifications to ensure that the work can be satisfactorily carried out as shown.

.2 Before commencing work, examine the work of the other Divisions and report at once any defect or interference affecting the work, the completion, or the guarantee of the work of this Division. No allowance will be made later for any expenses incurred through the failure to make these examinations or to report any such discrepancies in writing to the Department Representative.

1.11 CODES, PERMITS FEES ANC CONNECTIONS

.1 Conform to Federal, Provincial and Municipal regulations and perform work in accordance with requirements of By Laws and Regulations in force in area where the building is to be erected.

.2 Apply for, obtain, and pay for permits, fees and service connections for the work of this Division and the inspections required by Authorities having jurisdiction in the area where the building is to be erected.

.3 For information, a specific code or standard might be mentioned. This information must not be taken as the only code or standard applicable.

.4 When part of equipment does not bear the required UL label, the contractor shall obtain UL approval on site, when that part of the equipment is an electric component, a special approval shall be obtained and the Contractor shall pay the applicable fees.

.5 Furnish necessary certificates as evidence that the work installed conforms with laws and regulations of Authorities having jurisdiction. Changes in work requested by an Authority having jurisdiction shall be carried out without charge.

1.12 INSTALLATION OF WORK

.1 Coordinate with other trades and schedule all work to suit the date for the substantial performance established in the construction contract.

.2 Furnish items to be "built up" in ample time and give necessary information and assistance in connection with the building in of the same.

.3 Provide drawings showing all sleeving and openings required. Notify the Construction Manager of the size and location of recesses, openings and chases before walls, floors, etc., are erected.

.4 Proceed with the work as quickly as practical so that construction may be completed in as short a time as possible and in accordance with the building schedule. Ensure that all health, safety and environmental conditions are maintained.

.5 Ensure that all equipment and material is ordered in time to meet the building schedule. Provide a schedule of equipment deliveries to the Construction Manager within the time limit stipulated.

.6 Furnish promptly information required for the construction schedule.

.7 Manufactured products supplied with instructions for their installation shall be installed in strict accordance with those instructions.

1.13 SLEEVES

.1 Use cast iron sleeve or steel pipe sleeves with annular fin continuously welded at midpoint.

.2 For pipes passing through roofs, use cast iron sleeves with caulking recess and flashing clamp device. Anchor sleeves in roof construction; caulk between sleeve recess and pipe; fasten roof flashing to clamp device; make water tight durable joint.

.3 Fill voids around pipes

.1 Where sleeves pass through walls or floors, caulk space between insulation and sleeve or between pipe (duct) and sleeve with waterproof fire retardant non hardening mastic. Seal space at each end of sleeve with waterproof, fire retardant, non-hardening mastic.

.2 Ensure no contact between copper tube or pipe and ferrous sleeve.

.3 Fill future use sleeves with easily removable fire stop filler.

.4 Coat exposed exterior surfaces of ferrous sleeves with heavy application of zinc rich paint.

.4 All sleeves shall be as detailed on drawings.

.5 All sleeve locations including dimensions shall be submitted to the Department Representative.

1.14 TESTS

.1 Do not insulate or conceal work until tested and approved. Follow construction schedule and arrange for tests.

.2 Inform the Department Representative when tests will be conducted. All tests are to be documented test results submitted and included in the maintenance manuals. Refer to attached Appendix A for the format to be utilized for the test reports.

.3 Bear costs including retesting and making good.

.4 Prior to tests, isolate all equipment or other parts which are not designed to withstand test pressures.

1.15 SUMMARY OF COMMISSIONING

.1 Commissioning (Cx) is a systematic quality process of ensuring that building systems perform and interact according to the Owner's and the Design Engineers' Project Requirements and contract documents.

.2 Desired Outcomes

.1 A commissioned building provided optimized energy and occupant comfort, and sets the stage for minimal operation and maintenance costs. It serves as a tool for both the Owner and the Contractor to minimize post-occupancy remedial work.

.3 Commissioning Goals

.1 The Commissioning Process for a project typically focuses on systems and assemblies having to do with the performance objectives meeting the Owner's Project Requirements (OPR). Contractors, associated Sub-Contractors, equipment and material Suppliers are to support and ensure the requirements for commissioning are met in their respective work.

1.16 DEFINITIONS

.1 Owner's Project Requirements (OPR)

.1 The documentation of the functional performance requirements of the facility and the Owner's expectations of how it will be used and operated. This document is analogous to what has traditionally been referred to as the Owner Program.

.2 Basis of Design (BOD)

.1 A project-specific set of assumptions and design parameters for system and product selections to meet the OPR and applicable regulatory requirements.

.3 Commissioning Agent (CxA)

.1 An Owner designated member, not otherwise associated with the Architectural and Engineering Teams or the Contractor's Team. The CxA facilitates and coordinates the commissioning activities. Involvement of CxA shall not void any guarantees or warranties nor shall it relieve the Contractor of any contractual responsibilites.

.4 Deficiency/Issue

.1 A condition in the installation or function of a component or system that is not in compliance with the construction contract documents and/or Owner's requirements.

.5 Start-up/Pre-Functional The initial starting or activating of dynamic equipment, including the checkout of components and devices and completing static installation checklists.

.6 Functional Performance Testing (FPT)

.1 Testing performed by the Construction Team to verify that specific components, assemblies, systems, and integrated systems function and perform in accordance with the Owner's objectives and the contract documents. Tests are generally performed after the Contractor's start-up and initial checkouts are completed.

1.17 COMMISSIONING PLAN

.1 The CxA will develop a Commissioning Plan unique to the project.

.2 The Commissioning Plan identifies the strategies, aspects, and responsibilities within the commissioning process for all project team members.

.3 The Commissioning Plan contains the following information:
- .1 Commissioning Program Overview
  - .1 Goals and objectives
  - .2 General project information
  - .3 Systems to be commissioned.
- .2 Commissioning Team
  - .1 Team members, roles, and responsibilites.
  - .2 Communication protocol, coordination, meetings, and management.
- .3 Commissioning Process Activities
  - .1 Documenting the owner's project requirements.
  - .2 Preparing the basis of design.
  - .3 Developing systems functional performance test procedures.
  - .4 Verifying systems performance.
  - .5 Reporting deficiencies and the resolution process.
- .4 List of systems and assemblies to be commissioned.
- .5 The Contractor and the Sub-Contractors shall carryout commissioning activities as per the Commissioning Plan.

1.18 COMMISSIONING DOCUMENTATION

.1 The Commissioning Process includes a significant documentation and paper component. Commissioning documents include but are not limited to:
- .1 Drawings and Specifications.
- .2 Shop Drawings.
- .3 Pre-Functional Check Sheets.
- .4 OEM/Contractor Start Up/Test Forms and Records.
- .5 As Built Drawings.
- .6 Functional Performance Test Plans and Results.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 CUTTING AND PATCHING

.1 Cutting and patching shall be in accordance with the following:

.1 No openings shall be permitted through the completed structure without the written approval of the Department Representative. Any openings which are required through structure must be clearly and accurately shown. Exact locations, elevations and size of the proposed opening must be identified and submitted to the Department Representative for review, well in advance of doing the work.

.2 All cutting and patching shall be done by the trades specializing in the materials to be cut and is covered by the appropriate Divisions of this specification. Prepare drawings in conjunction with all trades concerned, showing sleeves and openings for passage through structure and all insert sizes and locations.

.3 Supporting members of any floor, wall or the building structure shall be cut only in such a location and manner as approved by the Department Representative in writing.

.4 Scan and x-ray floors prior to carrying out any openings. Rebars shall not be cut.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL

.1 The following is the strategy for Commissioning. Commissioning is a process in which the Commissioning Team Members, the Department Representative, the PWGSC Department Representative, PWGSC Design and Quality Assurance Authority, PWGSC Commissioning Manager, the Owner, Commissioning Manager, and the Contractors execute the commissioning process. The Owner has a skilled team of building staff and operators who can competently run a building provided they are given the appropriate background information, training and documentation.

.2 This specification section must be read in close conjunction with the noted commissioning sections below:
- .1 Section 01 91 13 - General Commissioning (Cx) Requirements
- .2 Section 01 91 31 - Commissioning (Cx) Plan.
- .3 Section 01 91 33 - Commissioning Forms.
- .4 Section 01 91 41 - Commissioning Training.
- .5 Section 01 91 51 - Building Management Manual (BMM).

.3 The Contractor shall meet all additional requirements noted in the referenced documents above as well as the work identified within the related sections below.

.4 Acronyms:
- .1 AFD - Alternate Forms of Delivery, service provider.
- .2 BMM - Building Management Manual.
- .3 .4 O & M - Operation and Maintenance
- .4 ICL Installation Check Lists
- .5 PI - Product Information (Forms)
- .6 PV - Performance Verification (Forms)
- .7 FPT - Functional Performance Test (Plans)
- .8 TAB - Testing, Adjusting and Balancing.
- .9 OEM - Original Equipment Manufacturer
- .10 BAS - Building Automation System (EMCS)
- .11 LSC - Life Safety Compliance
- .12 SOP - Standard Operating Procedures
- .13 M&E - Mechanical and Electrical
- .14 M&E DB - Mechanical and Electrical Database
- .15 WHMIS - Workplace Hazardous Materials Information System
- .16 MSDS - Material Safety Data Sheet
- .17 OPR - Owners Project Requirements

1.2 RELATED SECTIONS

.1 Section 01 91 13 - General Commissioning (Cx) Requirements

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

.3 Section 01 91 33 - Commissioning Forms.

.4 Section 01 91 41 - Commissioning Training.

.5 Section 01 91 51 - Building Management Manual (BMM).

.6 Division 22 / 23 Specification Sections

1.3 RESPONSIBILITIES

.1 The following are the general responsibilities for commissioning of the Contractor.

.1 Contractor- Construction:

.1 General:

.1 The Contractor shall be responsible for the commissioning process detailed within the Mechanical Specifications Sections.

.2 The Contractor shall conform to the commissioning requirements detailed in Mechanical Specification and the Commissioning Specification in Division 01.

.3 The Contractor shall coordinate and cooperate with the Electrical Contractor as detailed in Specification sections of the Mechanical and Electrical Specifications and as required to meet all commissioning requirements.

.4 Assign a Commissioning Coordinator who will have the required decision making authority / commissioning expertise and who is dedicated to the commissioning process.

.5 Explain and ensure all Sub Contractors understand the commissioning requirements. The Contractor shall schedule all commissioning tasks required to be completed by their Sub Contractors.

.6 If the project has phases the Record Drawings shall be submitted at the completion of each phase. The Mechanical Contractor shall at the end of the project submit a full consolidated set of recordings.

.7 Cooperate as required.

.2 Meetings:

.1 Throughout the Construction Schedule the Mechanical Contractor / Commissioning shall attend all commissioning and punch list meetings.

.3 Equipment Start up:

.1 The Mechanical Contractor shall provide notification of the scheduled date of completion for mechanical equipment and systems in writing to the Commissioning Manager and Department Representative a minimum of ten (10) working days prior to Start Up.

.2 Prior to providing notification of completion, the Mechanical Contractor shall review the work site and ensure all of the above are complete. In addition all labeling must be complete.

.3 Upon notice of scheduled completion separate walkthroughs shall be scheduled with the Commissioning Manager.

.4 The Contractor shall participate in construction complete walkthroughs for each system, sub-system or key item of mechanical equipment. Any items found to be not complete will be documented on a punch list. Items that are deemed to be essential for test run must be completed prior to the equipment or system being turned on.

.5 The Contractor shall participate in Health and Safety walkthroughs for each system, sub-system or key item of mechanical equipment prior to the equipment being started.

.4 Commissioning Test Forms:

.1 Rectify deficiencies documented in the PI, installation, start up, or functional performance verification (PV) test forms.

.2 Complete forms for PI, installation, start-up, and PV testing with Commissioning Manager.

.3 Complete form(s) for all integrated system(s) performance testing with Commissioning Manager.

.4 Update, create and complete forms as specified.

.5 Mechanical Contractor Testing:

.1 The Commissioning Manager will develop lists of tasks and schedules for building systems performance testing and demonstration.

.2 Working with the Commissioning Manager the Contractor shall schedule testing of the mechanical equipment and systems in accordance with the Contract Documents and the Program established by the Commissioning Manager. A detailed schedule shall be provided a minimum of two (2) weeks prior to the equipment or system being turned on. Schedule shall break down the testing into individual components, equipment, sub systems, and systems. The schedule shall provide adequate time for testing and commissioning of each system.

.3 During the testing of systems the Contractor shall make available skilled tradesmen to effect trouble shooting and effect repairs. During start up and performance testing same day repair and trouble shooting of equipment shall be provided.

.4 The Contractor shall conduct tests as detailed by the Commissioning Manager in the installation, start-up, functional performance verification (PV) and integrated building system(s) test forms. The test forms shall be filled out by the Mechanical Contractor and shall be witnessed by the Commissioning Manager.
.5 The Mechanical Contractor shall document the results of all tests conducted during the construction and the post construction phase and shall fill out documentation in accordance with Commissioning Manager's requirements.
.6 The Contractor shall ensure that Sub Contractors' testing is performed and complete in accordance with the Commissioning Manager's requirements.

.6 Progress Payments:
.1 Set aside in billing breakdown funds for commissioning, testing, manuals, demonstration training, and all other commissioning activities.

.7 Sub trades and Department Representative:
.1 Understand quality standards contained in the specifications and ensure by inspections, site visits and document revisions that they are being met by the Sub Contractors.
.2 The Contractor shall keep records of their testing in accordance with Commissioning Manager`s requirements.

.8 Maintenance Manuals:
.1 Assemble documentation; manuals, record drawings, commissioning forms, prior to turn over and training.
.2 Maintenance manuals shall be put together immediately upon completion of the submittal of shop drawings.
.3 All maintenance manuals shall be formatted as per PWGSC Standards - Commissioning Standard.
.4 Provide any information required to satisfy the requirements of Section 01 91 51 Building Management Manual (BMM) and as requested by Commissioning Manager for completion of the BMM.

.9 Building Turnover and Staff Training - Mechanical Contractor:
.1 Arrange training sessions with the Department Representative, Commissioning Manager and PWGSC Project Manager.
.2 Schedule clear interface between construction and Owner's operation of equipment.
.3 Testing and turnover procedures to be approved by the Commissioning Manager and a minimum of three (3) weeks prior to the first test / system or equipment scheduled turnover.

.10 Commissioning Manager:
.1 The Commissioning Manager will be generating the PI, PV and integrated systems commissioning test forms that are to be completed by the Mechanical Contractor.

1.4 COMMISSIONING REQUIREMENTS OVERVIEW

.1 Project equipment and systems as per existing contract documents.

Specification Section	**Item Description**	**Product Information Forms (PI)1**	**Installation Check Forms1**	**Operation / Performance Checks (PV)**
23 37 20	Heat Recovery Unit	Y	Y	Y
23 21 13	Electric Reheat	Y	Y	Y

Notes
1 PI forms only to new components and equipment.

1.5 INTEGRATED BUILDING SYSTEMS (IBS) PERFORMANCE TESTING

.1 If there is a requirement for detailed Performance Verification Testing of Integrated Building Systems the Construction Team shall execute the testing as required. The detail of these simulated performance verification tests of integrated / interconnected systems will be developed during the construction period of the project. The Mechanical Contractor will play a major role in supporting and participating in these performance verification tests of integrated / interconnected systems.

.2 The integrated / interconnected system performance tests are in addition to the Performance Verification Tests (PV).

.3 Integrated / interconnected performance testing may include the following integrated /interconnected systems:
.1 HVAC and associated systems forming part of integrated HVAC systems.
.2 Indoor air quality.
.3 Environmental space conditions.
.4 Fire alarm systems.
.5 Emergency lighting systems.

1.6 BUILDING MANAGEMENT MANUAL (BMM)

.1 The Contractor shall participate in the preparation of materials of this manual as directed by the General Contractor. Contractor requirements are defined in Section 01 91 51 and associated specifications.

1.7 DEVELOPMENT OF SYSTEMS OPERATION AND MAINTENANCE

.1 Standard Operating Procedures (SOP) Manual

.1 Mechanical SOP Manual will be developed for each system within that discipline, containing information:

.1 relating to the detailed description of each system,

.2 relating to day-to-day operation of the system,

.3 Permitting the operating personnel to make decisions which are in complete agreement with the Client's requirements within the limits of the installed system.

.2 Development: The Mechanical Contractor cooperates and supports the Department Representtive by providing all required data and information, identifying changes in set points of operating, limit and safety controls during start-up, verification, commissioning, and adjustments in operating procedures.

.3 Development: The SOP Manual is produced by the Department Representative based upon the format established by the generic SOP document.

.1 Phase 1 - Design Stage - the SOP Manual to include:

.1 The area and its function served by the mechanical system,

.2 Floor plans indicating zoning of electrical systems.

.3 Drawings, schematics and descriptions of the system, sub systems, equipment, components, functions and input/output parameters of each controller, start-up and shut down procedures.

.4 Brief narrative description of the sequence of operations and its components.

.2 Phase 2 - Contract Documents to be 90% complete & include:

.1 Detailed narrative descriptions of the sequence of operations.

.2 Necessary emergency procedures for the electrical systems.

.3 Details of its relationship to all other systems.

.3 Phase 3 - Construction, the Department Representative to bring the SOP Manual to 99% completion prior to pre start up inspections.

.4 Phase 4 - Development Construction - Commission Stage, the SOP Manual is brought to 100% completion at least six (6) weeks prior to issuance of the Interim Certificate of Completion, using data obtained during start-up, verification and commissioning. This will include:

.1 Documenting control systems as finally set,

.2 Instructions for operating under normal and emergency conditions.

.3 Details of response to emergency situations.

.5 Phase 5 - Development Operation, it may be necessary to make further changes to reflect operation under varying conditions of occupancy.

.4 Organizations of the SOP Manual: In general, the contents required are as follows:

.1 Section 1: Information directory: To provide easy access to all information, it should include:

.1 table of contents listing all systems in the building,

.2 list of equipment for each system, cross-referenced to the Operating and Maintenance Manual.

.2 Section 2: Drawings, schematics, diagrams, areas served, sketches, wiring diagrams and system description. To include, but not necessarily limited to:

.1 Drawings, schematics, diagrams, chart identifying all systems and the area(s) served by each system.

.2 For each Mechanical system:

.1 drawings, schematics, diagrams, and narrative description,

.2 operational tolerances of systems, equipment and components,

.3 manufacturers' recommendations for operation under all normal and emergency conditions,

.4 cross-references to the approved TAB and PV reports for each system.

.3 Section 3: Operating standards, operating logs, operating routines, procedures, BAS data: To be clearly understandable to building operators and the Property Manager and to include, but not necessarily limited to:

.1 required standards of performance,

.2 operating logs to monitor performance,

.3 reporting requirements for all licensing and inspections as applicable,

.4 identity of all activities associated with normal and abnormal operation,

.5 details of load-shedding procedures,

.6 operating checklists,

.7 seasonal start-up and shut-down procedures,

.8 all special or codified (i.e. Labour Canada regulations and amendments) procedures relating to environmental control, health and safety, and productive work environment.

.5 Section 4: Troubleshooting Information: This may include:

.1 elementary questionnaires,

.2 simple walk-through inspections,

.3 sophisticated diagnostic or expert analysis (depending upon the complexity of the system and the technical expertise of the O&M personnel). The intent is to allow Users of this manual to isolate probable causes in an orderly and efficient manner.

1.8 THE COMMISSIONING PROCESS

.1 The Commissioning Process consists of the following:
.1 Processing and completion of Shop Drawings and Record Drawings.
.2 Installation inspection of all Mechanical Equipment and completion of all associated testing.
.3 Independent Testing Contractor's participation and documentation.
.4 Performance Testing of Mechanical Equipment and Systems.
.5 Performance Testing of Integrated / Interconnected Systems.
.6 Participation in all Commissioning and Punch List Meetings.
.7 Participation in the completion of Operating and Maintenance Manuals.
.8 Participate in the completion of Systems Operating Manuals.
.9 Staff Operating Training.
.10 Preparation and Completion of all Commissioning Forms.
.11 Warranties.

.2 Installation Inspection and Equipment Verification/Checks:
.1 The Contractor shall coordinate with the Commissioning Manager and the PWGSC Project Manager who will be inspecting the mechanical installation.
.2 The Contractor shall notify the Commissioning Manager when each piece of equipment is ready for inspection for PI, installation, start up and performance (PV) testing. The Mechanical Contractor shall provide a detailed schedule for each system, subsystem and each piece of equipment.
.3 The Contractor shall rectify any deficiencies found by the Commissioning Manager or Department Representative during the commissioning process.

.3 Testing of Equipment and Systems:
.1 The Contractor shall be responsible for all tests detailed in the Contract Documents, BAS Sequences of Operation, and those tests required by a manufacturer as part of their installation requirements. The Mechanical Contractor shall be responsible for completing the PI, installation, start-up and functional performance (PV) test forms in accordance with the Contract Documents and BAS Sequences of Operation under the guidance of the Commissioning Manager.
.2 The Contractor shall only utilize employees with previous experience in Testing Procedures as they relate to a particular subject.
.3 The Contractor shall inform the Commissioning Manager, in writing, who they intend to use along with a list of relevant experience and projects completed. The Commissioning Manager retains the right to accept or reject the proposed individual.
.4 The Contractor shall hire the manufacturers' technicians who will conduct required start-up and/or programming and testing on their equipment.
.5 The Contractor shall cooperate with any Independent Testing. Contractors to provide assistance during the testing procedures.
.6 All tests shall be witnessed by the Commissioning Manager as they see fit. If tests are not witnessed and forms are not signed, the tests shall be repeated at the Contractor's expense.

.7 Commissioning Meetings and Reporting:

.1 The Contractor shall include the schedule for all tests in the Construction Schedule.

.2 The commissioning meetings will be held as separate meetings from the regular construction meetings. The testing schedules and the results of all tests shall be reviewed.

.8 All testing forms and reports associated with the mechanical systems shall be directed to the General Contractor with copies to the Department Represenive and Commissioning Team members as required.

.9 The forms and reports to be issued shall include:

.1 Shop drawings issued and accepted.

.2 Equipment Product Information (PI) Forms.

.3 Installation Check Lists (ICL).

.4 Performance Verification (PV) Test Forms.

.5 Integrated System Test Forms.

.6 Reports resulting from tests.

.7 Testing Schedule.

.8 Minutes of commissioning meetings.

.9 Manufacturers' Certificates, Verification and Test results.

.10 Operating and Maintenance Manuals.

.4 Staff and Operator Training:

.1 The Contractor and equipment manufacturers shall provide operator training for each system and its associated equipment.

.2 The training shall be executed on a construction phase by phase basis as per construction schedule.

.3 The training shall be provided by qualified technicians and shall be conducted in a classroom, and at the equipment or system.

.4 The training sessions shall be scheduled, coordinated by the General Contractor and turned over to the PWGSC Project Manager as per specifications.(video tapping as per PWGSC written request).

.5 Each training session shall be structured to cover the following:

.1 Operating and Maintenance Manual.

.2 Operating Procedures and BAS Sequences of Operation.

.3 Maintenance Procedures.

.4 Trouble shooting Procedures.

.5 The manufacturers or service representatives name, address and phone number.

.6 Submit a course outline to the Commissioning Manager, the Department Representative and the PWGSC Project Manager before training commences.

.7 Provide course documentation for up to ten (10) people.

.5 System Demonstration and Building Turnover:

.1 The system demonstration and building turnover to Owner's staff shall occur when:

.1 The installation is complete.

.2 The acceptance test and period conducted by the Commissioning Manager and the Department Representative has been 100% completed successfully.

.3 Training has been completed.

.2 Equipment Operating and Maintenance Manuals have been accepted:

.1 Shop drawings have been updated.

.2 Record drawings have been 100% completed.

.3 The Commissioning process has been 100% completed successfully and the system operation accepted by the Commissioning Manager.

.4 The Deficiency Punch Lists have been completed in their entirety.

.3 The systems demonstration shall be conducted by the Mechanical Contractor and manufacturers. The demonstration shall cover all sequences of operation, maintenance requirements and a physical demonstration of equipment installation and operation.

.6 Test Forms:

.1 The Contractor and manufacturers shall fill out the forms and check lists prepared by the Commissioning Manager during PI, installation, start-up and performance verification (PV) testing.

.2 The Commissioning Index of Forms shall be maintained by the Commissioning Manager in order to track the progress of the Commissioning process.

.7 Warranties:

1 Equipment and system warranties shall not begin until the system demonstration and turnover has been conducted successfully and accepted by the PWGSC Project Manager. The Mechanical Contractor shall fill out the Warranty Form(s) listing the equipment and systems and the start and finishing dates for the Warranty period.

.2 Refer to the Specifications for the requirements during the Warranty period.

.3 The Department Representative and the Commissioning Manager will review the performance of the systems in accordance with the BAS Sequences of Operation. If the performance is satisfactory, then no further action needs to be taken. If unsatisfactory, then the Mechanical Contractor will be instructed to correct all deficiencies, at his cost, to the satisfaction of the three parties.

.8 Commissioning Phases (Phase 1 to 6):

.1 Commissioning process spans various phases:

.1 Commissioning Phase 1

.1 The planning phase, where the risks, uncertainties and vulnerabilities are assessed.

.2 Establishes the extent of commissioning, time and budget for commissioning.

.3 Occurs during project at start of Contract Documents.

.2 Commissioning Phase 2

.1 Establishes technical requirements such as test requirements and standards

.2 Finalization of mechanical equipment and systems.

.3 Occurs during latter stage of the Contract Documents.

.3 Commissioning Phase 3

.1 The implementation phase where documentation for commissioning is developed.

.2 Mechanical Contractor should have made available all finalized shop drawings.

.3 The quality and extent of commissioning is determined and finalized in agreement with the client.

.4 A master index is developed with all elements of the mechanical systems.

.5 Commissioning forms / check lists such as PI, installation, start-up and performance verification (PV) test forms are developed in this phase.

.6 Occurs early in the Contract Administration Stage.

.4 Commissioning Phase 4

.1 The verification and commissioning before the equipment is turned over to Owner.

.2 All equipment received is checked against approved PI, installation, start-up and functional performance (PV) test forms.

.3 It is important to check in this phase that the equipment received has gone through the necessary factory tests.

.4 A Department Representative would have witnessed some of the factory tests carried out to ensure that the tests are conducted in accordance with the required standards.

.5 Start-up and operation instructions received from the equipment manufacturers are reviewed in this phase.

.6 All deficiencies are reported to the Mechanical Contractor and rectified before equipment is turned over to Owner for beneficial use.

.7 Occurs later on in the Contract Administration phase.

.5 Commissioning Phase 5

.1 The performance verification of the complete mechanical system functionally integrated with all the other systems in operation within the facility.

.2 Optimization, fine-tuning and post-occupancy commissioning is done in this phase.

.3 Occurs later on in the Contract Administration phase.

.6 Commissioning Phase 6

.1 Final Commissioning Report is submitted for review by the Commissioning Manager.

Project Design & Construction	Commissioning Activities	Remarks
Construction Administration	Verification of all commissioning tests, equipment, tests, Equipment start-up and turn over	Department Representative training is completed in this phase
	Mechanical Systems Performance Verification	This confirms that the systems are operating as per the specified requirements.
Post-Occupancy and Project Close Out	Prepare the final Commissioning evaluation report for submission to the Department Representative for review and acceptance by the PWGSC.	All commissioning documentation is compiled into the Final Commissioning Evaluation Report

.2 Framework:

.1 All equipment in the mechanical system is grouped into systems and subsystems for commissioning purposes. Documentation for PI, installation, start-up and performance (PV) will encompass all equipment in a given system.

.3 Documentation Guidelines:

.1 The Contractor completing the PI, installation, startup and performance (PV) test forms shall follow a consistent approach. Good documentation practice is essential in realizing the objectives of commissioning and to keep track of all commissioning related activities.

.4 Documentation shall be:

.1 Completed in permanent black ink only.

.2 Legible - can be easily read.

.3 Accurate - all information is correct.

.4 Timely - done at the appropriate time.

.5 Clear - can be understood by anyone who reads it.

.6 Consistent - done the same way each time.

.7 Complete - all required entries are made.

.8 Factual - what is written shall be what actually occurred.

.5 Correcting Mistakes: When mistakes are made accidentally while documenting, there shall be a standard way to correct the mistakes. Correct notation for documenting an entry error is to note Entry Error. Steps to follow:

.1 Cross out the error with a single line.

.2 Write the correct entry above the incorrect entry.

.3 Initial the correction.

.6 Before passing on the documentation, it shall be checked to make sure that it is timely, accurate, permanent, legible, complete, clear, consistent and factual.

.7 Submitted documentation which has not been reviewed will be rejected in its entirety by the Department Representative.

.8 Roles and Responsibilities:

.1 Activities, roles and responsibilities are clearly defined in commissioning plans. Commissioning activities, coordinated with all other activities in the project, will optimize the benefits of commissioning. The participants in commissioning activities have the roles and responsibilities, as given in the following Table.

SUMMARY OF ROLES AND RESPONSIBILITIES

Commissioning Activities	**Manufacturer**	**Mechanical Contractor**	**Department Representative**
Developing Commissioning Plan			Reviews
Developing Commissioning Test Forms			Reviews
Formulating Test Procedures			Reviews
Briefing Contractors on the Commissioning Plan	Participates	Participates	Participates
Finalizing Equipment)		Selects as per specifications	Accepts
Factory Tests	Executes Tests	Coordinate Testing	Witnesses and Approves
Verifying Equipment Received		Executes PI Forms	Verifies
Installation Checks on Equipment	Participates	Executes Installation Test Forms	Verifies
Equipment Start-up	Participates	Completes Start-up check forms and rectifies deficiencies	Witness and Sign-off/ Accepts

SUMMARY OF ROLES AND RESPONSIBILITIES

Commissioning Activities	**Manufacturer**	**Mechanical Contractor**	**Department Representative**
Performance Verification	Participates	Executes Performance check forms and rectifies deficiencies	Witness and Sign-off/ Accepts
Preparation of Operation and Maintenance Manuals	Supplies Information	Obtains information and prepares manuals	Reviews Manuals
Owners Training	Provides	Participates/ Provides	Reviews Training Program
Integrated Performance Tests	Participates	Executes performance forms and rectifies deficiencies	Witness and Sign-off/ Accepts
Post Occupancy Evaluation	Participates	Participates	Reviews

SUMMARY OF ROLES AND RESPONSIBILITIES (Cont'd)

	PWGSC Design and Quality Assurance Authority	**Commissioning Manager**
Developing Commissioning Plan	Reviews and Accepts	Develops
Developing Commissioning Test Forms	Reviews and Accepts	Develops
Formulating Test Procedures and	Reviews and Accepts	Develops
Briefing Contractors on the Commissioning Plan	Reviews and Accepts	Presents and Briefs
Finalizing Equipment	Reviews and Approves	Reviews
Factory Tests	Requests	Witnesses and Approves
Verifying Equipment Received	Accepts	Reviews
Installation Checks on Equipment	Accepts	Reviews
Equipment Start-up	Accepts	Witness and Sign-off

SUMMARY OF ROLES AND RESPONSIBILITIES (Cont'd)

	PWGSC Design and Quality Assurance Authority	**Commissioning Manager**
Performance Verification	Accepts	Witness and Sign-off
Preparation of Operation and Maintenance Manuals	Reviews Manuals	Reviews Manuals
Owners Training	Receives Training	Reviews Training Program
Integrated Performance Tests	Accepts	Witness and sign-off
Post Occupancy Evaluation	Reviews	Leads

PART 2 – THE COMMISSIONING TERMINOLOGY AND GLOSSARY

2.1 GENERAL

.1 NOTE: "Upon request" - Indicates that a person's attendance is required by a formal written request. "As required" or "if required" - Indicates that a person's attendance is required at their own discretion.

.2 "On behalf of" - Performs an action on behalf of another party (i.e. the Owner).

Term	**Definition & Examples**
Accepts	Receives and consents to deliverables content / format / or other specified deliverable parameter
Addresses	Directs attention to an outstanding unresolved document or process.
Approves	Gives consent to support a document or construction process.
Arranges	Takes responsibility to plan an activity, meeting or other deliverable. i.e. Arrange an integrated design charrette.
Assembles	Responsible for gathering in one place a single submission of documents or group. i.e. Commissioning schedule.
Assists	Supplies or makes available information, documentation, or other deliverables that may be used to move a deliverable towards completion. Provides administrative support to the team. i.e. Supplies support with inter-disciplinary coordination or developing a document / process
Attends	Present at an activity as required or as formally requested by contractor / specification / scope.

Term	**Definition & Examples**
Certifies	Guarantees or endorses an activity with the intention of confirming completion.
Chairs	Leads or presides over an activity or deliverable to achieve completion. Includes providing support documents / process / agenda / meeting minutes.
Co-chairs	Shares in leading or presiding over an activity or deliverable to achieve completion. Generally used for joint responsibilities for an activity.
Co-develop	Shares in creating requirements, criteria or a document to be included in the project deliverables.
Completes	Finishes or concludes a task or activity. Or having all parts or elements (lacking nothing) to a deliverable with the intent of being done. Responsible for "Final" executed deliverable.
Completion	Succeed at finishing or concluding a task / activity.
Conducts	Manages an activity or task with the intention of further developing the task.
Confirms	Establishes the truth or to make valid a task, activity or deliverable with the intention of moving the process forward. Establishes a level of preparedness for deadline. i.e. Equipment is ready for Performance Verification.
Comments	Provides written feedback on a document / task / process / deliverable. Often used to track progress of development process.

Term	**Definition & Examples**
Coordinates	Works with all the parties and stakeholders with the purpose to organize efforts to ensure a seamless project, result or deliverable. i.e. Executing the Integrated Building System tests
Defines	States, explains or identifies the meaning of activity, document or deliverable.
Designs	Creates or prepares construction documents with the plan or form a structure or system. Utilized to offer instruction and clarification of project requirements to the construction team.
Develops	Creates a comprehensive project deliverable to be issued to the construction team and to be used in the construction / commissioning process. A developed deliverable will generally be further "developed " during the construction / commissioning process i.e. Mechanical design data base.
Distributes	Responsible to continue to move deliverable along the process path.
Establishes	Clearly defines and articulates requirements or criteria to be included in the project deliverables.
Executes	Performs or accomplishes a deliverable with the purpose of moving the construction process forward.
Follows	Monitors or tracks progress of a deliverable with the purpose keeping up to date or current with developments and changes.
Grants	Receives a document to confirm in written report form that a process or activity was completed. i.e. To receive equipment OEM / Contractor start-up test reports

Term	Definition & Examples
Identifies	Recognizes or establishes requirements, criteria or actions to be included in the project deliverables.
Implements	Conducts or completes a task, activity or deliverable to move the construction process or commissioning process forward.
Inputs	Adds data or information to a document or database with the intention of keeping current and accurate information. i.e. Input data to PI forms .
Issues	Sends out, publishes and distributes a document for the purpose of sharing information with the construction and design team.
Maintains	Continues or sustains a document or action with the purpose of keeping the deliverable current with the construction process.
Manages	Takes responsibility and succeeds in accomplishing a deliverable with the purpose of moving the construction process forward
Monitors	Observes, detects and records an activity or task.
Participates	Takes an active role in a deliverable with the purpose of witnessing or reviewing the process or outcome of a test or activity.
Prepares	Creates or makes ready a deliverable to move the construction process forward.
Produces	Creates a document to be issued to or used in the construction / commissioning process. i.e. Commissioning specification.

Term	Definition & Examples
Provides	Makes available a document or feedback as required by the deliverable. Delivers support material or physical work as required by the task.
Recommends	Advises an alternative or suggests a choice or course of action in order to move an activity, task or deliverable forward.
Requests	Asks for an activity, document or deliverable to be completed with the purpose of moving the construction process forward.
Responds	Replies or answers by some action (written or verbal) to an activity or deliverable.
Reviews	Examines and provides written feedback on content, purpose or results of commissioning activities or deliverables. Tracks progress of development process. Each party is to provide an individual written report.
Re-works	To revise or correct a task, activity or deliverable.
Adjustments	Revises or corrects a task, activity or deliverable, including minor changes.
Sign-off	Physically acknowledge receipt or acceptance of a deliverable and make written confirmation.
Submits	Presents or provides an activity or deliverable with the purpose of gaining approval or review comments.
Updates	Brings up to date, as by adding new information or making corrections as required to maintain currency of the deliverable.

Term	**Definition & Examples**
Validates	Substantiates and or confirms authenticity of a report or result with the purpose of completing an activity or deliverable.
Utilizes	Applies a document / task / process or deliverable.
Verifies	Physically witness inputs and responses of specific processes. Generally related to an executed construction or commissioning process. i.e. Verify 10% of actual TAB reading Reviews, witnesses and monitors the execution of deliverables with the purpose of preparing for certification or acceptance by an organization or authority.
Witnesses	To be present at an activity as an active spectator as formally requested or required by the construction documents. Be prepared to sign off on the results of the activity.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)
.1 ANSI/ASHRAE 90.1-2016, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings (ANSI/ASHRAE/IES).

.2 Electrical Equipment Manufacturers' Advisory Council (EEMAC).

1.2 SECTIONS INCLUDES

.1 Electrical work to conform to Electrical Divisions including the following:
.1 Supplier and installer responsibility is indicated in Motor, Control and Equipment Schedule on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings.
.2 Control wiring and conduit is specified in Division 26 except for conduit, wiring and connections below 50 V which are related to control systems specified in Division 23. Refer to Division 26 for quality of materials and workmanship.

1.3 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00.

1.4 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for motors, drives and guards for incorporation into manual specified in Section 01 33 00.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Refer to Section 01 74 20.

PART 2 - PRODUCTS

2.1 GENERAL

.1 Motors to be high efficiency, in accordance with local Hydro company standards and the requirements of ASHRAE 90.1.

2.2 MOTORS

.1 Provide motors for mechanical equipment as specified.

.2 If delivery of specified motor will delay delivery or installation of equipment, install motor approved by Departmental Representative for temporary use. Final acceptance of equipment will not occur until specified motor is installed.

.3 Motors under 373 W (1/2 HP): speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, 120 V, unless otherwise specified or indicated.

.4 Motors 373 W (1/2 HP) and larger: EEMAC Class B, squirrel cage induction, speed as indicated, continuous duty, drip proof, ball bearing, maximum temperature rise 40°C, 3-phase, 600 V, unless otherwise specified or indicated.

.5 All motors shall be 1750 rpm unless otherwise noted.

.6 All motors shall be high efficiency, suitable for full voltage starting, rated for the voltage indicated in the schedule and shall have a service factor of 1.15. For the VFD applications motors shall be inverter duty, rated for service factor of 1.25.

.7 All motors shall have minimum NEMA Class F insulation systems or be rated for VFD application (when applicable). All motors shall be capable of supplying nameplate and service factor horsepower ratings on a continuous basis without exceeding the 105°C temperature rise in a 40°C ambient temperature.

.8 The temperature rises described above are based upon measurements by the resistance method. These limits shall not be exceeded when the voltage and frequency applied to motors are within the limitations of NEMA MG1.

.9 All motors shall have copper stator windings and motor leads.

.10 Aluminum die-cast rotor assemblies shall be provided, if available.

.11 Where aluminum die-cast rotor assemblies are not provided, rotor bars and conducting end rings shall be made of copper or copper alloys, with the bars welded or brazed to the rings. No phosphorous brazing materials may be used.

.12 Motors 3 HP and above shall be constructed to IEEE 841 standards and shall carry IEEE 841 certifications. Motors without IEEE 841 certifications and labeling shall be replaced by the contractor at their costs.

2.3 TEMPORARY MOTORS

.1 If delivery of specified motor will delay completion or commissioning work, install motor approved by Departmental Representative for temporary use. Work will only be accepted when specified motor is installed.

2.4 BELT DRIVES

.1 Fit reinforced belts in sheave matched to drive. Multiple belts to be matched sets.

.2 Use cast iron or steel sheaves secured to shafts with removable keys unless otherwise specified.

.3 For motors under 7.5 kW (10 HP): standard adjustable pitch drive sheaves, having plus or minus 10% range. Use mid-position of range for specified r/min.

.4 Correct size of sheave to be determined during commissioning.

.5 Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.

.6 Motor slide rail adjustment plates to allow for centre line adjustment.

.7 Supply one set of spare belts for each set.

2.5 DRIVE GUARDS

.1 Provide guards for unprotected drives.

.2 Guards for belt drives;
- .1 Expanded metal screen welded to steel frame.
- .2 Minimum 1.2 mm thick sheet metal tops and bottoms.
- .3 38 mm dia holes on both shaft centres for insertion of tachometer.
- .4 Removable for servicing.

.3 Provide means to permit lubrication and use of test instruments with guards in place.

.4 Install belt guards to allow movement of motors for adjusting belt tension.

.5 Guard for flexible coupling:
- .1 "U" shaped, minimum 1.6 mm thick galvanized mild steel.
- .2 Securely fasten in place.
- .3 Removable for servicing.

.6 Unprotected fan inlets or outlets:
- .1 Wire or expanded metal screen, galvanized, 19 mm mesh.
- .2 Net free area of guard: not less than 80% of fan openings.
- .3 Securely fasten in place.
- .4 Removable for servicing.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Fasten securely in place.

.2 Make removable for servicing, easily returned into, and positively in position.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED SECTIONS

.1 Section 23 05 93 - Testing, Adjusting and Balancing of HVAC.

1.2 REFERENCES

.1 National Building Code of Canada (NBC) 2010.

1.3 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00.

.2 Provide separate shop drawings for each isolated system system shop drawings complete with performance and product data.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Refer to Section 01 74 20.

PART 2 - PRODUCTS

2.1 GENERAL

.1 Size and shape of bases type and performance of vibration isolation to be as indicated.

2.2 SPRINGS

.1 Design stable springs so that ratio of lateral to axial stiffness is equal to or greater than 1.2 times the ratio of static deflection to working height. Select for 50% travel beyond rated load. Units to be complete with levelling devices.

.2 Ratio of height when loaded to diameter of spring to be between 0.8 to 1.0.

.3 Cadmium plate for outdoor 100% relative humidity all installations.

.4 Colour code springs.

2.3 HANGERS

.1 Colour coded springs, rust resistant, painted box type hangers. Arrange to permit hanger box or rod to move through a 30° arc without metal to metal contact.

.2 Type H3 - stable spring, elastomeric element, cup with moulded isolation bushing which passes through hanger box.

.3 Performance: 25mm deflection

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install vibration isolation equipment in accordance with manufacturer’s instructions and adjust mountings to level equipment.

.2 Provide spring isolators type H-3 for HRU-03.

.2 Ensure ducting and electrical connections to isolated equipment do not reduce system flexibility and that piping, conduit and ducting passage through walls and floors do not transmit vibrations.

.3 Block and shim level bases so that ductwork connections can be made to a rigid system at the operating level, before isolator adjustment is made. Ensure that there is no physical contact between isolated equipment and building structure.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL

.1 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section.

1.2 QUALIFICATIONS OF TAB PERSONNEL

.1 Names of personnel it is proposed to perform TAB to be submitted to and approved by Departmental Representative within 90 days of award of contract.

.2 Provide documentation confirming qualifications, successful experience.

1.3 PURPOSE OF TAB

.1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads

.2 Adjust and regulate equipment and systems so as to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.

.3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

1.4 EXCEPTIONS

.1 TAB of systems and equipment regulated by codes, standards to be to satisfaction of authority having jurisdiction.

1.5 CO-ORDINATION

.1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule so as to ensure completion before acceptance of project.

.2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

1.6 PRE-TAB REVIEW

.1 Review contract documents before project construction is started and confirm in writing to Departmental Representative adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.

.2 Review specified standards and report to Departmental Representative in writing all proposed procedures which vary from standard.

.3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

1.7 START-UP

.1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.

.2 Follow special start-up procedures specified elsewhere in Mechanical Division.

1.8 OPERATION OF SYSTEMS DURING TAB

.1 Operate systems for length of time required for TAB and as required by Departmental Representative for verification of TAB reports.

1.9 START OF TAB

.1 Notify Departmental Representative 7 days prior to start of TAB.

.2 Start TAB when building is essentially completed, including:

.3 Installation of ceilings, doors, windows, other construction affecting TAB.

.4 Application of weatherstripping, sealing, caulking.

.5 All pressure, leakage, other tests specified elsewhere in Division 23.

.6 All provisions for TAB installed and operational.

.7 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:
- .1 Proper thermal overload protection in place for electrical equipment.
- .2 Air systems:
  - .1 Filters in place, clean.
  - .2 Duct systems clean.
  - .3 Correct fan rotation.
  - .4 Fire, smoke, volume control dampers installed and open.
  - .5 Coil fins combed, clean.
  - .6 Access doors, installed, closed.
  - .7 Outlets installed, volume control dampers open.

1.10 APPLICATION TOLERANCES

.1 Do TAB to following tolerances of design values:
- .1 Other HVAC systems: plus 5%, minus 5 %.
- .2 Hydronic systems: plus or minus 10%.

1.11 ACCURACY TOLERANCES

.1 Measured values to be accurate to within plus or minus 2% of actual values.

1.12 INSTRUMENTS

.1 Prior to TAB, submit to Departmental Representative list of instruments to be used together with serial numbers.

.2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.

.3 Calibrate within 3 months of TAB. Provide certificate of calibration to Departmental Representative.

1.13 SUBMITTALS

.1 Submit, prior to commencement of TAB:

.2 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.14 PRELIMINARY TAB REPORT

.1 Submit for checking and approval of Departmental Representative , prior to submission of formal TAB report, sample of rough TAB sheets. Include:
- .1 Details of instruments used.
- .2 Details of TAB procedures employed.
- .3 Calculations procedures.
- .4 Summaries.

1.15 TAB REPORT

.1 Format to be in accordance with referenced standard.

.2 TAB report to show results in SI units and to include:
- .1 Project record drawings.
- .2 System schematics.

.3 Submit 6 copies of TAB Report to Departmental Representative for verification and approval, in English French both official languages in D-ring binders, complete with index tabs.

1.16 VERIFICATION

.1 Reported results subject to verification by Departmental Representative.

.2 Provide manpower and instrumentation to verify up to 30% of reported results.

.3 Number and location of verified results to be at discretion of Departmental Representative.

.4 Bear costs to repeat TAB as required to satisfaction of Departmental Representative.

1.17 SETTINGS

.1 After TAB is completed to satisfaction of Departmental Representative , replace drive guards, close access doors, lock devices in set positions, ensure sensors are at required settings.

.2 Permanently mark settings to allow restoration at any time during life of facility. Markings not to be eradicated or covered in any way.

1.18 COMPLETION OF TAB

.1 TAB to be considered complete when final TAB Report received and approved by Departmental Representative.

1.19 AIR SYSTEMS

.1 Standard: TAB to be to most stringent of this section or TAB standards of AABC NEBB SMACNA ASHRAE.

.2 Do TAB of systems, equipment, components, for the following systems, equipment, components, controls:
.1 Garage HRU

.3 Qualifications: personnel performing TAB to be current member in good standing of AABC or NEBB qualified to standards of AABC or NEBB.

.4 Quality assurance: Perform TAB under direction of supervisor qualified by to standards of AABC or NEBB.

.5 Measurements: to include, but not limited to, following as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.

.6 Locations of equipment measurements: To include, but not be limited to, following as appropriate:
.1 Inlet and outlet of dampers, filter, coil, humidifier, fan, other equipment causing changes in conditions.
.2 At controllers, controlled device.

.7 Locations of systems measurements to include, but not be limited to, following as appropriate: Main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

1.21 OTHER TAB REQUIREMENTS

.1 General requirements applicable to work specified this paragraph:
.1 Qualifications of TAB personnel: as for air systems specified this section.
.2 Quality assurance: as for air systems specified this section.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not used.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Definitions:
- .1 For purposes of this section:
  - .1 "CONCEALED" - insulated mechanical services and equipment in suspended ceilings and non-accessible chases and furred-in spaces.
  - .2 "EXPOSED" - means "not concealed" as previouslydefined.
  - .3 Insulation systems - insulation material, fasteners, jackets, and other accessories.
- .2 TIAC Codes:
  - .1 CRF: Code Rectangular Finish.

.2 Reference Standards:
- .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
  - .1 ANSI/ASHRAE/IES 90.1-2016, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.
- .2 ASTM International Inc.
  - .1 ASTM B209M-14, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
  - .2 ASTM C335-10e1, Standard Test Method for Steady State Heat Transfer Properties of Pipe Insulation.
  - .3 ASTM C411-11, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
  - .4 ASTM C449-07-13, Standard Specification for Mineral Fiber-Hydraulic- Setting Thermal Insulating and Finishing Cement.
  - .5 ASTM C547-15, Standard Specification for Mineral Fiber Pipe Insulation.
  - .6 ASTM C553-13, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
  - .7 ASTM C612-14, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
  - .8 ASTM C921-10(2015), Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- .3 Canadian General Standards Board (CGSB)
  - .1 CGSB 51-GP-52Ma-09, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
- .4 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (2015).
- .5 Underwriters Laboratories of Canada (ULC)
  - .1 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
  - .2 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Product Data:
.1 Provide manufacturer's printed product literature and datasheets for duct insulation, and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Manufacturers' Instructions:
.1 Provide manufacture's written duct insulation jointing recommendations. and special handling criteria, installation sequence, cleaning procedures.

1.3 QUALITY ASSURANCE

.1 Qualifications:
.1 Installer: specialist in performing work of this section, and have at least three (3) years successful experience in this size and type of project, qualified to standards member of TIAC.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Section 01 61 00.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address and ULC markings.

PART 2 - PRODUCTS

2.1 FIRE AND SMOKE RATING

.1 To CAN/ULC-S102:
.1 Maximum flame spread rating: 25.
.2 Maximum smoke developed rating: 50.

2.2 INSULATION

.1 Mineral fibre: as specified includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C mean temperature when tested in accordance with ASTM C335.

.3 TIAC Code C-1: Rigid mineral fibre board to ASTM C612, with without factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this Section).

.4 TIAC Code C-2: Mineral fibre blanket to ASTM C553 faced with without factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this section).
.1 Mineral fibre: to ASTM C553.
.2 Jacket: to CGSB 51-GP-52Ma.
.3 Maximum "k" factor: to ASTM C553.

2.3 JACKETS

.1 Canvas:
.1 220 gm/m cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.

.2 Lagging adhesive: compatible with insulation.

2.4 ACCESSORIES

.1 Vapour retarder lap adhesive:
.1 Water based, fire retardant type, compatible with insulation.

.2 Indoor Vapour Retarder Finish:
.1 Vinyl emulsion type acrylic, compatible with insulation.

.3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C449.

.4 ULC Listed Canvas Jacket:
.1 220 gm/m cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921 untreated.

.5 Tape: self-adhesive, aluminum reinforced, 50 mm wide minimum.

.6 Contact adhesive: quick-setting

.1 Maximum VOC limit 250 g/L.

.7 Canvas adhesive: washable.
.1 Maximum VOC limit 250 g/L.

.8 Tie wire: 1.5 mm stainless steel.

.9 Banding: 19 mm wide, 0.5 mm thick stainless steel.

.10 Facing: 25 mm stainless steel hexagonal wire mesh stitched on both faces of insulation.

.11 Fasteners: 4 mm diameter pins with 35 mm diameter or clips, length to suit thickness of insulation.

PART 3 - EXECUTION

3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 PRE-INSTALLATION REQUIREMENTS

.1 Pressure test ductwork systems complete, witness and certify.

.2 Ensure surfaces are clean, dry, free from foreign material.

3.3 INSTALLATION

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturer’s instructions and as indicated.

.3 Use 2 layers with staggered joints when required nominal thickness exceeds 75 mm.

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
.1 Ensure hangers, and supports are outside vapour retarder jacket.

.5 Hangers and supports in accordance with Section 23 05 29.
.1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.

.6 Fasteners: install at 300 mm on centre in horizontal and vertical directions, minimum 2 rows each side.

3.4 DUCTWORK INSULATION SCHEDULE

.1 Insulation types and thicknesses: conform to following table:

	TIAC Code	Vapour Retarder	Thickness (mm)
Rectangular cold and dual temperature ducts from the outside air plenum to the heat recovery unit	C-1	yes	50
Supply ducts downstream of the electric reheat coil			None
Outside and Exhaust Air plenum	C-1	yes	50
Exhaust duct between exhaust plenum and the heat recovery unit	C-1	no	25

3.5 JACKETS

.1 All exposed ductwork shall be provided with canvas jacket and lagging.

3.6 CLEANING

.1 Clean in accordance with Section 01 74 11.
.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Section Includes:
.1 Materials and installation of low-pressure metallic ductwork, joints and accessories.

1.2 REFERENCES

.1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).

.2 ASTM International.
.1 ASTM A635/A635M-15, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot Rolled.
.2 ASTM A653/A653M-15, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

.3 Department of Justice Canada (Jus).
.1 Canadian Environmental Protection Act (CEPA), 1999, c.33.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
.1 Material Safety Data Sheets (MSDS).

.5 National Fire Protection Association (NFPA).
.1 NFPA 90A-2015, Standard for the Installation of Air-Conditioning and Ventilating Systems.
.2 NFPA 90B-2015, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
.3 NFPA 96-2017, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

.6 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
.1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 3rd Edition 2005.
.2 SMACNA HVAC Air Duct Leakage Test Manual, 1985, 1st Edition.
.3 SMACNA IAQ Guidelines for Occupied Buildings Under Construction 2nd edition 2007; ANSI/SMACNA 008-2008.

1.3 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Section 01 33 00.

.2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets for the following:
.1 Sealants.
.2 Tape.
.3 Proprietary Joints.

1.4 QUALITY ASSURANCE

.1 Certification of Ratings:
.1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.2 Health and Safety:
.1 Do construction occupational health and safety in accordance with Section 01 35 29.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Refer to Section 01 74 20.

PART 2 - PRODUCTS

2.1 SEAL CLASSIFICATION

.1 Classification as follows:

TABLE PRESSURE CLASSIFICATION

Ductwork	Operating Pressure	Seal Classification	Remarks
Supply Air Ductwork	Up to 500 Pa	B	
Exhaust Air	Up to 500 Pa	B	
Exhaust and Outside Air Intake Plenums	Up to +/- 250 Pa	B	

.2 Seal classification:
.1 Class B: longitudinal seams, transverse joints and connections made airtight with sealant tape or combination thereof.

2.2 SEALANT

.1 Sealant: oil resistant, water borne, polymer type flame resistant duct sealant. Temperature range of minus 30°C to plus 93°C.

2.3 TAPE

.1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide.

2.4 DUCT LEAKAGE

.1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

2.5 FITTINGS

.1 Fabrication: to SMACNA.

.2 Radiused elbows.
- .1 Rectangular: standard radius short radius with single thickness turning vanes Centreline radius: 1.5 times width of duct.
- .2 Round: smooth radius five piece. Centreline radius: 1.5 times diameter.

.3 Mitred elbows, rectangular:
- .1 To 400 mm: with single double thickness turning vanes.
- .2 Over 400 mm: with double thickness turning vanes.

.4 Branches:
- .1 Rectangular main and branch: with radius on branch 1.5 times width of duct 45 degrees entry on branch.
- .2 Round main and branch: enter main duct at 45 degrees with conical connection.
- .3 Provide volume control damper in branch duct near connection to main duct.
- .4 Main duct branches: with splitter damper.

.5 Transitions:
- .1 Diverging: 20 degrees maximum included angle.
- .2 Converging: 30 degrees maximum included angle.

.6 Offsets:
- .1 Full short radiused elbows as indicated.

.7 Obstruction deflectors: maintain full cross-sectional area.
- .1 Maximum included angles: as for transitions.

2.6 FIRE STOPPING

.1 Retaining angles around duct, on both sides of fire separation.

.2 Fire stopping material and installation must not distort duct.

2.7 GALVANIZED STEEL

.1 Lock forming quality: to ASTM A653/A653M, Z90 zinc coating.

.2 Thickness, fabrication and reinforcement: to SMACNA.

.3 Joints: to SMACNA proprietary manufactured duct joint. Proprietary manufactured flanged duct joint to be considered to be a class A seal.

2.8 HANGERS AND SUPPORTS

.1 Hangers and Supports: in accordance with Section 23 05 29.
- .1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.
  - .1 Maximum size duct supported by strap hanger: 500.
- .2 Hanger configuration: to ASHRAE and SMACNA.

.3 Hangers: galvanized steel angle with galvanized steel rods to ASHRAE and SMACNA following table:

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
up to 750	25 x 25 x 3	6
751 to 1050	40 x 40 x 3	6
1051 to 1500	40 x 40 x 3	10
1501 to 2100	50 x 50 x 3	10
2101 to 2400	50 x 50 x 5	10
2401 and over	50 x 50 x 6	10

.4 Upper hanger attachments:
- .1 For concrete: manufactured concrete inserts.
- .2 For steel joist:manufactured joist clampsteel plate washer.
- .3 For steel beams: manufactured beam clamps.

PART 3 - EXECUTION

3.1 GENERAL

.1 Do work in accordance with NFPA 90A, NFPA 90B ASHRAE, SMACNA as indicated.

.2 Do not break continuity of insulation vapour barrier with hangers or rods.
.1 Insulate strap hangers 100 mm beyond i.sulated duct Ensure diffuser is fully seated

.3 Support risers in accordance with ASHRAE SMACNA as indicated.

.4 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.

.5 Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining.

3.2 HANGERS

.1 Strap hangers: install in accordance with SMACNA.

.2 Angle hangers: complete with locking nuts and washers.

.3 Hanger spacing: in accordance with ASHRAE SMACNA as follows:

Duct Size (mm)	Spacing (mm)
to 1500	3000
1501 and over	2500

3.3 WATERTIGHT DUCT

.1 Provide watertight duct for:
  .1 Fresh air intake.

.2 Form bottom of horizontal duct without longitudinal seams.
  .1 Solder weld joints of bottom and side sheets.
  .2 Seal other joints with duct sealer.

.3 Slope horizontal branch ductwork down towards fume hoods served.
  .1 Slope header ducts down toward risers.

.4 Fit base of riser with 150 mm deep drain sump and 32 mm drain connected, with deep seal trap and valve trap primer and discharging to open funnel drain as indicated.

3.4 SEALING AND TAPING

.1 Apply sealant to outside of joint to manufacturer's recommendations.

.2 Bed tape in sealant and recoat with minimum of one coat of sealant to manufacturers recommendations.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
  .1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible, 2005.

1.2 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00.

.2 Indicate the following:
  .1 Flexible connections.
  .2 Duct access doors.
  .3 Turning vanes.
  .4 Instrument test ports.

1.3 CERTIFICATION OF RATINGS

.1 Catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Refer to Section 01 74 20.

PART 2 - PRODUCTS

2.1 GENERAL

.1 Manufacture in accordance with SMACNA - HVAC Duct Construction Standards.

2.2 FLEXIBLE CONNECTIONS

.1 Frame: galvanized sheet metal frame 0.66 mm thick with fabric clenched by means of double locked seams.

.2 Material:
  .1 Fire resistant, self-extinguishing, neoprene coated glass fabric, temperature rated at minus 40°C to plus 90°C, density of 1.3 kg/mý.

2.3 ACCESS DOORS IN DUCTS

.1 Non-insulated ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame.

.2 Insulated ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame and 25 mm thick rigid glass fibre insulation.

.3 Gaskets: neoprene foam rubber.

.4 Hardware:
.1 Up to 300 x 300 mm: two sash locks complete with safety chain.
.2 301 to 450 mm: four sash locks complete with safety chain.
.3 451 to 1000 mm: piano hinge and minimum two sash locks.
.4 Doors over 1000 mm: piano hinge and two handles operable from both sides.
.5 Hold open devices.

2.4 TURNING VANES

.1 Factory or shop fabricated single thickness double thickness with without trailing edge, to recommendations of SMACNA and as indicated.

2.5 INSTRUMENT TEST

.1 1.6 mm thick steel zinc plated after manufacture.

.2 Cam lock handles with neoprene expansion plug and handle chain.

.3 28 mm minimum inside diameter. Length to suit insulation thickness.

.4 Neoprene mounting gasket.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Flexible connections:
.1 Install in following locations:
.1 Inlets and outlets to heat recovery unit
.2 As indicated.
.2 Length of connection: 100 mm.
.3 Minimum distance between metal parts when system in operation: 75 mm.
.4 Install in accordance with recommendations of SMACNA.
.5 When fan is running:
.1 Ducting on sides of flexible connection to be in alignment.
.2 Ensure slack material in flexible connection.

.2 Access doors and viewing panels:
.1 Size:
.1 600 x 600 mm for person size entry.
.2 450 x 450 mm for servicing entry.
.3 300 x 300 mm for viewing.
.4 As indicated.
.2 Locations:
.1 Control dampers.
.2 Devices requiring maintenance.
.3 Required by code.
.4 Reheat coils.
.5 Elsewhere as indicated.

.3 Instrument test ports.
- .1 General:
  - .1 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
- .2 Locate to permit easy manipulation of instruments.
- .3 Install insulation port extensions as required.
- .4 Locations.
  - .1 For traverse readings:
    - .1 Inlets and outlets of other fan systems.
    - .2 Main ducts.
    - .3 And as indicated.
  - .2 For temperature readings:
    - .1 At outside air intakes.
    - .2 At inlet and outlet of coils.
    - .3 And as indicated.

.4 Turning vanes:
- .1 Install in accordance with recommendations of SMACNA and as indicated.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Sheet Metal and Air Conditioning National Association (SMACNA)
.1 SMACNA HVAC Duct Construction Standards, Metal and Flexible-2005.

1.2 SUBMITTALS

.1 Shop Drawings and Product Data:
.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00. Include product characteristics, performance criteria, and limitations.

PART 2 - PRODUCTS

2.1 GENERAL

.1 Manufacture to SMACNA standards.

2.2 SPLITTER DAMPERS

.1 Of same material as duct but one sheet metal thickness heavier, with appropriate stiffening.

.2 Single Double thickness construction.

.3 Control rod with locking device and position indicator.

.4 Rod configuration to prevent end from entering duct.

.5 Pivot: piano hinge.

.6 Folded leading edge.

2.3 SINGLE BLADE DAMPERS

.1 Fabricate from same material as duct, but one sheet metal thickness heavier. V-groove stiffened.

.2 Size and configuration to recommendations of SMACNA, except maximum height 100 mm as indicated.

.3 Locking quadrant with shaft extension to accommodate insulation thickness.

.4 Inside and outside nylon bronze end bearings.

.5 Channel frame of same material as adjacent duct, complete with angle stop.

2.4 MULTI-BLADED DAMPERS

.1 Factory manufactured of material compatible with duct.

.2 Opposed blade: configuration, metal thickness and construction to recommendations of SMACNA.

.3 Maximum blade height: 100 mm.

.4 Bearings: self-lubricating nylon.

.5 Linkage: shaft extension with locking quadrant.

.6 Channel frame of same material as adjacent duct, complete with angle stop.

.7 Maximum leakage: 0.07% at 750 Pa.

.8 Provide staff extension and standoff for insulated ducts.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install where indicated and required to balance system.

.2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.

.3 Install balancing dampers in each branch duct, for supply and exhaust systems.

.4 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.

.5 All dampers to be vibration free.

.6 Ensure damper operators are observable and accessible.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 ASTM International
.1 ASTM A653/A653M-15el, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.

1.2 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00.

.2 Indicate the following:
.1 Performance data.

1.3 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00.

1.4 CERTIFICATION OF RATINGS

.1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Refer to Section 01 74 20.

PART 2 - PRODUCTS

2.1 MULTI-LEAF DAMPERS

.1 Opposed and or Parallel blade type as indicated.

.2 Structurally formed steel Extruded aluminum, interlocking blades, complete with extruded vinyl seals, spring stainless steel side seals, structurally formed and welded galvanized steel extruded aluminum frame.

.3 Pressure fit self-lubricated bronze bearings.

.4 Linkage: plated steel tie rods, brass pivots and plated steel brackets, complete with plated steel control rod.

.5 Operator: To be supplied and installed by control sub-contractor.

.6 Performance:
.1 Leakage: in closed position in accordance with Class 1 leakage at 1 kPa according to AMCA 511.
.2 Standard air leakage data to be certified under the AMCA certified ratings program.

.3 Pressure drop: at full open position to be less than 25 Pa differential across damper at 10 m/s.

.7 Insulated aluminum dampers:
.1 Frames: insulated with extruded polystyrene foam with R factor of 5.0.
.2 Blades: constructed from aluminum extrusions with internal hollows insulated with polyurethane or polystyrene foam, R factor of 5.0.
.3 Provide insulated damper for dampers exposed to outside air.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install where indicated.

.2 Install in accordance with recommendations of SMACNA and manufacturer's instructions.

.3 Seal multiple damper modules with silicon sealant.

.4 Ensure dampers are observable and accessible.

END OF SECTION

PART 1 - GENERAL

1.1 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00.

.2 Indicate the following:
- .1 Capacity.
- .2 Throw and terminal velocity.
- .3 Noise criteria.
- .4 Pressure drop.
- .5 Neck velocity.

1.2 CERTIFICATIONS

.1 Catalogued or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Refer to Section 01 74 20.

PART 2 - PRODUCTS

2.1 GENERAL

.1 Provide standard product to meet capacity, throw, noise level, throat and outlet velocity.

.2 Where grilles, registers and diffusers penetrate fire walls and fire partitions, provide approved steel sleeve secured to structure in accordance with NFPA 90A 2018 and required fire damper.

.3 Frames:
- .1 Steel: primed cold rolled steel with exposed welded joints and mitred corners.
- .2 Aluminum: extruded satin finish with mechanical fasteners and mitred corners.
- .3 Provide plaster frames as plaster stops where set into plaster or gypsum board.
- .4 Provide concealed fasteners and balancing operators in all finished areas.
- .5 Final finish to be selected by Architect from standard manufacturer finishes at shop drawing stage.
- .6 Style, frame, and installation details as indicated on the schedule.

.4 Sizes and capacities: as indicated in the schedule.

2.2 SUPPLY GRILLES AND REGISTERS

.1 1-1/4" (32 mm) border double deflection with airfoil shape horizontal face and vertical rear bars, opposed blade dampers (OBD) where indicated with concealed manual operator, and gaskets.

2.3 EXHAUST GRILLES AND REGISTERS

.1 1-1/4" (32 mm) border, single deflection, air foil shape, horizontal bar type 35 max turn up, when shown on the schedule opposed blade damper with concealed operator and rubber sealing strips.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install in accordance with manufacturer’s instructions.

.2 Install in accordance with manufacturer’s instructions.

.3 All diffusers and grilles to have concealed mounting.

.5 Install and adjust air registers to provide noiseless and draftless distribution. Primary air balance to be done at duct dampers with final adjustment only at diffusers and grilles.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Section Includes:
.1 Mechanical louvers; intakes; vents; and reinforcement and bracing for air vents, intakes and gooseneck hoods.

1.2 REFERENCES

.1 ASTM International
.1 ASTM E90-09 (2016), Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

.2 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

1.3 SYSTEM DESCRIPTION

.1 Performance Requirements:
.1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

1.4 SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00. Include product characteristics, performance criteria, and limitations.
.2 Indicate following:
.1 Pressure drop.
.2 Face area.
.3 Free area.

.2 Quality assurance submittals: submit following in accordance with Section 01 33 00.
.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
.2 Instructions: submit manufacturer's installation instructions.
.1 Departmental Representative will make available 1 copy of systems supplier's installation instructions.

.3 Test Reports:
.1 Submit certified data from independent laboratory substantiating acoustic and aerodynamic performance to ASTM E90.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:
.1 Deliver, store and handle in accordance with Section 01 61 00.
.2 Deliver, store and handle materials in accordance with manufacturer's

written instructions.

PART 2 - PRODUCTS

2.1 FIXED LOUVRES – ALUMINUM

.1 Construction: welded with exposed joints ground flush and smooth.

.2 Material: extruded aluminum alloy AA 6063-T5.

.3 Blade: stormproof pattern with centre watershed in blade, reinforcing bosses and maximum blade length of 1500 mm.

.4 Frame, head, sill and jamb: 100 mm deep one piece extruded aluminum, minimum 3 mm thick with approved caulking slot, integral to unit.

.5 Mullions: at 1500 mm maximum centres.

.6 Fastenings: stainless steel SAE-194-8F with SAE-194-SFB nuts and resilient neoprene washers between aluminum and head of bolt, or between nut, ss washer and aluminum body.

.7 Screen: 12 mm exhaust and 19 mm intake mesh, 2 mm diameter wire aluminum birdscreen on inside face of louvres in formed U-frame.

.8 For louvers within Generation Room provide security bars 13 mm ø steel rods at 152.4 mm OC welded to 114.3 mm steel frame.

.8 Finish: Powder coated, colour selection by Departmental Representative to coordinate with exterior metal wall panels.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 In accordance with manufacturer's and SMACNA recommendations.

.2 Reinforce and brace as indicated.

.3 Anchor securely into opening. Seal with caulking to ensure weather tightness.

3.3 CLEANING

.1 Proceed in accordance with Section 01 74 11.

.2 Upon completion and verification of performance of installation, remove

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

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

.1 National Fire Prevention Association (NFPA)
.1 NFPA 96-2017, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
.2 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)
.1 ASHRAE 52.2-2012, Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.
.3 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-115.10-M90, Disposable Air Filters for the Removal of Particulate Matter from Ventilating Systems.
.2 CAN/CGSB-115.11-M85, Filters, Air, High Efficiency, Disposable, Bag Type (Reaffirmed April 1985).
.3 CAN/CGSB-115.12-M85, Filters, Air, Medium Efficiency, Disposable, Bag Type (Reaffirmed April 1985).
.4 CAN/CGSB-115.14-M91, High Efficiency Cartridge Type Supported Air Filters for the Removal of Particulate Matter from Ventilating Systems.
.5 CAN/CGSB-115.15-M91, High Efficiency Rigid Type Air Filters for Removal of Particulate Matter from Ventilating Systems.
.6 CAN/CGSB-115.18-M85, Filter, Air, Extended Area Panel Type, Medium Efficiency.
.4 Underwriters' Laboratories of Canada
.1 ULC-S111-07, Standard Method of Fire Tests for Air Filter Units.
.2 ULC-S649-06, Grease Filters for Commercial and Institutional Kitchen Exhaust Systems.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawing and product data in accordance with Section 01 33 00.

1.3 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 20, and with the Waste Reduction Workplan.

1.5 MAINTENANCE MATERIALS

.1 Provide maintenance materials in accordance with Section 01 78 00.

1.6 EXTRA MATERIALS

.1 Spare filters: in addition to filters to be installed immediately prior to acceptance by Departmental Representative, supply 1 complete set of filters for each filter unit or filter bank in accordance with Section 01 78 00.

PART 2 - PRODUCTS

2.1 GENERAL

.1 Media: suitable for air at 100% RH and air temperatures between minus 40 and 50°C.

.2 Number of units, size and thickness of panels, overall dimensions of filter bank, configuration and capacities: as indicated.

.3 Pressure drop when clean and dirty, sizes and thickness: as indicated on schedule.

2.2 ACCESSORIES

.1 Holding frames: permanent "T" section or channel section construction of galvanized steel or extruded aluminum same material as casing/hood, 1.6 mm thick, except where specified otherwise.

.2 Seals: to ensure leakproof operation.

.3 Blank-off plates: as required, to fit all openings and of same material as holding frames.

.4 Access and servicing: through doors/panels on each side or from upstream or downstream face of filter bank.

2.3 FILTER PERFORMANCE

.1 Pleated Panel Filters 500 ; MERV 8; UL 900 Class 2) (30 to 35% Dust Spot Efficiency)

.1 Each filter shall consist of an individual pleated media pack, enclosed in a clay coated board frame, with integral pleat stabilizers and support straps.

.2 The media shall be a blend of 100% virgin synthetic fibers. Media must also be self-supporting in pleated form, with no metal or plastic material laminated to the media to provide pleat support.

.3 The pleated media pack must be enclosed in a 1-piece, 28 pt. moisture resistant beverage carrier board frame. In addition to the perimeter frame, the filter must have three pleat stabilizers bonded to the media on the air leaving side and three support straps adhered to the air entering side of the filter. The pleat stabilizers must be made of moisture resistant beverage carrier board, and bonded to the media to maintain the proper pleat spacing throughout the life of the filter. The support straps are to be made from moisture resistant beverage carrier board and must be adhered along the tips of each pleat.

.4 Filters of the size and air flow capacity shall meet the following rated performance specifications based on the ASHRAE 52.2 test method. Pertinent tolerances specified in Section 7.4 of the Air-Conditioning and Refrigeration Institute (ARI) Standard 850-93 shall apply to the performance ratings. All testing is to be conducted on filters with a nominal 600 x600 (24" x 24") face dimension.

Minimum Efficiency Reporting Value	8
Dust Holding Capacity (grams)	105
Nominal Size (Width x Height x Depth)	600 x 600 x 50 24 x 24 x 2
Rated Air Flow Capacity (cfm)	2000
Rated Air Flow Rate (feet per minute)	500
Final Resistance (inches w.g.)	1.0
Rated Initial Resistance (inches w.g.)	0.33

2.4 FILTER GAUGES DIAL TYPE

.1 Diaphragm actuated, direct reading.

.2 Range: 0 to 2 times initial pressure 0 to 250 Pa.

PART 3 - EXECUTION

3.1 INSTALLATION GENERAL

.1 Install in accordance with manufacturer's recommendations and with adequate space for access, maintenance and replacement.

3.2 REPLACEMENT MEDIA

.1 Replace all media with new upon acceptance.

.2 Filter media to be new and clean, as indicated by pressure gauge, at time of acceptance.

3.3 FILTER GAUGES

.1 Install type across each filter bank (pre-filter in approved and easy readable location.

.2 Mark each filter gauge with value of pressure drop for clean condition and manufacturer's recommended replacement (dirty) value.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

.1 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE).

.2 ASHRAE 84, Method of Testing Air-to-Air Heat Exchangers (ANSI approved).

1.2 SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Front End Documents. Include product characteristics, performance criteria, and limitations.

.2 Shop Drawings:
.1 Plate to Plate Heat exchanger performance
.2 Materials of Construction.
.3 Frost threshold.
.4 Motor HP and V/Ph/Hz.
.5 Controls.

PART 2 – PRODUCTS

2.1` GENERAL

.1 Comply with ASHRAE 84.

2.2 UNITS GENERAL

.1 The performance of the plate to plate heat recovery unit shall meet the performance outlined in the schedule.

.2 The Manufacturer shall guarantee the performance of the unit as to its total heat transfer capacity and its operation.

2.3 CASING

.1 20 gauge galvanized steel. Baked powder coated paint.

2.4 INSULATION

.1 Insulated with 1 in. (25 mm) fiberglass with FSK facing and 2 in. of foil-faced high density polystyrene foam on the outdoor air side for condensation control.

2.5 FANS

.1 Two (2) factory balanced fans with backward curved blades. Motors shall come with permanently lubricated sealed ball bearings, (TOP) thermal overload protected for maintenance-free operation.

2.6 HEAT TRANSFER MEDIA

.1 The heat recovery cores shall be fixed plate cross-flow heat exchanger using 1100 alloy aluminum and capable of transferring sensible heat between air streams. The heat recovery cores are engineered with a turbulence inducing geometry in order to maximize heat transfer while allowing an effective evacuation of condensate. The plates shall be hemmed to avoid cross-contamination of airstreams.

2.7 ACCESS DOORS

.1 The unit shall have access doors on the front and back. Locate the main control panel to provide access in accordance with floor plans.

2.8 SERVICEABILITY

.1 Cores, filters and drain pan shall be able to be accessed easily from both sides of the HRV from hinged access panels. Cores shall slide out with only 15" (380 mm) clearance. Blowers shall be able to be accessed from both side of the HRV from fastened access panels.

.2 Blowers shall be easily removed by taking off the access panel and sliding the motor plates out of the HRV. A quick connect shall be provided to allows for fast inspection of the blowers.

2.9 FILTERS

.1 The exhaust and outside air streams shall be protected by Merv 8 filters

2.10 MOTORIZED DAMPERS

.1 Provide motorized dampers in the outside air inlet and exhaust air outlet complete with end switch.

2.11 ELECTRIC HEATING COILS

.1 Provide a preheat coil prior to the heat recovery and a heating coil downstream of the heat recovery.

.2 Refer to section 23 82 40 for coil specifications.

2.12 CONTROLS

.1 The heat recovery unit shall be provided with a packaged control system to control the operation of the unit.

.2 The following controls shall be provided:
- .1 Discharge air temperature control.
- .2 Free cooling function
- .3 Prevention of Frost Formation
- .4 Opening/Closing of Dampers
- .5 Space Temperature Control.

.3 The heat recovery unit shall be provided with a preheat coil which is set to maintain the supply air temperature upstream of the heat recovery unit at

-10 C (14 F).

.4 The plate to plate heat recovery is capable of raising the supply air temperature to 11.7 C (53 F) on a peak design day.

.5 The heating coil downstream of the heat recovery shall be set to maintain the supply air temperature at 20 C (68 F).

.6 During part load conditions the plate to plate heat recovery shall provide as much heat as possible to meet the supply air temperature setpoint while minimizing the amount of reheat.

.7 On an enable signal the outside air and exhaust air dampers shall open. Once the dampers are open the supply and exhaust fans shall start.

.8 Provide an audible alarm at the unit so that if the unit goes into alarm an audible and visual alarm shall be initiated.

.9 Provide a wall mounted enable/disable switch with 0 to 12 hours timer. Timer shall provide the ability to also allow the unit to run continuously.

PART 3 – EXECUTION

3.1 INSTALLATION

.1 Install in accordance with manufacturers recommendations.

.2 Provide all wiring for controls and power wiring.

END OF SECTION

PART 1 – GENERAL

1.1 GENERAL

.1 This section of the specification shall be read in conjunction with and shall be governed by the requirements outlined in Section 22 05 01.

.2 System Description: Open coil electric reheat coils designed for air heating applications using electric heat.

1.2 REFERENCE STANDARDS

.1 ASTM B88-13 Specification for Seamless Copper Water Tube.

.2 ASTM B783-13 Specification for Materials for Ferrous Powder Metallurgy (P/M) Structural Parts.

.3 UL STD 1996 UL File number E245517.

.4 CSA Standard C22.2 No. 46: Electric Air-Heaters.

PART 2 – PRODUCTS

2.1 GENERAL

.1 Coils shall have the capability to be used in right-hand or left-hand applications.

.2 Each coil shall be selected using a computer selection program approved by ARI Standard 410.

.3 All duct heaters shall be tested and certified to UL STD 1996 UL File number E245517.

2.2 ELECTRIC REHEAT COILS

.1 Cabinet
.1 The duct heater frame, control enclosure and element support brackets shall be of 20 gauge (minimum) galvanized steel.
.2 Provide a large electrical cabinet door hinged for access.

.2 Electrical Connection
.1 Provide a single point electrical power connection.

.3 Coils
.1 Coils shall be made of high grade Nickel Chrome alloy (80% nickel and 20% chromium) and shall be insulated by floating ceramic bushings from the galvanized steel frame securely fastened to the element support brackets.
.2 Coil terminal pins shall be stainless steel, mechanically secured and insulated from the frame by a lock which shall keep it floating and stress free.

.4 Clearance
.1 Heaters shall be CSA approved for zero clearance in horizontal ducts.
.2 Coils shall be ETL listed to meet electrical safety standards and shall comply with CSA 236/UL requirements.

.5 Duct Connection
.1 Provide ¾” (20mm) flange type construction for connection to the ductwork.

.6 Controls
.1 The controls enclosure shall be NEMA-1 construction with standard door interlocking disconnect switch.
.2 Provide an automatic thermal reset cut out specifically matched to each unit to protect against overheating in case the minimum air flow requirements are not met.
.3 Provide a secondary thermal cut out in the power circuit to provide back up in case of failure of the automatic reset thermal cutout.
.4 Provide a flow switch to confirm positive air flow. If no air flow is present the flow switch shall lock out the electric heat.
.5 Provide a remote 120 V thermostat to modulate the reheat coil as required to maintain the space temperature at setpoint.

.7 Contactors and Fuses
.1 All duct heaters shall be provided with magnetic contactors as required, control transformer, SCR control for full modulation of the electric heating element and air flow sensor.
.2 Provide load fuses in accordance with the National Electric Code.
.3 Terminal blocks and ground lugs will be furnished on all heaters for field wiring. A line voltage to 24 volt, class II transformer shall be provided and mounted inside the control enclosure. All heaters shall have a disconnecting magnetic contactor(s) with a 24-volt holding coil as standard.

.8 Wiring Diagram
.1 A wiring diagram shall be installed on the control box cover.

.9 Testing
.1 Prior to shipment heaters shall be tested in accordance with CSA requirements.

PART 3 – EXECUTION

3.1 GENERAL

.1 Install all coils in accordance to manufacturer’s recommendations and as shown on the drawings.

.2 Provide an access door upstream of all reheat coils.

3.2 CLEANING

.1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Adhere to the latest Canadian Standards Association (CSA International)
.1 CSA-C22.1-18, Canadian Electrical Code, Part 1 (26th Edition), Safety Standard for Electrical Installations.
.2 CAN3-C235-83 (R2015), Preferred Voltage Levels for AC Systems, 0 to 50,000V.

.2 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS).

.3 The Ontario Electrical Safety Code, and all bulletins (Ontario).

.4 Electrical Safety Authority (ESA) requirements and local applicable codes and regulations.

1.2 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 Control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.3 Language operating requirements: provide identification nameplates and labels for control items in English.

1.3 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00.

.2 Product Data: submit WHMIS MSDS.

.3 Shop drawings:
.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario.
.2 Submit 6 number of copies of drawings and product data to authority having jurisdiction.
.3 If changes are required, notify Departmental Representative of these changes before they are made.

.4 Quality Control: in accordance with Section 01 45 00.
.1 Provide CSA certified equipment and material.
.2 Where CSA certified equipment and material is not available, submit such equipment and material to authority having jurisdiction for special approval before delivery to site.
.3 Submit test results of installed electrical systems and instrumentation.

.4 Permits and fees: in accordance with General Conditions of contract. Pay associated fees. Departmental Representative will provide drawings and specifications required by Electrical Inspection Department and Supply Authority at no cost.
.5 Submit, upon completion of Work, load balance report as described in PART 3 - Load Balance.
.6 Submit certificate of acceptance from Electrical Safety Authority having jurisdiction upon completion of Work to Departmental Representative.
.7 Submit fire alarm testing and verification certificate upon completion of work.

1.4 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00.

.2 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices as per the conditions of Provincial Act respecting manpower vocational training and qualification.
.1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.
.2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.

.3 Site Meetings:
.1 In accordance with Section 01 31 19.

.4 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Material Delivery Schedule: provide Departmental Representative with schedule within four (4) weeks after award of Contract.

.2 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

1.6 SYSTEM STARTUP

.1 Instruct Departmental Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.

PART 2 - PRODUCTS

2.1 SUSTAINABLE REQUIREMENTS

.1 Materials and products in accordance with Section 01 11 00.

2.2 MATERIALS AND EQUIPMENT

.1 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - Submittals.

.2 Factory assemble control panels and component assemblies.

2.3 WARNING SIGNS

.1 Warning signs: in accordance with requirements of authority having jurisdiction.

2.4 WIRING TERMINATIONS

.1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.5 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates and labels as follows:
.1 Nameplates: plastic laminate 3 mm thick plastic engraving sheet, matt white finish face, black core, mechanically attached with self-tapping screws.
.2 Sizes as follows:

NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

.2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.

.3 Wording on nameplates and labels to be approved by Departmental Representative prior to manufacture.

.4 Allow for minimum of twenty-five (25) letters per nameplate and label.

.5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.6 Identify equipment with Size 3 labels engraved "ASSET INVENTORY No. " as directed by Departmental Representative.

.7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.8 Terminal cabinets and pull boxes: indicate system and voltage.

.9 Transformers: indicate capacity, primary and secondary voltages.

.10 Receptacles: indicate panel name and circuit number.

2.6 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA-C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

2.7 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes and metallic sheathed cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue

2.8 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

2.9 DISTRIBUTION SYSTEM

.1 120/208V, 3-phase, 4-W, 60 Hz. and 347/600V, 3-phase, 4-W, 60 Hz.

.2 Inform other Divisions of electrical system characteristics.

2.10 WIRING SYSTEM

.1 Power and lighting circuits in EMT and/or described in other sections.

.2 Use heavy wall rigid conduit where required by codes.

.3 RW-90, XLPE insulated wire for panel feeder and branch circuits, GTF insulated wire for final fixture connection.

.4 #12 AWG minimum wire size, #10 AWG or larger shall be stranded.

.5 Copper conductors.

.6 Size branch circuits and panel feeders for maximum 2% voltage drop.

.7 Provide insulated green ground conductor in all EMT conduits.

.8 Provide nylon insulated bushings on the ends of all conduits in junction boxes, pullboxes, panelboards, etc.

.9 Minimum size conduit for lighting and power circuits is 21 mm.

2.11 GROUNDING

.1 Ground equipment with approved conductors and connectors.

.2 Make tests required by code and authorities having jurisdiction.

2.12 MOTOR AND CONTROL WIRING

.1 Provide wiring and connections for motors and electrical equipment supplied under other Divisions.

.2 Mechanical Divisions shall wire control circuits 50 volts and under.

2.13 PANELBOARD

.1 Provide panelboard of the circuit breaker type.

.2 Install branch circuit breakers shown on panel schedule.

.3 Panel to be in dead front metal cabinet with hinged door and catches.

.4 Breakers: toggle type, bolt-on, quick-make, quick-break, 40°C ambient temperature compensated and trip-free of operating handles on overloads.

.5 Lock-on handle devices for breakers not controlling lighting. 2P and 3P breakers to be with single handle common trip type.

.6 Typed directory card showing load supplied by each circuit, mounted inside cabinet door. Updated panel directories as required to reflect all work done under this project.

.7 Mount panel at 1500 mm above finished floor with the top of panel not higher than 2000 mm.

.8 Copper bus with neutral of same ampere rating as mains.

.9 Provide two 27 mm spare empty conduits from recessed panels into ceiling space above panel and terminate in an accessible location for any new panel provided under this project.

.10 Panelboards connected to emergency power shall be coloured red.

.11 Enclosures located indoors in climate controlled areas to be typically NEMA 1 rating type and include sprinkler-proof provisions as follows:
.1 where enclosures are surface mounted to include drip shield;
.2 doors and openings to be gasketted;
.3 where equipped with ventilation louvers, louvers designed to prevent penetration of water spray on live parts.

2.14 OUTLET BOXES

.1 Light fixture outlet boxes: standard, octagonal or square as required.

.2 Switch outlet boxes: standard, single or ganged as required.

.3 Receptacle outlet boxes: standard.

.4 Steel construction.

.5 Standard FS conduit fittings for surface mounted outlets in exposed areas.

2.15 SWITCHES

.1 Specification grade, toggle type, 20 amps, 120V back and side wired, chrome plated yoke, silver cadmium oxide contacts, switch mechanism on neoprene cushion.

.2 Locate switches on latch side of door, 1.5 m above finished floor unless noted otherwise.

2.16 RECEPTACLES

.1 Specification grade, 15 amp, 125 volt, AC, 'U' ground parallel blade slots, triple wiping contacts, double grounding terminals, break- off feature for separate feeds, built-in strap in plastic moulded body and back and side wiring terminals.

.2 Locate receptacles 400 mm above finished floor unless noted otherwise.

.3 Provide outlets with various configurations as indicated on electrical drawings.

2.17 COVER PLATES

.1 Common cover plate at ganged outlet boxes. Split plates not allowed.

2.18 FIXTURE MOUNTING

.1 Provide mounting and supports required for safe installation to Departmental Representative's satisfaction.

2.19 LIGHTING FIXTURES

.1 Provide lighting fixtures with lamps as illustrated in electrical standard details.

.2 Shop drawings to consist of catalogue cuts and photometric data from an independent test lab.

2.20 FLUORESCENT FIXTURES

.1 Ballast: electronic high power factor, energy saving type automatic resetting, thermal protection, pressure sensitive capacitor protection, lowest sound level available.

.2 Body: minimum 0.952 mm thick (20 gauge) steel, white baked enamel finish, reflectance value minimum 85%.

.3 Lens: 100% pure acrylic, low brightness, sparkling crystal prismatic pattern, maximum efficiency, and direct glare control. ULC certified.

.4 CSA rated for continuous row mounting.

2.21 LAMPS

.1 Fluorescent lamps: T8 Lamps, 1220 mm length unless specified otherwise, bi-pin, rapid start, premium grade, 30,000 hour life expectancy, 3,200 initial lumen output, cool/warm white.

2.22 DISCONNECT SWITCHES

.1 Heavy duty, quick-make, quick-break.

2.23 WORK IN EXISTING BUILDING

.1 The Work of the specification shall be read in conjunction with and be governed by the requirements with this section.

.2 Maintain life safety systems to all existing buildings at all times during construction.

.3 Maintain electrical continuity to all portions of existing building during all work. Submit letter to Departmental Representative requesting off-hours shut-down. Provide all temporary power and wiring required to achieve this.

2.24 AS-BUILT DRAWINGS

.1 Obtain CAD drawings from Departmental Representative to do CAD as-built drawing.

.2 Submit CAD as-built drawings at the end of the project for review and approval.

.3 Using PWGSC layering system.

2.25 ELECTRICAL COMMISSIONING

.1 Related Sections
.1 This section of the Specification shall be read in conjunction with and be governed by the requirements of other sections.

2.26 SUMMARY OF COMMISSIONING

.1 Commissioning (Cx) is a systematic quality process of ensuring that building systems perform and interact according to the Departmental Representative 's and the Design Engineers' Project Requirements and contract documents.

.2 Desired Outcomes
.1 A commissioned building provided optimized energy and occupant comfort, and sets the stage for minimal operation and maintenance costs. It serves as a tool for both the Departmental Representative and the Contractor to minimize post-occupancy remedial work.

.3 Commissioning Goals
.1 The Commissioning Process for a project typically focuses on systems and assemblies having to do with the performance objectives meeting the Departmental Representative 's Project Requirements (OPR). Contractors, associated Sub-Contractors, equipment and material Suppliers are to support and ensure the requirements for commissioning are met in their respective work.

2.27 DEFINITIONS

.1 Departmental Representative's Project Requirements (OPR)
.1 The documentation of the functional performance requirements of the facility and the Departmental Representative's expectations of how it will be used and operated. This document is analogous to what has traditionally been referred to as the Departmental Representative Program.

.2 Basis of Design (BOD)
.1 A project-specific set of assumptions and design parameters for system and product selections to meet the OPR and applicable regulatory requirements.

.3 Commissioning Agent (CxA)
.1 The CxA facilitates and coordinates the commissioning activities. Involvement of CxA shall not void any guarantees or warranties nor shall it relieve the Contractor of any contractual responsibilites.

.4 Deficiency/Issue
.1 A condition in the installation or function of a component or system that is not in compliance with the construction contract documents and/or Departmental Representative's requirements.

.5 Start-up/Pre-Functional The initial starting or activating of dynamic equipment, including the checkout of components and devices and completing static installation checklists.

.6 Functional Performance Testing (FPT)
.1 Testing performed by the Construction Team to verify that specific components, assemblies, systems, and integrated systems function and perform in accordance with the Departmental Representative's objectives and the contract documents. Tests are generally performed after the Contractor's start-up and initial checkouts are completed.

2.28 COMMISSIONING PLAN

.1 The CxA will develop a Commissioning Plan unique to the project.

.2 The Commissioning Plan identifies the strategies, aspects, and responsibilities within the commissioning process for all project team members.

.3 The Commissioning Plan contains the following information:
.1 Commissioning Program Overview
.1 Goals and objectives
.2 General project information
.3 Systems to be commissioned.
.2 Commissioning Team
.1 Team members, roles, and responsibilities.
.2 Communication protocol, coordination, meetings, and management.
.3 Commissioning Process Activities
.1 Documenting the Departmental Representative's project requirements.
.2 Preparing the basis of design.
.3 Developing systems functional performance test procedures.
.4 Verifying systems performance.
.5 Reporting deficiencies and the resolution process.

.4 List of systems and assemblies to be commissioned.

.5 The Contractor and the Sub-Contractors shall carryout commissioning activities as per the Commissioning Plan.

2.29 COMMISSIONING DOCUMENTATION

.1 The Commissioning Process includes a significant documentation and paper component. Commissioning documents include but are not limited to:
.1 Drawings and Specifications.
.2 Shop Drawings.
.3 Pre-Functional Check Sheets.
.4 OEM/Contractor Start Up/Test Forms and Records.
.5 As Built Drawings and Specifications.
.6 Functional Performance Test Plans and Results.

PART 3 - EXECUTION

3.1 GENERAL

.1 Turnover all existing equipment that is no longer required to the Departmental Representative. Remove from site any equipment that the Departmental Representative may decide upon. Package all HID fixtures individually.

.2 Protect all removed (to be retained) equipment from damage. Replace damaged equipment.

.3 Provide temporary power feeder from new electrical room to existing 600A service until permanent feeder is installed.

3.2 COMMISSIONING PROCESS

.1 Commissioning Meetings
.1 Commissioning during the Construction Phase begins with a team kick off meeting, conducted by the CxA, where the Commissioning Plan is reviewed with the Commissioning Team and roles and responsibilities are clarified. Additional meetings will be held throughout construction, to be conducted by the CxA with the Commissioning Team and if required with other necessary parties attending (for example, a supplier of a product or system), to plan, scope, coordinate, and schedule ongoing commissioning activities and resolve issues/problems. The commissioning meetings will normally be at the call of the CxA in coordination with the Commissioning Team.

.2 Pre-Functional Verification
.1 The Electrical Contractor will develop the Pre-Functional Check Sheets and provide to the Commissioning Agent for review. These pre-functional check sheets are to be completed by the Contractor during their normal installation and start up process.
.2 The equipment start up shall be in accordance with all related specifications and OEM requirements.

.3 Notify the CxA a minimum of two (2) weeks in advance of equipment and system start up and/or installation verification testing. The CxA verifies the Contractor completed check sheets, checks installation and the startup checks/documentation.

.4 Evaluation of the results will be conducted by the CxA. The CxA will evaluate whether the installed systems meet the criteria for the project.

.3 Functional Performance Testing

.1 All Pre-Functional Check sheets and Processes shall be completed and signed off by the CxA prior to starting equipment or system Functional Performance Testing

.2 Systems functional performance testing occurs once all system components are installed, energized, programmed, and otherwise ready for operation.

.4 Testing includes each process in the sequence of operation under central and packaged equipment control.

.5 Systems performance testing relies on the testing procedures developed by the CxA specifically for the systems to be tested.

.6 All equipment/systems shall be functionally tested by the Contractor and Subs prior to demonstration to the CxA. It is the responsibility of the Contractor and Subs to ensure all equipment /systems are functioning properly according to the contract documents before this demonstration occurs.

.7 The Contractor is required to demonstrate functional performance to the CxA, as required by the CxA. The CxA will evaluate whether the system performance meets the criteria set forth by contract documents and the Departmental Representative's project requirements.

.8 Evaluation of the results will be conducted by the CxA. The CxA will evaluate whether the installed systems meet the criteria for the project.

3.3 SYSTEMS TO BE COMMISSIONED

.1 New Lighting and Electrical Distributions/outlets.

.2 Life Safety where required.

3.4 ELECTRICAL CONTRACTOR RESPONSIBILITIES

.1 The Contractor shall be responsible for the commissioning process detailed here and in the Electrical Specifications sections.

.2 The Contractor shall coordinate and cooperate with the other divisions as detailed in the specification sections of the Electrical Specifications.

.3 The Contractor shall only utilize employees with previous experience in testing procedures as they relate to a particular subject.

.4 The Contractor shall hire the Manufacturers' technicians who will conduct tests on their equipment.

.5 Provide a schedule showing commissioning activities and milestones and allow adequate time for testing, commissioning and re-work if required.

.6 Explain and ensure the Sub-Contractors understand commissioning requirements.

.7 Establish and keep separate record of tests, during construction and the post construction phase.

.8 Understand quality standards contained in the specifications and ensure by inspections, review by others and testing that they are being met by the Sub-Contractors.

.9 Arrange samples, test equipment, etc., required by specifications.

.10 Ensure Sub-Contractors' testing is performed and complete prior to turnover.

.11 Develop Pre-Functional Check Sheets.

.12 Completion of Pre-Functional Check Sheets and Functional Performance Test Plans.

Commissioning Team Roles and Responsibilities

Commissioning Activities and Milestones	OEM(s)	Contractor(s)	Departmental(s) Representative & Designers	Departmental Representative	Commissioning Agent(CxA)
Commissioning Plan		Provides input re: schedule	Reviews	Reviews	Develops
Briefing Contractors Milestones		Participates		Attends	Briefs
Pre-Functional Check Sheets		Develops/ Executes			Reviews
Pre-Functional Inspection (Installation & start-up)	Performs start-up as required	Performs start-up and executes Pre-Functional Check Sheet		Witness as Required	Review installation & start-up execution and documentation
Functional Performance Testing Plans	Assists with development and execution where required	Assists with development and execution where required	Reviews and comments as required		Develops test procedures
Functional Performance Testing and Verification	Demonstrates operation to CxA	Demonstrates operation to CxA		Witness as required	Witness, verify and document results

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)
.1 CSA C22.2 No. 131-17, Type TECK 90 Cable.
.2 CAN/CSA-C61089-11(R2015), Round Wire Concentric Lay Overhead Electrical Stranded Conductors.

.2 National Electrical Manufacturers' Association (NEMA)/Insulated Cable Engineers Association (ICEA)
.1 ICEA S-93-639/NEMA WC74-2012, 5-46 KV Shielded Power Cable for Use in the Transmission and Distribution of Electrical Energy.

1.2 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Provide product data in accordance with Section 01 33 00.
.1 Provide manufacturer's printed product literature, specifications, data sheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Quality assurance submittals: submit following in accordance with Section 01 11 00 and Section 01 45 00.
.1 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:
.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 PRIMARY OVERHEAD CONDUCTORS (1001 - 5000 V)

.1 Bare aluminum conductors steel reinforced: to CAN/CSA-C61089, size as indicated.

2.2 RUBBER INSULATED CABLES (1001 - 5000 V)

.1 Conductors: aluminum size as indicated.

.2 Insulation: cross-linked polyethylene compound rated RL90.

.3 Insulation shielding: semi-conducting non-metallic tape over insulation, and served wire shield over tape.

.4 Cable jacket: thermosetting with separator tape between shield and jacket.

2.3 ALUMINUM SHEATHED CABLES (1001 - 5000 V)

.1 Sheath: seamless, corrugated, aluminum.

.2 Outer covering: extruded PVC.

2.4 CONCENTRIC NEUTRAL POWER CABLE (1001 - 5000 V)

.1 Single copper conductor, size as indicated.
.1 Semi-conducting strand shield.

.2 Insulation: cross-linked polyethylene rated 90 degrees C and 5 kV.

.3 Semi-conducting insulation shielding layer.

.4 Copper neutral wires applied helically over insulation shield equivalent to 100% full capacity.

.5 Separator mylar tape over neutral wires.

.6 Extruded PVC jacket rated minus 40 degrees C.

2.5 PRIMARY OVERHEAD CONDUCTORS (5001 - 15000 V)

.1 Bare, aluminum, steel reinforced conductors, size as indicated.

2.6 RUBBER INSULATED CABLES (5001 - 15000 V)

.1 Single aluminum conductor: to ICEA S-93-639/NEMA WC74 size as indicated.

.2 Strand shielding.

.3 Insulation: chemically cross-linked thermosetting polyethylene material rated 90 degrees C and 15 kV.

.4 Barrier tape over shield.

.5 Overall jacket of PVC rated minus 40 degrees C.

2.7 CONCENTRIC NEUTRAL POWER CABLES (5001 - 2.8 00 V)

.1 Concentric neutral power cable: to ICEA S-93-639/NEMA WC74.

.2 Single aluminum conductor, size as indicated.

.3 Semi-conducting strand shield.

.4 Class 2.

.5 Insulation: cross-linked thermosetting polyethylene material rated 90°C and 15kV for 133% voltage level.

.6 Semi-conducting insulation shielding layer.

.7 Copper neutral wires applied helically over insulation shield equivalent to 100% full capacity.

.8 Separator tape over neutral wires.

.9 Extruded PVC jacket rated minus 40°C.

2.8 TECK POWER CABLE (1001 - 15000 V)

.1 Cable: to CSA C22.2 No. 131 in accordance with Section 26 05 00.

.2 Bare aluminum grounding conductor, size as indicated.

.3 Aluminum circuit conductors, size and number as indicated.

.4 Strand shielding.

.5 Insulation: chemically cross-linked thermosetting polyethylene rated RW90 5 kV to ICEA S-93-639/NEMA WC74.

.6 Insulation shielding: semi-conducting non-metallic tape over insulation and served wire shield over tape to ICEA S-93-639/NEMA WC74.

.7 Separator tape over conductor assembly.

.8 Inner jacket of PVC.

.9 Interlocked aluminum armour.

.10 Overall PVC jacket rated minus 40°C.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install power cable on pole lines as indicated and in accordance with manufacturer's instructions.

.2 Install power cable in trenches as indicated.

.3 Provide supports and accessories for installation of high voltage power cable.

.4 Install stress cones, terminations and splices in accordance with manufacturer's instructions

.5 Install grounding in accordance with local inspection authority having jurisdiction.

.6 Provide cable identification tags and identify each phase conductor of power cable.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00.

.2 Use of qualified tradespersons for installation, splicing, termination and testing of high voltage power cables.

.3 Engage an independent testing agent to test high voltage power cable. Submit test result and inspection certificate.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Sustainability Requirements Section 01 35 63.

.2 Sustainability Procedures Section 01 35 66.

.3 CSA International
.1 CSA-C22.2 No.18.2-06 (R2016), Outlet Boxes, Conduit Boxes and Fittings.
.2 CSA-C22.2 No.65-18, Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE).

.4 National Electrical Manufacturers Association (NEMA)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for wire and box connectors and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00.

.2 Operation and Maintenance Data: submit operation and maintenance data for wire and box connectors for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect wire and box connectors from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Pressure type wire connectors to: CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.

.2 Fixture type splicing connectors to: CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

.3 Bushing stud connectors: to 1Y-2 to consist of:
- .1 Connector body and stud clamp for stranded copper conductors.
- .2 Clamp for stranded copper conductors.
- .3 Stud clamp bolts.
- .4 Bolts for copper conductors.
- .5 Sized for conductors as indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wire and box connectors installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Remove insulation carefully from ends of conductors and cables and:
- .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
- .2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA-C22.2 No.65-13.
- .3 Install fixture type connectors and tighten to CSA-C22.2 No.65-13. Replace insulating cap.
- .4 Install bushing stud connectors in accordance with 1Y-2.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
  .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 20.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
  .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 PRODUCT DATA

.1 Provide product data in accordance with Section 01 33 00.

1.2 DELIVERY, STORAGE AND HANDLING

.1 Packaging Waste Management: remove for reuse and return of packaging materials in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
.1 Copper conductors: size as indicated, with 600V insulation of cross-linked thermosetting polyethylene material rated RW90, Non-Jacketted.
.2 Copper conductors: size as indicated, with thermoplastic insulation type T90 Nylon rated at 600 V.

2.2 ARMOURED CABLES

.1 Conductors: insulated, copper size as indicated.

.2 Type: AC90.

.3 Armour: interlocking type fabricated from galvanized steel strip.

.4 Type: ACWU90 jacket over thermoplastic armour and compliant to applicable Building Code classification for this project.

.5 Connectors: anti short connectors.

2.3 CONTROL CABLES

.1 Type: LVT: soft annealed copper conductors, sized as indicated:
.1 Insulation: thermoplastic.
.2 Sheath : armour of closely wound aluminum wire.

.2 Type: low energy 300 V control cable: stranded annealed copper conductors sized as indicated LVT: soft annealed copper conductors, sized as indicated:
.1 Insulation: TWH.
.2 Shielding: tape coated with paramagnetic material over each conductors.
.3 Overall covering: polyethylene jackets.

.3 Type: 600 V stranded annealed copper conductors, sizes as indicated:
.1 Insulation: RW90.
.2 Shielding: magnetic tape conductors.

.3 Overall covering: thermoplastic jacket.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00.

.2 Perform tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

.1 Terminate cables in accordance with Section 26 05 20.

.2 Cable Colour Coding: to Section 26 05 00.

.3 Conductor length for parallel feeders to be identical.

.4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

.5 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.

.6 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.3 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:
.1 In conduit systems in accordance with Section 26 05 34.

3.4 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible on channels.

3.5 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduit.

.2 Ground control cable shield.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation for connectors and terminations.

1.2 RELATED SECTIONS

.1 Section 26 05 32 - Outlet, Boxes, Conduit Boxes and Fittings.

1.3 REFERENCES

.1 Canadian Standards Association
  .1 CSA C22.2 No.41-13, Grounding and Bonding Equipment.
  .2 CSA C22.2 No.65-18 as required sized for copper compression conductors.

1.4 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 20.

.2 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Departmental Representative.

PART 2 - PRODUCTS

2.1 CONNECTORS AND TERMINATIONS

.1 Copper compression connectors to CSA C22.2 No.65-18 as required sized for conductors.

.2 Junction boxes with respective pothead for conductor cables in accordance with Section 26 05 31.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Bond and ground as required to CSA C22.2 No.41.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00.

1.2 REFERENCES

.1 American National Standards Institute /Institute of Electrical and Electronics Engineers (ANSI/IEEE)
.1 ANSI/IEEE 837-2014, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for grounding equipment and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00.

.2 Operation and Maintenance Data: submit operation and maintenance data for grounding equipment for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect grounding equipment.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 EQUIPMENT

.1 Clamps for grounding of conductor: size as required to electrically conductive underground water pipe.

.2 Grounding conductors: bare stranded copper, soft annealed, size as required.

.3 Insulated grounding conductors: green, copper conductors, size as required.

.4 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
- .1 Grounding and bonding bushings.
- .2 Protective type clamps.
- .3 Bolted type conductor connectors.
- .4 Thermit welded type conductor connectors.
- .5 Bonding jumpers, straps.
- .6 Pressure wire connectors.

PART 3 - EXECUTION

3.1 INSTALLATION GENERAL

.1 Provide new grounding where required and connect to existing grounding system.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Use mechanical connectors for grounding connections to equipment provided with lugs.

.5 Soldered joints not permitted.

.6 Install bonding wire for flexible conduit, connected at both one ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.7 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.

.8 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.

3.2 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Frames of motors, starters, control panels, panels.

3.3 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00.

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 20.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

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

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

PART 2 - PRODUCTS

2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted or suspended.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Secure equipment to masonry, tile and plaster surfaces with lead anchors.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.

.5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.6 Fasten exposed conduit or cables to building construction or support system using straps.
.1 One-hole malleable iron steel straps to secure surface conduits and cables 50 mm and smaller.
.2 Two-hole steel straps for conduits and cables larger than 50 mm.
.3 Beam clamps to secure conduit to exposed steel work.

.7 Suspended support systems.

.1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.

.2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.

.8 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.9 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.10 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.11 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative.

.12 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)
.1 CSA C22.1-2018, Canadian Electrical Code, Part 1.

1.2 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Product Data:
.1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:
.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 JUNCTION AND PULL BOXES

.1 Construction: welded steel enclosure.

.2 Covers Flush Mounted: 25 mm minimum extension all around.

.3 Covers Surface Mounted: screw-on flat edge covers.

PART 3 - EXECUTION

3.1 SPLITTER INSTALLATION

.1 Mount plumb, true and square to building lines.

.2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Mount cabinets with top not higher than 2 m above finished floor except where indicated otherwise.

.3 Install terminal block as indicated in Type T cabinets.

.4 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.3 IDENTIFICATION

.1 Equipment Identification: to Section 26 05 00.

.2 Identification Labels: Size 2 nameplate.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)
  .1 CSA C22.1-2018, Canadian Electrical Code, Part 1, 26th Edition.

1.2 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Submit samples for floor box in accordance with Section 01 33 00.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00.

.2 Waste Management and Disposal:
  .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 102 mm square or larger outlet boxes as required.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices.

.5 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 GALVANIZED STEEL OUTLET BOXES

.1 One-piece electro-galvanized construction.

.2 Single and multi-gang flush device boxes for flush installation, minimum size 76x50x38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.

.3 Utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.

.4 102 mm square or octagonal outlet boxes for lighting fixture outlets.

.5 Extension and plaster rings for flush mounting devices in finished walls.

2.3 CONDUIT BOXES

.1 Cast FS or FD boxes with factory-threaded hubs and mounting feet for surface wiring of devices.

2.4 FITTINGS – GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 35 mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

.4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.

.5 Vacuum clean interior of outlet boxes before installation of wiring devices.

.6 Identify systems for outlet boxes as required.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Sustainability Requirements Section 01 35 63.

.2 Sustainability Procedures Section 01 35 66.

.3 CSA International
.1 CSA C22.2 No.40-M1989(R2014), Cutout, Junction and Pull Boxes.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for raceway and boxes and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00.

.2 Operation and Maintenance Data: submit operation and maintenance data for raceway and boxes for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials [off ground] [indoors] [in dry location] and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect [raceway and boxes] from [nicks, scratches, and blemishes].
.3 Replace defective or damaged materials with new.

.4 Develop [Construction Waste Management Plan] [Waste Reduction Workplan] related to Work of this Section.

.5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Construction Waste Management Plan Waste Reduction Workplan in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 JUNCTION BOXES POWER LEVEL

.1 Cast iron octagonal box painted with chromate primer and gray enamel with joints ground smooth and fitted with gasket, contacts mounted on porcelain supports to which conductors are fastened by soldered-on lugs, medium hard asphalt compound filled, suitable for 3 phase, 15 kV cable, 250 MCM maximum cable size, with wiping sleeve stuffing box entrance.

.2 Welded steel rectangular boxes, oil resistant gasketted steel plate lids fastened with silicon-bronze bolts, shot blasted and painted with chromate primer and gray enamel, cable heads medium hard asphalt compound filled cap nut sealed potheads with [wiping sleeve] stuffing box entrances, oil filled [air filled], disconnecting links insulated switch stick operated at no voltage rated 250A at 7500V,4 way for wall mounting in maintenance holes.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for raceway and boxes installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied [and after receipt of written approval to proceed from Departmental Representative].

3.2 INSTALLATION

.1 Install junctions boxes on trench floor around cable splice to [CSA C22.2 No.40]. Connect cable terminals to box contacts.
.1 Ground junction boxes as required.
.2 Fasten lid securely and check for air leaks before trench is backfilled.

.2 Install distribution level steel boxes on walls of maintenance holes tunnels. Splice main cable in box and connect branch feeder. Fasten cover and fill with compound.
.1 Ground steel boxes as required.

.3 Install power level boxes as follows:
.1 Cast iron type: on trench floor, connect cable terminals to box contacts, fasten lid and fill with compound before trench is backfilled.
.2 Steel type: mount on wall of [maintenance hole] [tunnel]; connect cables to box terminals; install disconnect links, fasten lid securely [fill with oil] [check for air leaks].
.3 Ground power level boxes as required.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CSA-C22.2 No. 18.2-06(R2016), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
- .2 CSA-C22.2 NO. 18.1-13, Metallic Outlet Boxes.
- .3 CSA-C22.2 No. 18.3-12, Conduit, Tubing, and Cable Fittings (Tri-National standard, with ANCE NMX-J-017 and UL 514B).
- .4 CSA C22.2 No. 56-13, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .5 CSA C22.2 No. 83-M1985(R2013), Electrical Metallic Tubing.

1.2 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Product data: submit manufacturer's printed product literature, specifications and datasheets.
- .1 Submit cable manufacturing data.

.3 Quality assurance submittals:
- .1 Test reports: submit certified test reports.
- .2 Instructions: submit manufacturer's installation instructions.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

PART 2 - PRODUCTS

2.1 CONDUITS

.1 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

.2 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.

2.2 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 50 mm and smaller.
- .1 Two hole steel straps for conduits larger than 50 mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits at 3 m on centre.

.4 Threaded rods, 6 mm diameter, to support suspended channels.

2.3 CONDUIT FITTINGS

.1 Fittings: to CSA C22.2 No. 18.3, manufactured for use with conduit specified. Coating: same as conduit.

.2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.

.3 Watertight connectors and couplings for EMT.
.1 Set-screws are not acceptable.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 200 mm linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.

.3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 FISH CORD

.1 Polypropylene.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.

.3 Surface mount conduits on existing concrete wall and columns.

.4 Use rigid galvanized steel threaded conduit except where specified otherwise.

.5 Use electrical metallic tubing (EMT) above 2.4 m not subject to mechanical injury.

.6 Use flexible metal conduit for connection to motors in dry areas connection to recessed fixtures without prewired outlet box connection to recessed fluorescent fixtures, work in movable metal partitions.

.7 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.

.8 Install conduit sealing fittings in hazardous areas.
.1 Fill with compound.

.9 Minimum conduit size for lighting and power circuits: 21 mm.

.10 Bend conduit cold:
.1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.11 Mechanically bend steel conduit over 21 mm diameter.

.12 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.13 Install fish cord in empty conduits.

.14 Run 2-25 mm spare conduits up to ceiling space and 2-25 mm spare conduits down to ceiling space from each flush panel.
.1 Terminate these conduits in 152 x 152 x 102 mm junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in surface type box.

.15 Remove and replace blocked conduit sections.
.1 Do not use liquids to clean out conduits.

.16 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on suspended channels.

.5 Do not pass conduits through structural members except as indicated.

.6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

.3 Do not install conduits in terrazzo or concrete toppings.

3.5 CLEANING

.1 Proceed in accordance with Section 01 74 11.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Sustainability Requirements Section 01 35 63.

.2 Sustainability Procedures Section 01 35 66.

.3 CSA International
.1 CSA C22.2 No.29-15, Panelboards and Enclosed Panelboards.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for panelboards and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
.2 Include on drawings:
.1 Electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00.

.2 Operation and Maintenance Data: submit operation and maintenance data for [panelboards] for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials off ground, indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect panelboards from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 PANELBOARDS

.1 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.

.1 Install circuit breakers in panelboards before shipment.

.2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

.2 250V panelboards: bus and breakers rated for 42kA (symmetrical) interrupting capacity or as indicated.

.3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

.4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.

.5 Minimum of 2 flush locks for each panel board.

.6 Two keys for each panelboard and key panelboards alike.

.7 Aluminum bus with neutral of same ampere rating of mains.

.8 Mains: suitable for bolt-on breakers.

.9 Trim with concealed front bolts and hinges.

.10 Trim and door finish: baked enamel as per colour schedule.

.11 Isolated ground bus.

.12 Include grounding busbar with 3 of terminals for bonding conductor equal to breaker capacity of the panel board.

2.2 BREAKERS

.1 Breakers: to Section 26 28 16.02.

.2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

.3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.

.4 Lock-on devices for 10% of 15 to 30 A breakers installed as indicated. Turn over unused lock-on devices to Departmental Representative.

.5 Lock-on devices for receptacles, fire alarm, emergency, door supervisory, exit and night light circuits.

2.3 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00.

.2 Nameplate for each panelboard Size 4 engraved [as indicated].

.3 Nameplate for each circuit in distribution panelboards Size 2 engraved [as indicated].

.4 Complete circuit directory with typewritten legend showing location and load of each circuit, mounted in plastic envelope at inside of panel door.

.5 Circuits supplying Patient Care Areas must be entered in circuit directory with Bold Font.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for panelboards installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Install surface mounted panelboards on plywood backboards in accordance with Section 06 10 00. Where practical, group panelboards on common backboard.

.3 Mount panelboards to height specified in Section 26 05 00 or as indicated.

.4 Connect loads to circuits.

.5 Connect neutral conductors to common neutral bus with respective neutral identified.

.6 Where panels of different systems (i.e. Standard and Vital Power) supply a common patient care area, ground busses in panels to be interconnect with a minimum #6 AWG ground conductor.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
  .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
  .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by panelboards installation.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 CSA International
.1 CSA C22.2 No.42-10 (R2015), General Use Receptacles, Attachment Plugs and Similar Devices.
.2 CSA C22.2 No.42.1-13, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
.3 CSA C22.2 No.55-15, Special Use Switches.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for wiring devices and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00.

.2 Operation and Maintenance Data: submit operation and maintenance data for wiring devices for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect wiring devices from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 SWITCHES

.1 15A, 120V, single pole, double pole, three-way, switches to: CSA C22.2 No.55 and CSA C22.2 No.111.

.2 Manually-operated general purpose AC switches with following features:
- .1 Terminal holes approved for No. 10 AWG wire.
- .2 Silver alloy contacts.
- .3 Urea or melamine moulding for parts subject to carbon tracking.
- .4 Suitable for back and side wiring.
- .5 Ivory on drywall and Brown on existing concrete walls toggle.

.3 Toggle operated fully rated for tungsten filament, LED, and fluorescent lamps, and up to 80% of rated capacity of motor loads.

.4 Switches of one manufacturer throughout project.

2.2 RECEPTACLES

.1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA C22.2 No.42 with following features:
- .1 Ivory urea moulded housing.
- .2 Suitable for No. 10 AWG for back and side wiring.
- .3 Break-off links for use as split receptacles.
- .4 Eight back wired entrances, four side wiring screws.
- .5 Triple wipe contacts and rivetted grounding contacts.

.2 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground with following features:
- .1 Ivory in drywalls and Brown in concrete walls urea moulded housing.
- .2 Suitable for No. 10 AWG for back and side wiring.
- .3 Four back wired entrances, 2 side wiring screws.

.3 Other receptacles with ampacity and voltage as indicated.

.4 Receptacles of one manufacturer throughout project.

.5 Finishes to be confirmed prior to ordering.

2.3 COVER PLATES

.1 Cover plates for wiring devices to: CSA C22.2 No.42.1.

.2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

.3 Stainless steel, vertically brushed, 1 mm thick cover plates for wiring devices mounted in flush-mounted outlet box.

.4 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

2.4 SOURCE QUALITY CONTROL

.1 Cover plates from one manufacturer throughout project.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wiring devices installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Switches:
.1 Install single throw switches with handle in "UP" position when switch closed.
.2 Install switches in gang type outlet box when more than one switch is required in one location.
.3 Mount toggle switches at height in accordance with Section 26 05 00.

.2 Receptacles:
.1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
.2 Mount receptacles at height in accordance with Section 26 05 00.
.3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
.4 Install GFI type receptacles as indicated.

.3 Cover plates:
.1 Install suitable common cover plates where wiring devices are grouped.
.2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.
.3 Provide outdoor WP coverplates to meet ESA requirements.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.

.3 Repair damage to adjacent materials caused by wiring device installation.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

1 Sustainability Requirements Section 01 35 63.

.2 Sustainability Procedures Section 01 35 66.

1.2 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Product Data:
.1 Provide fuse performance data characteristics for each fuse type and size above 30A. Performance data to include: average melting time-current characteristics.

.3 Shop Drawings:
.1 Provide shop drawings in accordance with Section 01 33 00.
.2 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Ship fuses in original containers.

.2 Do not ship fuses installed in switchboard.

.3 Store fuses in original containers in [storage cabinet] [moisture free location].

.4 Waste Management and Disposal:
.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

1.4 MAINTENANCE MATERIALS

.1 Provide maintenance materials in accordance with Section 01 78 00.

.2 Three spare fuses of each type and size installed above 600 A.

.3 Six spare fuses of each type and size installed up to and including 600A.

PART 2 - PRODUCTS

2.1 FUSES - GENERAL

.1 Fuse type references L1, L2, J1, R1, etc. have been adopted for use in this specification.

.2 Fuses: product of one manufacturer.

2.2 FUSE TYPES

.1 Class L fuses.
.1 Type L1, time delay, capable of carrying 500% of its rated current for 10 s minimum.
.2 Type L2, fast acting.

.2 Class J fuses.
.1 Type J1, time delay, capable of carrying 500% of its rated current for 10 s minimum.
.2 Type J2, fast acting.

.3 Class R -R fuses.
.1 Type R1, (UL Class RK1), time delay, capable of carrying 500% of its rated current for 10 s minimum, to meet UL Class RK1 maximum let-through limits.
.2 Type R2, time delay, capable of carrying 500% of its rated current for 10 s minimum.
.3 Type R3, (UL Class RK1), fast acting Class R, to meet UL Class RK1 maximum let-through limits.

.4 Class C fuses.

2.3 FUSE STORAGE CABINET

.1 Fuse storage cabinet, manufactured from 2.0 mm thick aluminum 750 mm high, 600 mm wide, 300 mm deep, hinged, lockable front access door finished in accordance with Section 26 05 00.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install fuses in mounting devices immediately before energizing circuit.

.2 Ensure correct fuses fitted to physically matched mounting devices.
  .1 Install rejection clips for Class R fuses.

.3 Ensure correct fuses fitted to assigned electrical circuit.

.4 Where UL Class RK1 fuses are specified, install warning label "Use only UL Class RK1 fuses for replacement" on equipment.

.5 Install spare fuses in fuse storage cabinet.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 CSA International (CSA)
.1 CSA C22.2 No. 5-16, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2016).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for circuit breakers and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store circuit breakers in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect circuit breakers.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 BREAKERS GENERAL

.1 Moulded-case circuit breakers, and ground-fault circuit-interrupters: to CSA C22.2 No. 5.

.2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.

2.2 THERMAL MAGNETIC BREAKERS DESIGN A

.1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

2.3 ENCLOSURE

.1 Sprinkler-proof: NEMA 1R.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Install circuit breakers as required.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 CSA International
.1 CSA C22.2 No.144.1-16, Ground Fault Circuit Interrupters.

.2 National Electrical Manufacturers Association (NEMA)
.1 NEMA PB 2.2-2014, Application Guide for Ground Fault Protection Devices for Equipment.

1.2 ACTION AND INFORMATIONAL

.1 Submit in accordance with Section 01 33 00.

1.3 SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for ground fault circuit interrupters and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

.4 Test and Evaluation Reports: submit test report for field testing of ground fault equipment to Departmental Representative and certificate that system as installed meets criteria specified.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00.

.2 Operation and Maintenance Data: submit operation and maintenance data for ground fault circuit interrupters for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect ground fault circuit interrupters.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Equipment and components for ground fault circuit interrupters (GFCI): to CSA-C22.2 No.144.1.

.2 Components comprising ground fault protective system to be of same manufacturer.

2.2 BREAKER TYPE GROUND FAULT INTERRUPTER

.1 Single or Two pole ground fault circuit interrupter for 15 or 20A, 120V, single-phase circuit c/w test and reset facilities.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for ground fault circuit interrupters installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 and co-ordinate with Section 01 45 00 if required.

.2 Arrange for field testing of ground fault equipment by ground fault equipment manufacturer before commissioning service.

.3 Demonstrate simulated ground fault tests.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
  .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
  .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

.1 Non-fusible, disconnect switch in CSA Enclosure 1R, size as indicated.

.2 Provision for padlocking in off switch position by locks.

.3 Mechanically interlocked door to prevent opening when handle in ON position.

.4 ON-OFF switch position indication on switch enclosure cover.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00.

.2 Indicate name of load controlled on Size 4 nameplate.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install disconnect switches complete with fuses if applicable.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Sustainability Requirements Section 01 35 63.

.2 Sustainability Procedures Section 01 35 66.

.3 CSA International
.1 CSA C22.2 No.14-13, Industrial Control Equipment.

.4 National Electrical Manufacturers Association (NEMA)
.1 NEMA ICS 1-2000(R2015), Industrial Control and Systems: General Requirements.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for control devices and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
.2 Include schematic, wiring, interconnection diagrams.

1.3 QUALITY ASSURANCE

.1 Conduct tests in accordance with Section 26 05 00.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00.

.2 Operation and Maintenance Data: submit operation and maintenance data for control devices for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect control devices from nicks, scratches, and

blemishes.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 AC CONTROL RELAYS

.1 Control Relays: to CSA C22.2 No.14 and NEMA ICS 1.

.2 Convertible contact type: contacts field convertible from NO to NC, electrically held permanent magnet latched double-voltage type with sliding barrier to permit access to contacts only or coil only, with pneumatic solid state timer and poles overlap type. Coil rating: V, VA.

.3 Sealed contact type: electrically held permanent magnet latched with poles and front mounted contact block to provide additional poles. Coil rating: V, VA.

.4 Universal pole type: electrically held mechanically held latch type with poles, convertible from NO to NC by changing wiring connections.

.5 Fixed contact plug-in type: general purpose low coil current heavy duty with poles.

2.2 RELAY ACCESSORIES

.1 Standard contact cartridges: normally-open, convertible to normally-closed in field.

2.3 OILTIGHT LIMIT SWITCHES

.1 Snap action Slow action type: roller rod fork lever, top side pushwobble stick actuator, CSA type 1 open type enclosure.
Contact rating NEMA ICS 1 V, A AC DC.

.2 Surface Manifold Plug-in Cavity mounted.

.3 Standard Neutral position Time delay contact block.

.4 Socket bases and DIN mounting rails for plug-in type relays.

2.4 SEALED CONTACT OILTIGHT LIMIT SWITCHES

.1 Lever type switches: roller fork rod operated, single double pole, double throw.
Contact rating: NEMA ICS 1 AC DC.

.2 Push type switches: actuated by rod plunger located ontip side of operating head, spring return maintained contact single double pole, double throw.
Contact rating: NEMA ICS 1 V, A AC DC.

.3 Wobble stick cat whisker type switches: actuated by rod stick extending from tip of operating head. Moving rod in any direction operates contacts.

Single Double pole, double throw. Contact rating: V, A AC DC NEMA ICS 1.

.4 Lever operated: time delay switch: adjustable time delay from 1/2 s to 15 s plus 25%. Contact rating: V, A AC DC NEMA ICS 1.

.5 Plug-in construction switches: CSA Type 4, two four circuit, lever push wobble stick type, contact rating: V, A AC DC NEMA ICS 1.

2.5 SOLID STATE TIMING RELAYS

.1 Construction: AC operated electronic timing relay with solid-state timing circuit to operate output contact. Timing circuit and output contact completely encapsulated to protect against vibration, humidity and atmospheric contaminants.

.2 Operation: on-delay or off-delay.

.3 Potentiometer: self contained external to provide time interval adjustment.

.4 Supply voltage: 120 V, AC, 60 Hz.

.5 Temperature range: minus 20 degrees C to plus 60 degrees C.

.6 Output contact rating: maximum voltage 300 V AC or DC. Current: NEMA ICS 1 A.

.7 Timing ranges: minimum 0.1 0.5 1.0 s, maximum 530 60 s.

2.6 INSTANTANEOUS TRIP CURRENT RELAYS

.1 Enclosure: CSA Type 1 open type

.2 Contacts: NO, NC automatic reset with adjustable tripping point.

.3 Control: 3 wire, with provision for shorting contacts during accelerating period of motor.

.4 Contact rating: NEMA ICS 1 V, A AC DC.

2.7 OPERATOR CONTROL STATIONS

.1 Enclosure: CSA Type 1 4, surface flush mounting:

2.8 PUSHBUTTONS

.1 Illuminated, Standard Heavy duty Oil tight. Operator recessed flush extend mushroom type, as indicated. Black Green, with 1-NO and 1-NC contacts rated at V, A, AC DC, labels as indicated. Stop pushbuttons coloured red, provision for padlocking in depressed position labelled "emergency stop".

2.9 SELECTOR SWITCHES

.1 Maintained Spring return to, 23 position labelled as indicated standard heavy duty oil tight , operators standard knob wing lever cylinder lock, contact arrangement as indicated, rated V, A, AC DC.

2.10 INDICATING LIGHTS

.1 Standard Heavy duty Oil tight, full voltage, transformer resistor LED type, push-to-test, lens colour: red amber blue green clear white as indicated, supply voltage: V AC DC, lamp voltage: V AC DC, labels as indicated.

2.11 CONTROL AND RELAY PANELS

.1 CSA Type 1 sheet steel enclosure with hinged padlockable access door, accommodating relays timers, labels, as indicated, factory installed and wired to identified terminals.

2.12 CONTROL CIRCUIT TRANSFORMERS

.1 Single phase, dry type.

.2 Primary: 240 V, 60 Hz ac.

.3 Secondary: 120 V, AC.

.4 Rating: 50VA.

.5 Secondary fuse: 3A.

.6 Close voltage regulation as required by magnet coils and solenoid valves.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for control devices installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Install pushbutton stations, control and relay panels, control devices and interconnect.

3.3 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00.

.2 Depending upon magnitude and complexity, divide control system into convenient sections, energize one section at time and check out operation

of section.

.3 Upon completion of sectional test, undertake group testing.

.4 Check out complete system for operational sequencing.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 International Electrotechnical Commission (IEC)
.1 IEC 60947-4-1-14, Low-voltage switchgear and controlgear - Part 4-1: Contactors and motor-starters - Electromechanical contactors and motor-starters.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Product Data:
.1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
.1 Provide shop drawings: in accordance with Section 01 33 00.
.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
.2 Provide shop drawings for each type of starter to indicate:
.1 Mounting method and dimensions.
.2 Starter size and type.
.3 Layout and components.
.4 Enclosure types.
.5 Wiring diagram.
.6 Interconnection diagrams.

1.3 CLOSEOUT SUBMITTALS

.1 Provide maintenance materials in accordance with Section 01 78 00.

.2 Submit operation and maintenance data for each type and style of motorstarter for incorporation into maintenance manual.

.3 Extra Materials:
.1 Provide listed spare parts for each different size and type of starter.
.1 3 contacts, stationary.
.2 3 contacts, movable.
.3 1 contacts, auxiliary.
.4 1 control transformers.
.5 1 operating coil.
.6 2 fuses.
.7 10% indicating lamp bulbs used.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Section 01 61 00.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets crates paddling and packaging materials in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Starters: to IEC 60947-4-1 with AC4 utilization category.

2.2 FULL VOLTAGE MAGNETIC STARTERS

.1 Magnetic and combination magnetic starters of size, type, rating and enclosure type as indicated with components as follows:
.1 Contactor solenoid operated, rapid action type.
.2 Motor overload protective device in each phase, manually reset from outside enclosure.
.3 Wiring and schematic diagram inside starter enclosure in visible location.
.4 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.

.2 Combination type starters to include fused disconnect switch motor circuit interrupter circuit breaker with operating lever on outside of enclosure to control disconnect motor circuit interrupter circuit breaker, and provision for:
.1 Locking in "OFF" position with up to 3 padlocks.
.2 Independent locking of enclosure door.
.3 Provision for preventing switching to "ON" position while enclosure door open.

.3 Accessories:
.1 Pushbuttons Selector switches: standard heavy duty oil tight labelled as indicated.
.2 Indicating lights: standard heavy duty oil tight type and color as indicated.
.3 1-N/O and 1-N/C spare auxiliary contacts unless otherwise indicated.

2.3 CONTROL TRANSFORMER

.1 Single phase, dry type, control transformer with primary voltage as indicated and 120V secondary, complete with secondary fuse, installed in with starter as indicated.

.2 Size control transformer for control circuit load plus 20% spare capacity.

2.4 ACCESSORIES

.1 Pushbutton: heavy duty, oil tight as required.

.2 Selector switches: heavy duty, oil tight as required.

.3 Indicating lights: heavy duty, oil tight, type and colour as indicated.

2.5 FINISHES

.1 Apply finishes to enclosure in accordance with Section 26 05 01.

2.6 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 01.

.2 Magnetic starter designation label, white plate, black letters, size as required engraved as indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install starters and control devices in accordance with manufacturer's instructions.

.2 Install and wire starters and controls as indicated.

.3 Ensure correct fuses installed.

.4 Confirm motor nameplate and adjust overload device to suit.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 and manufacturer's instructions.

.2 Operate switches and contactors to verify correct functioning.

.3 Perform starting and stopping sequences of contactors and relays.

.4 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.

3.3 CLEANING

.1 Clean in accordance with Section 01 74 11.
  .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 American National Standards Institute (ANSI)
.1 ANSI C82.1-2004, (R2015), American National Standard for Lamp Ballasts - Line Frequency Fluorescent Lamp Ballasts.

.2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
.1 ANSI/IEEE C62.41.1-2002 (R2008), Guide on the Surge Environment in Low-Voltage (1000V and less) AC Power Circuits.

.3 ASTM International Inc.
.1 ASTM F1137-11e1, Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.

.4 ICES-005 (May 2009), Radio Frequency Lighting Devices.

.5 Underwriters' Laboratories of Canada (ULC).

.6 CSA C22.2 No. 141 Emergency Lighting Equipment.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Product Data:
.1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Provide complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Departmental Representative.
.3 Photometric data to include: VCP Table where applicable.

.3 Quality assurance submittals: provide following in accordance with Section 01 45 00.
.1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence and cleaning procedures.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Packaging Waste Management: remove for reuse and return of pallets and packaging materials in accordance with Section 01 74 20.

.4 Divert unused metal materials from landfill to metal recycling facility.

.5 Disposal and recycling of fluorescent lamps as per local regulations.

.6 Disposal of old PCB filled ballasts.

PART 2 - PRODUCTS

2.1 LAMPS

.1 Fluorescent lamps to be - T8, 32 Watt, medium bi-pin, rapid-start, 4100K, 30,000 hour lamp life, 2950 initial lumens, CRI 85; or as indicated.

.2 Compact fluorescent lamps to be - 18 Watt, G24q-2 base, 12,000 hour lamp life, 12,000 initial lumens, 4100K, CRI 85 or as indicated.

.3 LED lamp shall be CRI 75, 4100K, 50,000 hours minimum.

2.2 LED Driver

.1 LED Driver features to include:

.1 operate from 60 Hz input source of 120 VAC with sustained variations of ± 10% (voltage and frequency) with no damage to driver;

.2 output regulated to ±5% across load range;

.3 power factor greater than 0.90;

.4 total harmonic distortion less than 20%;

.5 Class A sound rating;

.6 compliance with ANSI C62.41 Category A for transient protection;

.7 compliance with FCC47 CFR Part 15 and RoHS.

.8 Power supplies and control interfaces should be suitable/compatible with the LED modules/luminaires.

.9 The Power supply to have protection features against open circuit, short circuit, overload and overheating.

.10 Dimming drivers to have linear dimming, flicker-free and ensure no colour shift.

.11 Pulse width modulation (PWM) will be used as the basis for dimming the LEDs.

2.3 FINISHES

.1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

2.4 OPTICAL CONTROL DEVICES

.1 As indicated in luminaire schedule.

2.5 LUMINAIRES

.1 As indicated in luminaire schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Locate and install luminaires as indicated.

.2 Provide adequate support to suit ceiling system.

3.2 WIRING

.1 Connect luminaires to lighting circuits:
.1 Install flexible or rigid conduit for luminaires as indicated.

3.3 LUMINAIRE SUPPORTS

.1 For suspended ceiling installations support luminaires independently of ceiling.

3.4 LUMINAIRE ALIGNMENT

.1 Align luminaires mounted in continuous rows to form straight uninterrupted line.

.2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

3.5 CLEANING

.1 Clean in accordance with Section 01 74 11.
.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 31 23 33.01 - Excavating, Trenching and Backfilling.

1.2 REFERENCES

.1 OPSS 180, November 2016 - General Specification for the Management of Excess Material.

.2 OPSS 201 - November 2007 - Construction Specification for Clearing, Close Cut Grubbing and Removal of Surface and Piled Boulders.

1.3 DEFINITIONS

.1 Clearing consists of cutting off trees and brush, vegetative growth to not more than 300mm above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris off site.

.2 Grubbing consists of excavation and disposal of stumps and roots, boulders and rock fragments of specified size to not less than specified depth below existing ground surface.

.3 Tree removal consists of the removal of all trees including the stump and roots to a minimum of 300 mm below finished grade.

1.4 STORAGE AND PROTECTION

.1 Prevent damage to fencing, trees, landscaping, natural features, bench marks, existing structures, utility lines, site appurtenances, water courses, root systems of trees which are to remain.
- .1 Repair damaged items to approval of Departmental Representative.
- .2 Replace trees designated to remain, if damaged, as directed by Departmental Representative.
- .3 Limit clearing and grubbing to area at the discretion of Departmental Representative.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 PREPARATION

.1 Inspect site and verify with Departmental Representative, items designated to remain. No clearing or grubbing is to commence without the approval of Departmental Representative.

.2 Locate and protect utility lines: preserve in operating condition active utilities traversing site.

.1 Notify Departmental Representative immediately of damage to or when unknown existing utility lines are encountered.

.3 Notify utility authorities before starting clearing and grubbing.

.4 Keep roads and access free of dirt and debris.

3.2 CLEARING

.1 Clear as indicated on drawings, by cutting at height of not more than 300 mm above ground, in areas to be subsequently grubbed.

.2 Cut off branches and cut down trees overhanging area cleared.

.3 Cut off unsound branches on trees designated to remain.

3.3 GRUBBING

.1 Grub out stumps and roots to not less than 300 mm below ground surface.

.2 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension, but less than 0.25 mü.

.3 Fill depressions made by grubbing with new topsoil and to make new surface conform with existing adjacent surface of ground.

3.4 TREE REMOVAL

.1 Remove trees identified for removal to OPSS 180 and OPSS 201. Stump to be removed to 300 mm below finished grade. Backfill with new material and compact resulting pits and finish grade as required.

3.5 REMOVAL AND DISPOSAL

.1 Remove cleared and grubbed materials off site.

.2 Remove and dispose of soil generated through excavation, tree removal and grubbing during the course of this work at a facility licensed to accept non-hazardous waste in accordance with the Phase 2 ESA Ground Water and Soils Recommendations.

3.6 PROTECTIVE FENCING

.1 All existing trees within the work area which are to remain, shall be fully protected with hoarding, i.e. 1200 mm snow fencing erected beyond their drip line. Groups of trees and other existing plantings to be protected, shall be done in a like manner with hoarding around the entire clump(s). Areas within the protective fencing shall remain undisturbed and shall not be used for the storage of building materials or equipment.

.2 All species at risk within or adjacent to the area of work shall be protected. Species at Risk to be identified by the Departmental Representative at Project commencement.

3.7 STORAGE OF MATERIALS

.1 No rigging cables shall be wrapped around or installed in trees and surplus soil, equipment, debris or materials shall not be placed over root systems of trees within the protective fencing. No contaminants will be dumped or flushed where feeder roots of trees exist.

3.8 ROOT DAMAGE

.1 Where root systems of protected trees are exposed directly adjacent to or damaged by construction work, they shall be trimmed neatly and the area backfilled with appropriate material to prevent desiccation.

3.9 SILTATION CONTROL

.1 During construction, contractor shall take every precaution to avoid siltation or erosion of undisturbed or adjacent lands, to the approval of the Departmental Representative.

3.10 PRUNING

.1 Selectively remove 1/3 of tree branches to reduce transpiration and compensate for dieback of roots in fill conditions and damage to root system in cut conditions.

.2 Where limbs or portions of trees are removed to accommodate construction work, they will be removed carefully by accepted horticultural practices, and exposed wood treated with an approved tree wound dressing.

3.11 FINISHED SURFACE

.1 Leave ground surface in condition suitable for stripping of topsoil to approval of Departmental Representative.

END

PART 1 - GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
.1 ASTM D698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³).

.2 Canadian Standards Association (CSA):
.1 CAN/CSA A23.1/A23.2-M, Concrete Materials and Methods of Concrete Construction/Methods of Tests For Concrete.

.3 Ontario Provincial Standard Specification (OPSS):
.1 OPSS.PROV 1010 November 2013, Material Specification for Aggregates, Base, Subbase, Select Subgrade, and Backfill Material.

.4 Soil and Groundwater Assessment in Support of Proposed Construction Project. Port Weller Search and Rescue Station, 4 Welland Canals Parkway, St. Catharines, ON. Prepared by Dillion Consulting. Dated February 4th, 2019 (Phase 2ESA).

1.2 DEFINITIONS

.1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
.1 Rock: solid material in excess of 1.00 m³ and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m^2 bucket. Frozen material not classified as rock.
.2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.

.2 Topsoil:
.1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
.2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than [25 millimeters] in any dimension.

.3 Waste material: excavated material unsuitable for use in Work or surplus to requirements.

.4 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.

.5 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.

.6 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

1.3 SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00.

.2 Quality Control: in accordance with Section 01 45 00:
.1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.
.2 Submit for review by Departmental Representative proposed dewatering methods as described in PART 3 of this Section.
.3 Submit to Departmental Representative written notice at least 7 days prior to excavation work, to ensure cross sections are taken.
.4 Submit to Departmental Representative written notice when bottom of excavation is reached.
.5 Submit to Departmental Representative testing and inspection results and report as described in PART 3 of this Section.

.3 Preconstruction Submittals:
.1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.
.2 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field.

1.4 QUALITY ASSURANCE

.1 Do not use soil material until written report of soil test results are reviewed by Departmental Representative.

.2 Health and Safety Requirements: Do construction occupational health and safety in accordance with Section 01 35 29.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

1.6 EXISTING CONDITIONS

.1 Buried services:
.1 Before commencing work verify location of buried services on and adjacent to site.
.2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
.3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
.4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.

.5 Prior to beginning excavation Work, notify Departmental Representative and applicable authorities having jurisdiction, establish location and state of use of buried utilities and structures. Departmental Representative and authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work.
.6 Confirm locations of buried utilities by careful test excavations.
.7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
.8 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing or re-routing.
.9 Record location of maintained, re-routed and abandoned underground lines.
.10 Confirm locations of recent excavations adjacent to area of excavation.

.2 Existing buildings and surface features:
.1 Conduct, with Departmental Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by Work.
.2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.
.3 Where required for excavation, cut roots or branches as directed by Departmental Representative.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Aggregate Materials: Granular A (19 mm max.) in accordance with OPSS 1010.

.2 Geotextile fabric: Needle-punched, nonwoven, made of polypropylene staple fibres meeting the following minimum criteria:

Property	Value
Grab Elongation	50%
Permittivity	2.00 Sec-1
Apparent Opening	0.300 mm
UV Stability	70% @ 500 hrs.

.3 Unshrinkable fill: 0.7 MPa cement stabilized backfill conforming to requirements of CAN/CSA A23.1/A23.2-M.

PART 3 - EXECUTION

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of Authorities having jurisdiction.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 SITE PREPARATION

.1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

3.3 PREPARATION/PROTECTION

.1 Protect existing features in accordance with Section 01 56 00 and applicable local regulations.

.2 Keep excavations clean, free of standing water, and loose soil.

.3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative approval.

.4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.

.5 Protect buried services that are required to remain undisturbed.

3.4 STOCKPILING

.1 Stockpile fill materials in areas designated by Departmental Representative.
.1 Stockpile granular materials in manner to prevent segregation.

.2 Protect fill materials from contamination.

.3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

3.5 DEWATERING

.1 Keep excavations free of water while Work is in progress.

.2 Provide for Departmental Representative's review details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.

.3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
.1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.

.4 Protect open excavations against flooding and damage due to surface run-off.

.5 Soil and Groundwater Assessment in Support of Proposed Construction Project. Port Weller Search and Rescue Station, 4 Welland Canals Parkway, St. Catharines, ON. Prepared by Dillion Consulting. Dated February 4th, 2019 (Phase 2ESA).

3.6 EXCAVATION

.1 Excavate to lines, grades, elevations and dimensions as indicated.

.2 Remove concrete, masonry, paving, walks, and other obstructions encountered during excavation in accordance with Authorities having jurisdiction.

.3 Excavation must not interfere with bearing capacity of adjacent foundations.

.4 Do not disturb soil within branch spread of trees or shrubs that are to remain.
.1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.

.5 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.

.6 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.

.7 Restrict vehicle operations directly adjacent to open trenches.

.8 Dispose of excavated material generated through excavation at a facility licensed to accept non-hazardous waste in accordance with the Phase 2 ESA - Soil and Groundwater Assessment Recommendations Port Weller Search and Rescue Station, DRAFT dated November 29th, 2018.

.9 Do not obstruct flow of surface drainage or natural watercourses.

.10 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

.11 Notify Departmental Representative when bottom of excavation is reached.

.12 Obtain Departmental Representative approval of completed excavation.

.13 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.

.14 Correct unauthorized over-excavation as follows:
.1 Fill under bearing surfaces and footings with concrete specified for footings.
.2 Fill under other areas with granular material indicated compacted to not less than 95% of corrected Standard Proctor maximum dry density.

.15 Hand trim, make firm and remove loose material and debris from excavations.
.1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
.2 Clean out rock seams and fill with concrete mortar or grout to approval of Departmental Representative.

.16 Dispose of all soil generated through excavation during construction at a facility licensed to accept non-hazardous wate.

3.7 COMPACTION

.1 Use types of fill as indicated. Compaction densities are percentages of maximum densities obtained from ASTM D698.
.1 Exterior side of perimeter walls: fill to subgrade level. Compact to 95% of corrected maximum dry density.
.2 Within building area: fill to underside of base course for floor slabs. Compact to 100% of corrected maximum dry density.
.3 Under concrete slabs: provide 150 mm compacted thickness base course to underside of slab. Compact base course to 100%.
.4 Place unshrinkable fill in areas as indicated.

3.8 BEDDING AND SURROUND OF UNDERGROUND SERVICES

.1 Place and compact granular material for bedding and surround of underground services as indicated.

.2 Place bedding and surround material in unfrozen condition.

3.9 BACKFILLING

.1 Do not proceed with backfilling operations until completion of following:
.1 Departmental Representative has inspected and approved installations.
.2 Departmental Representative has inspected and approved of construction below finish grade.
.3 Inspection, testing, approval, and recording location of underground utilities.
.4 Removal of concrete formwork.
.5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.

.2 All backfill material to be new.

.3 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

.4 Do not use backfill material which is frozen or contains ice, snow or debris.

.5 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.

.6 Prior to backfilling, install geotextile fabric to separate existing soil from new clean backfill and request inspection by Departmental Representative.

.7 Prior to backfilling, coordinate testing of new backfill and submit record of testing to Departmental Representative.

.8 Backfilling around installations:
.1 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
.2 Place layers simultaneously on both sides of installed Work to equalize loading.
.3 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
.1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from Departmental Representative or:
.2 If approved by Departmental Representative, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Departmental Representative.

.9 Place unshrinkable fill in areas as indicated.

.10 Consolidate and level unshrinkable fill with internal vibrators.

3.10 RESTORATION

.1 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 20, trim slopes, and correct defects as directed by Departmental Representative.

.2 Replace topsoil as indicated.

.3 Reinstate lawns to elevation which existed before excavation.

.4 Reinstate pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.

.5 Clean and reinstate areas affected by Work as directed by Departmental Representative.

.6 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.

.7 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 03 20 00: Concrete Reinforcing.

.2 Section 03 30 00: Cast in Place Concrete.

.3 Section 31 23 33.01: Excavating, Trenching and Backfilling.

1.2 REFERENCES

.1 All referenced standards to be the current edition or the edition referenced by the 2015 National Building Code.

.2 Canadian Standards Association (CSA International):
.1 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
.2 CSA S16-14, Limit States Design of Steel Structures.
.3 W47.1-09 (R2014), Certification of Companies for Fusion Welding of Steel.
.4 CSA W48-18, Filler Metals and Allied Materials for Metal Arc Welding.
.5 W59-18, Welded Steel Construction (Metal Arc Welding).

.3 ASTM International Inc.:
.1 ASTM A36/A36M-14, Standard Specification for Carbon Structural Steel.
.2 ASTM A123/A123M-17, Standard Specification for Zinc (Hot Dip Galvanized) coating on Iron and Steel Products
.3 ASTM F3125/F3125M-15a, Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPA) Minimum Tensile Strength, Inch and Metric dimensions
.4 ASTM A500/A500M-18, Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

.4 Canadian Geotechnical Society:
.1 Canadian Foundation Engineering Manual.

.5 The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers (NACE) International:
.1 SSPC-SP 1, Solvent Cleaning.
.2 NACE No. 3 / SSPC-SP 6, Commercial Blast Cleaning.
.3 NACE No.4 / SSPC-SP 7, Brush Off Blast Cleaning.
.4 NACE No.2 / SSPC-SP 10, Near White Blast Cleaning.
.5 SSPC Technology Guide No.14 – Guide for the Repair of Imperfections in Galvanized, Organic or Inorganic Zinc-Coated Steel Using Organic Zinc Rich Coating.
.6 SSPC Paint Specification No. 20 – Zinc Rich Coating, Type I – Inorganic and Type II - Organic.

1.3 QUALITY ASSURANCE

.1 Qualifications:
.1 Companies supplying and installing helical piles to have minimum 5 year experience working with this type of foundations.
.2 Company installing helical piles to be certified by the supplier.
.3 Welding to be performed by a firm certified by the Canadian Welding Bureau under the requirements of CSA W47.1, Division 1 or 2.
.4 Welders to be CWB approved.
.5 Engage a Professional Engineer licensed in the place where the project is located to be responsible for design, detailing and installation of all helical piles.

1.4 QUALITY CONTROL

.1 Submit in accordance with Section 01 45 00.

.2 Source Quality Control Submittals:
.1 Submit mill test reports showing chemical and physical properties of helical piles to be incorporated in the project.

.3 Tolerances:
.1 Maximum deviation at cut-off elevation from position on plan: 65 mm (2½")
.2 Maximum deviation from cut-off elevation: +12 mm, -50 mm (+½", -2")
.3 Maximum deviation from plumb: 2%
.4 Projection over legal boundary: zero

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Submit list of equipment to be used for installation, including calibration reports.

.3 Submit load testing procedure, including list of equipment to be used for testing and calibration records.

.4 Shop Drawings:
.1 Provide drawings stamped and signed by a Professional Engineer responsible for design of helical piles.
.2 When requested, submit sketches and design calculations stamped and signed by that Engineer.
.3 Show on drawings:
.1 Helical piles types, sizes and layouts.
.2 Design loads, ULS and SLS pile capacities.
.3 Expected total and differential settlements.
.4 Material specifications.
.5 Size of pile shaft and number and diameter of helical

plates.
.6 Minimum effective installation torque.
.7 Inclination.
.8 Cut off elevation.
.9 Details of attachment to structure.

.5 On completion of installation, provide a letter signed and sealed by the Professional Engineer responsible for helical piles stating that each pile will be capable of developing the required load capacity without excessive settlement.

PART 2 - PRODUCTS

2.1 DESIGN REQUIREMENTS

.1 Design helical piles and their anchorage using Limit State Design approach, in accordance with the governing Building Code, CSA A23.3, CSA S16 and Canadian Foundation Design Manual, to be capable of safely carrying the loads shown on drawings without excessive settlements. Use Geotechnical Resistance Factor in line with the method used to determine the ultimate geotechnical resistance.

.2 Establish pile length and refusal criteria necessary to achieve the specified capacity.

.3 Specify performance and/or proof load testing procedure and acceptance criteria to confirm design assumptions. A testing program for helical piles subject to tension is mandatory.

.4 If requested, provide signed and sealed design calculation.

.5 If the pile supplier’s design requires modifications of any other elements shown on design drawings (such as pile caps), the pile supplier will be responsible for all associated modification costs.

2.2 MATERIALS

.1 Helical pile shafts, blades and accessories: to CSA G40.20/G40.21, hot dip galvanized per ASTM A123/A123M.

PART 3 - EXECUTION

3.1 SITE CONDITIONS

.1 Determine any potential interference with existing services and protect from disruption and damage

.2 Protect existing structure from damage.

.3 If the site is underlain by variable fill known to generate explosive gases, refer to Division 1 for safety requirements.

3.2 FOUNDATION CONDITIONS

.1 A Geotechnical Report has been prepared for the Project by Englobe, Report No. 124-B-0017786-0-01-GE-R-0001-00, dated January 2, 2018.

.2 The Geotechnical Report is not represented as a complete description of site conditions but only as to what was found in borings at indicated locations. The Owner, Architect and Departmental Representative assume no responsibility for any interpretation or deduction that the Contractor may make from the data. The Contractor to establish the nature of observable conditions to his own satisfaction and has the right to obtain additional information, if necessary in his judgment.

.3 A Geotechnical Engineer will be appointed by the Departmental Representative to provide full-time inspection during installation of helical piles in accordance with Section 01 45 00.

.4 Notify Departmental Representative if subsurface conditions are found to differ materially from those indicated in the Contract Documents or geotechnical report.

3.3 OBSTRUCTIONS

.1 Obstructions may be encountered during installation of helical piles.

.2 All obstructions are to be confirmed by the Geotechnical Engineer, who will track and certify the time required for obstruction removal.

.3 Have all the equipment required to do this work readily available for the duration of the pile installation.

.4 Delay time resulting from not having the required equipment readily available, or from breakdown of the equipment will be at the cost of the Contractor.

.5 Repair and replacement costs for damaged equipment shall not be considered extras.

.6 The time required for obstruction removal cannot be claimed to extend the overall construction schedule.

3.4 INSTALLATION

.1 Do not install helical piles anchors unless the Geotechnical Engineer is present.

.2 Do not damage adjacent structures. Make good any damage caused by pile installation and operations.

.3 Hold piles securely and accurately in position while installing, and apply sufficient down pressure to advance them. Install in a smooth, continuous manner.

.4 Prevent load transfer between soil and the portion of the piles above the level of the competent soil to be used for bearing by providing bitumen coating or permanent smooth sleeves.

.5 Provide plain extension material as required to advance piles to the required depth. Extensions to be coupled to helical pier using high strength structural bolts.

.6 Monitor installation torque throughout the installation process.

.7 Terminate pile installation when the minimum installation torque and the minimum depth requirements are satisfied. Record termination torque.

.8 If the minimum torque requirement has not been satisfied at a pile's minimum depth level, the contractor has the following options:
.1 To advance the pile deeper using additional plain extension material until the specified torque level is obtained.
.2 To remove the pile and to install another pile with larger and/or more helices. This revised pile to be installed at least 900 mm (3') beyond the termination depth of the original pile.
.3 To propose installation of additional piles and submit for Departmental Representative review.

.9 If the maximum torque rating of a pile and/or the installing unit is reached prior to satisfying the minimum depth requirement, remove the pile and install another pile with smaller and/or fewer helices. The revised pile to be installed at least 900 mm (3') beyond the termination depth of the original pile.

.10 Cut-off piles neatly and square at elevations indicated.

.11 Connect piles to structure using steel brackets or end plates per capable of safely transferring the structural loads to the pile.

.12 Touch up all cuts, drills welds and other damage to galvanizing with Zinc Rich paint in accordance to SSPC Technology Guide No. 14.

.13 Keep accurate records and submit to Departmental Representative at the completion of installation. Records to include:
.1 Deviation from specified location and plumb.
.2 Type of installation equipment used.
.3 Installation torque measured at 300 mm (1') increments.
.4 Bottom elevation and cut off elevation.
.5 Ground surface elevation
.6 Load testing results.

.14 As an alternative to the submission of a full set of records, the Contractor may certify the records of the Inspection and Testing Agency and submit only the information not included in those records.

3.5 FIELD QUALITY CONTROL

.1 Refer to Section 01 45 00.

.2 Perform load tests as required to confirm tension pile capacities. Test 10% of the installed piles.

.3 If a pile fails the load test, modify installation procedures as required to achieve the specified capacity and repeat the test. Submit proposal for the remedial work necessary to allow piles already installed to carry their specified load for Departmental Representative approval.

3.6 INSPECTION AND TESTING

.1 An Inspection and Testing Agency will be appointed to check pile length refusal criteria, to review the proposed pile load testing procedures and acceptance criteria, and to observe and document installation and load testing of helical tension piles on a full-time basis.

.2 Assist the Inspection and Testing Agency in its work. Notify as to the Work Schedule and provide safe access to the work area as required.

.3 The Agency will submit reports covering the work inspected and the testing performed.

.4 The Agency will keep accurate records of the construction of each pile and submit to Departmental Representative at the completion of the piling operation.

PART 1 - GENERAL

1.1 SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data: Submit manufacturer's instructions, printed product literature and data sheets for seed, and fertilizer.

1.2 QUALITY ASSURANCE

.1 Pre-Installation Meeting: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements in accordance with Section 01 33 00.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements:
.1 Labelled bags of fertilizer identifying mass in kg, mix components and percentages, date of bagging, supplier's name and lot number.
.2 Fertilizer must be dry.

.3 Storage and Handling Requirements:
.1 Store fertilizer off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Replace defective or damaged materials with new.

1.4 WARRANTY

.1 For seeding, 12 months warranty period is extended to 1 full growing season.

PART 2 - PRODUCTS

2.1 GRASS SEED

.1 Canada "Certified" seed, "Canada No. 1 Lawn Grass Mixture" in accordance with Government of Canada "Seeds Act" and "Seeds Regulations".
.1 Grass seed mixture.

.3 In packages individually labelled in accordance with "Seeds Regulations" and indicating name of supplier.

2.2 WATER

.1 Free of impurities that would inhibit germination and growth.

.2 Supplied by Departmental Representative at designated source.

2.3 FERTILIZER

.1 To Canada "Fertilizers Act" and Regulations.

.2 Complete 11-48-0 commercial fertilizer, minimum of 50% of elements derived from organic sources.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for seeding installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 SEED BED PREPARATION

.1 Do not perform work under adverse field conditions as determined by Departmental Representative.

.2 Remove and dispose of weeds; debris; stones 50 mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials; off site in in accordance with Section 01 74 20.

.3 Verify that grades are correct. If discrepancies occur, notify Departmental Representative and commence work when instructed by Departmental Representative.

.4 Fine grade surface free of humps and hollows to smooth, even grade, to contours indicated to tolerance of plus or minus 15 mm, surface draining naturally.

.5 Cultivate fine graded surface approved by Departmental Representative to 25 mm depth immediately prior to seeding.

3.3 SEED PLACEMENT

.1 Ensure seed is placed under supervision of certified Landscape Planting Supervisor.

.2 Manual seeding:
.1 Use manually operated drop seeder ("Cyclone" type or equivalent).
.2 Use manually operated, water ballast, landscaping type, smooth steel drum roller.
.3 Use equipment and method acceptable to Departmental Representative.

.3 On cultivated surfaces, sow seed uniformly at rate of 3 kg/100 sq. m.

.4 Blend applications 150 mm into adjacent grass areas to form uniform surfaces.

.5 Sow half of required amount of seed in one direction and remainder at right angles as applicable.

.6 Incorporate seed by light raking in cross directions.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work area clean at end of each day.
.2 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris at all times.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11. Clean and reinstate areas affected by Work.

3.5 PROTECTION

.1 Erect barrier around newly seeded areas sufficient to protect against deterioration due to pedestrian or other traffic.

3.6 FERTILIZING PROGRAM

.1 Apply fertilizer only after final grade has been approved at a rate of 3 kg/100 sq. m.

.2 Spread evenly with calibrated mechanical distributor.

.3 Mix thoroughly into upper 50 mm of topsoil.

3.7 MAINTENANCE DURING ESTABLISHMENT PERIOD

.2 Perform following operations from time of seed application until acceptance by Departmental Representative:
.1 Water seeded area to maintain optimum soil moisture level for germination and continued growth of grass. Control watering to prevent washouts.
.2 Repair and reseed dead or bare spots to allow establishment of seed prior to acceptance.
.3 Cut grass to 50 mm whenever it reaches height of 70 mm. Remove clippings which will smother grass.
.4 Fertilize seeded areas after first cutting. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.
.5 Control weeds by mechanical means utilizing acceptable integrated pest management practices.
.6 Adjust protection barrier as necessary to protect against deterioration due to pedestrian or other traffic as needed.

3.8 FINAL ACCEPTANCE

.1 Seeded areas will be accepted by Departmental Representative provided that:
.1 Areas are uniformly established free of rutted, eroded, bare or dead spots and extent of weeds apparent in grass is acceptable.
.2 Areas have been cut at least twice.
.3 Areas have been fertilized.

.2 Areas seeded in fall will be accepted in following spring, one month after start of growing season provided acceptance conditions are fulfilled.

3.9 MAINTENANCE DURING WARRANTY PERIOD

.1 Perform following operations from time of acceptance until end of warranty period.
.1 Water seeded area to maintain optimum soil moisture level for continued growth of grass. Control watering to prevent washouts.
.2 Repair and reseed dead or bare spots to satisfaction of Departmental Representative.
.3 Cut grass to 50 mm whenever it reaches height of 70 mm. Remove clippings which will smother grass.
.4 Control weeds by mechanical means utilizing acceptable integrated pest management practices.

END