

Durham District School Board

ARCHITECTURAL & STRUCTURAL SPECIFICATIONS **Bayview Heights P.S. Elevator Addition**

1400 Garvolin Ave, Pickering, ON L1W 1J6

Project Number: 25-114A
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Design Discipline

Sections prepared by Structural Consultant are denoted with (S). All other sections by Architect.

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Section 01 11 00 Summary of Work

Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

- .1 Work of this Contract comprises renovation of Bayview Heights Public School, located at 1400 Garvolin Ave, Pickering L1W 1J6 ; and further identified as Bayview Heights.

1.2 CONTRACT METHOD

- .1 Construct Work under stipulated price contract.

1.3 WORK BY OTHERS

- .1 Co-operate with other Contractors in carrying out their respective works and carry out instructions from Consultant.
- .2 Co-ordinate work with that of other Contractors. If any part of work under this Contract depends for its proper execution or result upon work of another Contractor, report promptly to Consultant, in writing, any defects which may interfere with proper execution of Work.

1.4 WORK SEQUENCE

- .1 Construct Work in stages to accommodate Owner's continued use of premises during construction.
- .2 Co-ordinate Progress Schedule and co-ordinate with Owner Occupancy during construction.
- .3 Maintain fire access/control.

1.5 CONTRACTOR USE OF PREMISES

- .1 Limit use of premises for access, to allow:
 - .1 Owner occupancy.
 - .2 Work by other contractors.
 - .3 Public usage.
- .2 Co-ordinate use of premises under direction of Consultant.
- .3 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .4 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.
- .5 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Consultant.
- .6 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

1.6 OWNER OCCUPANCY

- .1 Owner will occupy premises during entire construction period for execution of normal operations.
- .2 Co-operate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.

1.7 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

- .1 Execute work with least possible interference or disturbance to occupants, public and normal use of premises. Arrange with Consultant to facilitate execution of work.

1.8 EXISTING SERVICES

- .1 Notify, Consultant and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give 72 hours notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to tenant operations.
- .3 Provide alternative routes for pedestrian and vehicular traffic.
- .4 Establish location and extent of service lines in area of work before starting Work. Notify Consultant of findings.
- .5 Submit schedule to and obtain approval from Consultant for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .6 Provide temporary services when directed by Consultant to maintain critical building and tenant systems.
- .7 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.
- .8 Where unknown services are encountered, immediately advise Consultant and confirm findings in writing.
- .9 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .10 Record locations of maintained, re-routed and abandoned service lines.
- .11 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.9 DOCUMENTS REQUIRED

- .1 Maintain at job site, one copy each document as follows:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Reviewed Shop Drawings.
 - .5 List of Outstanding Shop Drawings.

- .6 Change Orders.
- .7 Other Modifications to Contract.
- .8 Field Test Reports.
- .9 Copy of Approved Work Schedule.
- .10 Health and Safety Plan and Other Safety Related Documents.
- .11 Other documents as specified.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

Section 01 14 00 Work Restrictions

Part 1 General

1.1 ACCESS AND EGRESS

- .1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.
- .2 Contractor to coordinate with College facilities to maintain access to grounds and equipment located adjacent to construction entrance.

1.2 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Consultant to facilitate work as stated.
- .2 Maintain existing services to building and provide for personnel and vehicle access.
- .3 Where security is reduced by work provide temporary means to maintain security.
- .4 Use of College washroom facilities is note permitted. Contractor to provide temporary washroom facilities
- .5 Use only elevators, existing in building for moving workers and material.
 - .1 Use of elevators must be coordinated with and receive owner's approval.
 - .2 Protect walls of passenger elevators, to approval of Owner prior to use.
 - .3 Accept liability for damage, safety of equipment and overloading of existing equipment.
- .6 Closures: protect work temporarily until permanent enclosures are completed.

1.3 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

- .1 Execute work with least possible interference or disturbance to building operations and normal use of premises. Arrange with Consultant to facilitate execution of work.

1.4 EXISTING SERVICES

- .1 Notify, Consultant and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give 72 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.
- .3 Provide for pedestrian and vehicular traffic.
- .4 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.5 SPECIAL REQUIREMENTS

- .1 Carry out noise generating Work that disrupts the Owner's day-to-day function on Monday to Friday from 23:00 to 07:00 hours, weekends and on statutory holidays at cost to contractor
- .2 Submit schedule in accordance with Section 01 32 16.19 - Construction Progress Schedule - Bar (GANTT) Chart complete with critical path milestones.
- .3 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .4 Keep within limits of work and avenues of ingress and egress.
- .5 Deliver materials outside of peak traffic hours 17:00 to 07:00 and 13:00 to 15:00 unless otherwise approved by Owner.

1.6 SECURITY

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

1.7 BUILDING SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions. Smoking is not permitted.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Section 01 19 00

Specifications and Documents

Part 1 General

1.1 SECTION INCLUDES

- .1 Words and terms.
- .2 Complementary documents.
- .3 Precedence of Documents.
- .4 Specification grammar.

1.2 RELATED DOCUMENTS

- .1 Document 00 52 10 - Agreement and Definitions: Precedence of documents.
- .2 Document 00 72 13 - General Conditions - Stipulated Price.
- .3 This section describes requirements applicable to all sections within Divisions 02 to 49.

1.3 WORDS AND TERMS

- .1 Conform to definitions and their defined meanings in the Agreement and Definitions portion of for supplementary words and terms.
- .2 The following words and terms are applicable to the Contract Documents for this project:
- .3 Addendum: A document that amends the Bid Documents during the Bidding Period and becomes part of the Contract Documents when a Contract is executed. (Plural: Addenda).
- .4 Agreement: The signed and sealed legal instrument binding parties in a Contract, describing in strict terms their mutual arrangement, roles and responsibilities, commencement, and completion responsibilities.
- .5 Alternative Price: The amount stipulated by a Bidder for an Alternative and stated as an addition, a deduction, or no change to the Bid Price.
- .6 Bid: To offer as a Bid stating for what price a Contractor will assume a Contract.
- .7 Bid Documents: A set of documents consisting of the Instructions to Bidders, Bid Form, Contract Documents, and other information issued for the benefit of Bidders to prepare and submit a Bid.
- .8 Bid Form: The specific and detailed form used to collect information about a Bid.
- .9 Bidding: The process of preparing and submitting a Bid.
- .10 Construction Documents: The Drawings and Project Manual. When combined with a Contract and Contract conditions, these documents form the Contract Documents.
- .11 Contingency Allowance: An additional monetary amount added to a Project cost estimate and designated to cover unpredictable or unforeseen items of Work. The amount is usually based on some percentage of the estimated cost and expended and adjusted by Change Order. It is not intended to cover additions to the scope of Work.

- .12 Cost Plus Contract: A Contract under which a Contractor is reimbursed for the direct and indirect costs for the performance of a Contract and, in addition, is paid a Fee for services. The Fee is usually stated as a stipulated price or as a percentage of cost.
- .13 General Conditions: That part of the Contract Documents that sets forth many of the rights, responsibilities and relationships of the parties involved in a Contract.
- .14 Instructions To Bidders: Instructions contained in the Bid Documents to convey an Owner's expectations and criteria associated with submitting a Bid.
- .15 Section: A portion of a Project Specification covering one or more segments of the total Work or requirements. Sections are included in a Project manual as required to meet Project requirements.
- .16 Standard: A document describing a grade or a level of quality, which has been established by a recognized agency or organization, utilizing an internal voting process.
- .17 Separate Price: A separate price for work to be added to the base price if selected by the Owner. This price type is not a part of the base bid price.
- .18 Stipulated Price: An amount set forth in a Stipulated Price Contract as the total payment for the performance of the Work. Sometimes referred to as a stipulated sum or a lump sum stipulated price.
- .19 Tender: A term that was formally abandoned by CCDC and the Canadian Construction industry in the early 1980's in favour of the preferred term Bid.
- .20 Unit Price: The amount payable for a single unit of Work as stated in a Schedule of Prices.
- .21 Install: To remove from site storage, move or transport to intended location, install in position, connect to utilities, repair site caused damage, and make ready for use.
- .22 Supply: To acquire or purchase, ship or transport to the site, unload, remove packaging to permit inspection for damage, re-package, replace damaged items, and safely store on-site.

1.4 COMPLEMENTARY DOCUMENTS

- .1 Generally, drawings indicate graphically, the dimensions and location of components and equipment. Specifications indicate specific components, assemblies, and identify quality.
- .2 Drawings, specifications, diagrams and schedules are complementary, each to the other, and what is required by one, to be binding as if required by all.
- .3 Should any conflict or discrepancy appear between documents, which leaves doubt as to the intent or meaning, apply the Precedence of Documents article below or obtain guidance or direction from Consultant.
- .4 Examine all discipline drawings, specifications, schedules, diagrams and related Work to ensure that Work can be satisfactorily executed.
- .5 All specification sections of the Project Manual and Drawings are affected by requirements of Division 01 sections.

1.5 PRECEDENCE OF DOCUMENTS

- .1 In the event of conflict within and between the Contract Documents, the order of priority within specifications and drawings for this project are - from highest to lowest:
 - .1 the Agreement and Definitions between the Owner and the Contractor;

- .2 the Definitions;
- .3 Supplementary Conditions;
- .4 the General Conditions;
- .5 Sections of Division 01 of the specifications;
- .6 Sections of Divisions 02 through 49 of the specifications.
- .7 Schedules and Keynotes:
 - .1 Material and finishing schedules within the specifications, then;
 - .2 Material and finishing schedules on drawings, then;
 - .3 Keynotes and definitions thereto, then;
- .8 Diagrams.
- .9 Drawings:
 - .1 Drawings of larger scale shall govern over those of smaller scale of the same date, then;
 - .2 Dimensions shown on drawings shall govern over dimensions scaled from drawings, then;
 - .3 Location of utility outlets indicated on architectural detail drawings takes precedence over positions or mounting heights located on mechanical or electrical Drawings.
- .10 Later dated documents shall govern over earlier documents of the same type.
- .2 In the event of conflict between documents, the decision of the Consultant shall be final.

1.6 SPECIFICATION GRAMMAR

- .1 Specifications are written in the imperative (command) mode, in an abbreviated form.
- .2 Imperative language of the technical sections is always directed to the Contractor identified as a primary constructor, as sole executor of the Contract, unless specifically noted otherwise.
 - .1 This form of imperative (command) mode statement requires the primary constructor to perform such action or Work.
 - .2 Perform all requirements of the Contract Documents whether stated imperatively or otherwise.
- .3 Division of the Work among subcontractors, suppliers, or others is solely the prime constructor's responsibility. The Consultant(s) and specification authors assume no responsibility to function or act as an arbiter to establish subcontract scope or limits between sections or divisions of Work.

END OF SECTION

Section 01 21 00

Allowances

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-2020, Stipulated Price Contract.
- .2 Project Supplementary Conditions

1.2 CASH ALLOWANCES

- .1 Refer to CCDC 2, GC 4.1.
- .2 Include in Contract Price specified cash allowances.
- .3 Cash allowances, unless otherwise specified, cover net cost to Contractor & Subcontractor of services, products, construction machinery and equipment, freight, handling, unloading, storage installation and other authorized expenses incurred in performing Work.
- .4 Contract Price, and not cash allowance, includes Contractor's overhead and profit in connection with such cash allowance.
- .5 Contract Price will be adjusted by written order to provide for excess or deficit to each cash allowance.
- .6 Where costs under a cash allowance exceed amount of allowance, Contractor will be compensated for excess incurred and substantiated plus allowance for overhead and profit as set out in Contract Documents.
- .7 Include progress payments on accounts of work authorized under cash allowances in Consultant's monthly certificate for payment.
- .8 Prepare schedule jointly with Consultant and Contractor to show when items called for under cash allowances must be authorized by Consultant for ordering purposes so that progress of Work will not be delayed.
- .9 Amount of each allowance, for Work specified in respective specification Sections is as follows:
 - .1 Cash Allowance CA1: Abatement
 - .2 Cash Allowance CA2: Additional Unforeseen Cutting and Patching
 - .3 Cash Allowance CA3: BAS Controls
 - .4 Cash Allowance CA4: Classroom 229 refresh
 - .5 Cash Allowance CA5: Inspection and Testing
 - .6 Cash Allowance CA6: PA & Security Communications

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Section 01 31 00

Project Management and Coordination

Part 1 General

1.1 SECTION INCLUDES

- .1 Coordination Work with other contractors and work by Owner under administration of Consultant.
- .2 Scheduled progress meetings.

1.2 COORDINATION

- .1 Perform coordination of progress schedules, submittals, use of site, temporary utilities, construction facilities and construction Work, with progress of Work of others and Work by Owner, under instructions of Consultant.

1.3 CONSTRUCTION ORGANIZATION AND START-UP

- .1 Within fifteen (15) days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Consultant, Owner, Contractor, major Subcontractors, field inspectors and supervisors are to be in attendance.
- .3 Establish time and location of meeting and notify parties concerned minimum five (5) days before meeting.
- .4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .5 Agenda to include following:
 - .1 Appointment of official representative of participants in Work.
 - .2 Schedule of Work, progress scheduling as specified in Section 01 32 16.19.
 - .3 Schedule of submission of shop drawings, samples, colour chips as specified in Section 01 33 00.
 - .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences as specified in Section 01 51 00.
 - .5 Delivery schedule of specified equipment as specified in Section 01 32 00.
 - .6 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, and administrative requirements.
 - .7 Owner-furnished Products.
 - .8 Record drawings as specified in Section 01 78 00, 01 79 00 and consultant specifications.
 - .9 Maintenance material and data as specified in Section 01 78 00, 01 79 00 and consultant specifications.

- .10 Take-over procedures, acceptance, and warranties as specified Section 01 78 00, 01 79 00 and consultant specifications.
- .11 Monthly progress claims, administrative procedures, photographs, and holdbacks.
- .12 Appointment of inspection and testing agencies or firms as specified in Section 01 45 00.
- .13 Insurances and transcript of policies.
- .6 Comply with Consultant's allocation of mobilization areas of site; for field offices and sheds, for staging, access, traffic, and parking facilities.
- .7 During construction, coordinate use of site and facilities through Consultant's procedures for intra-project communications: Submittals, reports and records, schedules, coordination of drawings, recommendations, and resolution of ambiguities and conflicts.
- .8 Comply with instructions of Consultant for use of temporary utilities and construction facilities.
- .9 Coordinate field engineering and layout work with Consultant.

1.4 CONTRACT ADMINISTRATION - WEB-BASED PROJECT SOFTWARE

- .1 The Contract Administration process shall be hosted through rform; which is an online construction contract administration software platform, administered by Gow Hastings Architects. This software is to be used to host and manage project documentation until final completion. All of the below project documents are to be issued via rform (www.rform.ca):
 - .1 Project Forms:
 - .1 Proposed Change Order (PCO)
 - .2 Change Order (CO)
 - .3 Change Directive (CD)
 - .4 Supplemental Instruction (SI)
 - .5 Request for Information
 - .6 Schedule of Values
 - .7 Certificates of Payment
 - .2 Project Files
 - .3 Submittals
- .2 The project will be setup on rform by Gow Hastings Architects and the contractor will be invited to collaborate online.

1.5 ON-SITE DOCUMENTS

- .1 Maintain at job site, one copy each of the following:
 - .1 Contract drawings.
 - .2 Specifications.
 - .3 Addenda.

- .4 Reviewed shop drawings.
- .5 Change orders.
- .6 Other modifications to Contract.
- .7 Online access to rform as referenced in section 1.4 above.
- .8 Field test reports.
- .9 Copy of approved Work schedule.
- .10 Manufacturers' installation and application instructions.
- .11 Labour conditions and wage schedules.
- .12 Applicable current editions of municipal regulations and by-laws. Current building codes, complete with addenda bulletins applicable to the Place of the Work.

1.6 SCHEDULES

- .1 Submit preliminary construction progress schedule as specified in Section 01 32 16.19 to Consultant coordinated with Consultant's project schedule.
- .2 After review, revise and resubmit schedule to comply with revised project schedule.
- .3 During progress of Work revise and resubmit as directed by Consultant.

1.7 CONSTRUCTION PROGRESS MEETINGS

- .1 During course of Work schedule progress meetings biweekly unless otherwise requested by the Consultant or Owner.
- .2 Contractor, major subcontractors involved in Work , Consultant and Owner are to be in attendance.
- .3 Notify parties minimum of five days prior to meetings.
- .4 Record minutes of meetings, and circulate to attending parties and affected parties not in attendance within two days after meeting.
- .5 Agenda to include following:
 - .1 Review, approval of minutes of previous meeting.
 - .2 Review of Work progress since previous meeting.
 - .3 Field observations, problems, conflicts.
 - .4 Problems that 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 effect on construction schedule and on completion date.

- .12 Review site safety and security issues.
- .13 Other business.

1.8 SUBMITTALS

- .1 Prepare and issue submittals to Consultant for review.
- .2 Submit preliminary Shop Drawings, product data and samples as specified in Section 01 33 00 for review for compliance with Contract Documents; for field dimensions and clearances, for relation to available space, and for relation to Work of other contracts. After review, revise and resubmit for transmittal to Consultant.
- .3 Submit requests for payment for review, and for transmittal to Consultant.
- .4 Submit requests for interpretation of Contract Documents, and obtain instructions through Consultant.
- .5 Process substitutions through Consultant.
- .6 Process change orders through Consultant.
- .7 Deliver closeout submittals for review and preliminary inspections, for transmittal to Consultant.

1.9 COORDINATION DRAWINGS

- .1 Provide information required by Consultant for preparation of coordination Drawings.
- .2 Review and approve revised Drawings for submittal to Consultant.

1.10 CLOSEOUT PROCEDURES

- .1 Notify Consultant when Work is considered ready for Substantial Performance, Permit Review and Ready-For-Takeover.
- .2 Accompany Consultant on preliminary inspection to determine items listed for completion or correction.
- .3 Comply with Consultant's instructions for correction of items of Work identified as deficient, incomplete or missing.
- .4 Notify Consultant of instructions for completion of items of Work determined in Consultant's final inspection.

END OF SECTION

Section 01 31 19 Project Meetings

Part 1 General

1.1 ADMINISTRATIVE

- .1 Schedule and administer biweekly project meetings throughout the progress of the work.
- .2 Prepare agenda for meetings.
- .3 Distribute written notice of each meeting five days in advance of meeting date to Consultant.
- .4 Provide physical space and make arrangements for meetings.
- .5 Preside at meetings.
- .6 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.
- .7 Reproduce and distribute copies of minutes within three days after meetings and transmit to meeting participants , affected parties not in attendance and Consultant.
- .8 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 15 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Consultant, Owner 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 16.19 - Construction Progress Schedules - Bar (GANTT) Chart complete with Critical Path Milestones.
 - .3 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .4 Requirements for site access, laydown area, temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 - Construction Facilities.
 - .5 Delivery schedule of specified equipment in accordance with Section 01 14 00 - Work Restrictions.

- .6 Site security in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
- .7 Proposed changes, change orders and site instructions procedures including approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
- .8 RFI and submittal procedures.
- .9 Health and safety policies.
- .10 Owner provided products.
- .11 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .12 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.
- .13 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.
- .14 Monthly progress claims, administrative procedures, photographs, hold backs.
- .15 Appointment of inspection and testing agencies or firms.
- .16 Insurances, transcript of policies.

1.3 PROGRESS MEETINGS

- .1 During course of Work and two weeks prior to project completion, schedule progress meetings biweekly or weekly as required to maintain communication between the stakeholders.
- .2 Contractor, major Subcontractors involved in Work ,Owner and Consultant are to be in attendance.
- .3 Set next meeting date at the end of each meeting and notify all stakeholders of changes in date/time min. 3 days in advance
- .4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within 3 days after meeting.
- .5 Agenda to include the following:
 - .1 Review, approval of minutes of previous meeting.
 - .2 Review of Work progress since previous meeting.
 - .3 Field observations, problems, conflicts.
 - .4 Problems which impede construction schedule.
 - .5 Review of off-site fabrication delivery schedules.
 - .6 Corrective measures and procedures to regain projected schedule.
 - .7 Revision to construction schedule.
 - .8 Progress schedule, during succeeding work period.
 - .9 Review submittal schedules: expedite as required.
 - .10 Maintenance of quality standards.

- .11 Review proposed changes for affect on construction schedule and on completion date.
- .12 Other business.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Section 01 32 16.19

Construction Progress Schedule - Bar (GANTT) Chart

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.

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 owner provided 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, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.
- .5 Activities impacting programs must be scheduled after regular hours or during weekends. This work must be coordinated in advance with the Owner.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

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

1.4 MASTER PLAN

.1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).
.2 Schedule to be submitted to Consultant for review and comment.
.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.

1.5 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 Interior Architecture (Walls, Floors and Ceiling).
.6 Plumbing.
.7 Lighting.
.8 Electrical.
.9 Piping.
.10 Controls.
.11 Heating, Ventilating, and Air Conditioning.
.12 Millwork.
.13 Testing and Commissioning.
.14 Supplied equipment long delivery items.
.15 Engineer supplied equipment required dates.
.16 Any tasks that will disrupt traffic i.e. RTU installation

1.6 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.

- .3 Provide a schedule variance and a schedule performance index calculation at each progress meeting after the project is reaching 20% completion and discuss milestones on the critical path.

1.7 PROJECT MEETINGS

- .1 Discuss Project Schedule at regular site meetings, 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 OF SECTION

Section 01 33 00 Submittal Procedures

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CCDC 2-2020, Stipulated Price Contract.

1.2 ADMINISTRATIVE

- .1 Submit to Consultant 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 Provide Owner with copies of shop drawing that are requested for prior verification.
- .3 Do not proceed with Work affected by submittal until review is complete.
- .4 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .5 Where items or information is not produced in SI Metric units converted values are acceptable.
- .6 Review submittals prior to submission to Consultant. 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.
- .7 Notify Consultant, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .8 Verify field measurements and affected adjacent Work are co-ordinated.
- .9 Contractor's responsibility for errors and omissions in submission is not relieved by Consultant's review of submittals.
- .10 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Consultant review.
- .11 Keep one reviewed copy of each submission on site.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Refer to CCDC 2 GC 3.11.
- .2 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.
- .3 Where requested in drawings and/or specifications, submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
- .4 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.

- .5 Allow 10 days for Consultant's review of each submission.
- .6 Adjustments made on shop drawings by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.
- .7 Make changes in shop drawings as Consultant may require, consistent with Contract Documents. When resubmitting, notify Consultant in writing of revisions other than those requested.
- .8 Accompany submissions with electronic and/or hard copy transmittal letter 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.
- .9 Submissions 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.

- .10 After Consultant's review, distribute copies.
- .11 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Consultant may reasonably request.
- .12 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Consultant where shop drawings will not be prepared due to standardized manufacture of product.
- .13 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Consultant.
 - .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.
- .14 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Consultant.
 - .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.
- .15 Submit electronic copies of manufacturers instructions for requirements requested in specification Sections and as requested by Consultant.
 - .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.
- .16 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Consultant.
- .17 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .18 Submit 2 hard copies and 1 electronic copy of Operations and Maintenance data for requirements requested in specification Sections and as requested by Consultant.
 - .1 Refer to section 01 78 00 Closeout submittals.
- .19 Delete information not applicable to project.
- .20 Supplement standard information to provide details applicable to project.
- .21 If upon review by Consultant, no errors or omissions are discovered or if only minor corrections are made, the submittal 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.

1.4 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 Consultant's business address.
- .3 Notify Consultant 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 Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.
- .6 Make changes in samples which Consultant 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.

1.5 MOCK-UPS

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

1.6 PHOTOGRAPHIC DOCUMENTATION

- .1 Submit electronic of colour digital photography in jpg format, standard resolution of all phases of construction compiled on a USB memory stick.
- .2 Project identification: name and number of project and date of exposure indicated.
- .3 Number of viewpoints: 2 locations.
 - .1 Viewpoints and their location as determined by Consultant.
- .4 Frequency of photographic documentation: as directed by Consultant.
 - .1 Upon completion of: as directed by Consultant.

1.7 CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.
- .2 Submit transcription of insurance immediately after award of Contract.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Section 01 41 00 Regulatory Requirements

Part 1 General

1.1 SUMMARY

- .1 This Section references to laws, by laws, ordinances, rules, regulations, codes, orders of Authority Having Jurisdiction, and other legally enforceable requirements applicable to Work and that are; or become, in force during performance of Work.

1.2 REFERENCES TO REGULATORY REQUIREMENTS

- .1 Department of Justice Canada (Jus)
 - .1 SOR/2018-196 Prohibition of Asbestos and Products Containing Asbestos Regulations.
- .2 Perform Work in accordance with the current Ontario Building Code including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .3 Specific design and performance requirements listed in specifications or indicated on Drawings may exceed minimum requirements established by referenced Building Code; these requirements will govern over the minimum requirements listed in Building Code
 - .1 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.

1.3 HAZARDOUS MATERIAL DISCOVERY

- .1 Asbestos: demolition of spray or trowel-applied asbestos is hazardous to health. Stop work immediately when material resembling spray or trowel-applied asbestos is encountered during demolition work. Notify Consultant.
- .2 PCB: Polychlorinated Biphenyl: stop work immediately when material resembling Polychlorinated Biphenyl is encountered during demolition work. Notify Consultant.
- .3 Mould: stop work immediately when material resembling mould is encountered during demolition work. Notify Consultant.

1.4 BUILDING SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions and municipal by-laws.

1.5 QUALITY ASSURANCE

- .1 Regulatory Requirements: Except as otherwise specified, Constructor shall apply for, obtain, and pay fees associated with, permits, licenses, certificates, and approvals required by regulatory requirements and Contract Documents, based on General Conditions of Contract and the following:
 - .1 Regulatory requirements and fees in force on date of Bid submission, and

.2 A change in regulatory requirements or fees scheduled to become effective after date of tender submission and of which public notice has been given before date of tender submission

Part 2 Products

2.1 NOT USED

.1 Not Used.

2.2 PERMITS

.1 Building Permit:

.1 Owner has applied for and will be paying for building permit. Constructor is responsible for obtaining or coordinating other permits required for Work and its various parts.

.2 Constructor will require that specific Subcontractor's obtain and pay for permits required by authorities having jurisdiction, where their Work is affected by Work requiring permits.

.3 Constructor shall display building permit and other permits in a conspicuous location at Place of Work.

.2 Occupancy Permits:

.1 Constructor shall apply for, obtain, and pay for occupancy permits, including partial occupancy permits where required by authority having jurisdiction.

.2 Consultant will issue appropriate instructions to Constructor for correction to Work where Contract Document deficiencies are required to be corrected in order to obtain occupancy permits, including partial occupancy permits.

.3 Constructor shall correct deficiencies in accordance with Consultant's instructions. Where deficiency is not corrected, Owner reserves the right to make correction and charge Constructor for costs incurred.

.4 Constructor shall turn occupancy permits over to Owner upon receipt from the Building Department verbal and /or in writing.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Section 01 45 00 Quality Control

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-2020, Stipulated Price Contract.

1.2 INSPECTION

- .1 Refer to CCDC 2, GC 2.3.
- .2 Allow Consultant 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.
- .3 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Consultant instructions, or law of Place of Work.
- .4 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .5 Consultant will order part of Work to be examined if Work is suspected to be not in accordance with 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.

1.3 INDEPENDENT INSPECTION AGENCIES

- .1 Independent Inspection/Testing Agencies will be engaged by the Contractor for purpose of inspecting and/or testing portions of Work. Cost of such services will be covered by the testing and inspections cash allowance. Refer to section 01 21 00 Allowances .
- .2 Contractor to tender this scope of work to 3 recognized inspection/ testing agencies and present recommendations to Consultant and Owner prior to contract award.
- .3 Provide equipment required for executing inspection and testing by appointed agencies.
- .4 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .5 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Consultant at no cost to the Owner. Pay costs for retesting and reinspection.

1.4 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.

1.5 PROCEDURES

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

1.6 REJECTED WORK

- .1 Refer to CCDC, GC 2.4.
- .2 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Consultant as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .3 Make good other Contractor's work damaged by such removals or replacements promptly.
- .4 If in opinion of Consultant it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Consultant.

1.7 REPORTS

- .1 Submit electronic copies of inspection and test reports to Consultant.
- .2 Provide copies to manufacturer or fabricator of material being inspected or tested.
- .3 A copy of all test reports is to be included in the final O&M manuals

1.8 TESTS AND MIX DESIGNS

- .1 Furnish test results and mix designs as requested.
- .2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Consultant and may be authorized as recoverable.

1.9 MOCK-UPS

- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.
- .2 Construct in locations acceptable to Consultant and Owner.
- .3 Prepare mock-ups for Consultant's review with reasonable promptness and in orderly sequence, to not cause delays in Work.
- .4 Failure to prepare mock-ups 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.
- .5 If requested, Consultant will assist in preparing schedule fixing dates for preparation.

- .6 Remove mock-up at conclusion of Work or when acceptable to Consultant.
- .7 Mock-ups may remain as part of Work pending approval by Consultant.

1.10 MILL TESTS

- .1 Submit mill test certificates as required of specification Sections.
- .2 Include in Operations and Maintenance Manuals Submittals

1.11 EQUIPMENT AND SYSTEMS

- .1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.
- .2 Include in Operations and Maintenance Manuals Submittals

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Section 01 51 00 Temporary Utilities

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

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

1.2 INSTALLATION AND REMOVAL

- .1 Provide temporary utilities controls in order to execute work expeditiously.
- .2 Remove from site all such work after use.

1.3 WATER SUPPLY

- .1 The Owner will provide access to a hose bib located in the proximity of the construction area for water supply. GC will be responsible for all connections, maintenance and removal.

1.4 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 flameless (vent free) 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 degrees Celsius 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 will not be permitted for use during construction. All air return ducts exposed to the construction area to be sealed to prevent dust infiltration. Be responsible for damage and cleaning of heating system used in error or without written permission.
- .7 New RTU and heating system usage will not be permitted during construction. Final commissioning of RTU to be scheduled when all interior finishes generating dust, i.e. drywall sanding, etc. are complete.
- .8 On completion of Work for which existing heating system is used, clean units and replace filters.
- .9 Ensure Date of Substantial Performance and Warranties for heating system do not start until entire system is in as near original condition as possible and is certified by Consultant.
- .10 Pay costs for maintaining temporary heat, when using permanent heating system.
- .11 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.
- .12 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.5 TEMPORARY POWER AND LIGHT

- .1 Owner will provide access to an existing electrical panel for temporary electrical panel connection during construction temporary lighting and operating of power tools, to a maximum supply of 230 volts 30 amps.
- .2 Temporary power for electric cranes, welding machines and other equipment requiring in excess of above is responsibility of Contractor based on General Conditions of Contract.
- .3 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx.
- .4 Electrical power and lighting systems installed under this Contract may be used for construction requirements only with prior approval of Owner and Consultant provided that guarantees are not affected.
 - .1 Repair damage to electrical system caused by use under this Contract.
 - .2 Replace lamps which have been used for more than 3 months.

1.6 TEMPORARY COMMUNICATION FACILITIES

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

1.7 FIRE PROTECTION

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction 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.
- .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 OF SECTION

Section 01 52 00 Construction Facilities

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-2008, Stipulated Price Contract.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.
 - .2 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
- .3 CSA Group (CSA)
 - .1 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA-0121-M1978 (R2003), Douglas Fir Plywood.
 - .3 CAN/CSA-S269.2-M1987 (R2003), Access Scaffolding for Construction Purposes.
 - .4 CAN/CSA-Z321-96 (R2001), Signs and Symbols for the Occupational Environment.
- .4 Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses and Conditions (SACC)-ID: R0202D, Title: General Conditions 'C', In Effect as of: May 14, 2004.
- .5 Ontario Environmental Protection Act

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 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.

1.4 SCAFFOLDING

- .1 Scaffolding in accordance with CAN/CSA-S269.2.
- .2 Provide and maintain all required equipment.

1.5 HOISTING

- .1 Provide, operate and maintain hoists cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for their use of hoists.
- .2 Hoists cranes to be operated by qualified operator.

1.6 SITE STORAGE/LOADING

- .1 Refer to CCDC 2, GC 3.12.
- .2 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.
- .3 Do not load or permit to load any part of Work with weight or force that will endanger Work.

1.7 CONSTRUCTION PARKING

- .1 Parking will be permitted on site only in designated areas and pre-approved by the Owner, at no additional charge.
- .2 Provide and maintain adequate access to project site.

1.8 SECURITY

- .1 Provide and pay for responsible security personnel to guard site and contents of site after working hours and during holidays as necessary and as requested by Owner.

1.9 OFFICES

- .1 Provide office heated to 22 degrees C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table.
- .2 Provide marked and fully stocked first-aid case in a readily available location.
- .3 Maintain office in clean condition.

1.10 EQUIPMENT, TOOL AND MATERIALS STORAGE

- .1 Provide and maintain, in 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 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 precautions as required by local health authorities. Keep area and premises in sanitary condition.
- .3 College washroom facilities cannot be used by contractors during construction.

1.12 CONSTRUCTION SIGNAGE

- .1 Provide proposed project sign and location for Owner's approval. Erect project sign within three weeks of signing Contract in the approved location.

- .2 Construction sign up to 4m x 2 m, of wood frame and plywood construction painted with exhibit lettering produced by a professional sign painter.
- .3 Indicate on sign, name of Owner, Consultant Contractor and Subcontractor, of design style established by Owner.
- .4 No other signs or advertisements, other than warning signs, are permitted on site.
- .5 Direct requests for approval to erect Consultant/Contractor signboard to Consultant. For consideration general appearance of Consultant/Contractor signboard must conform to project identification site sign. Wording in both official languages.
- .6 Signs and notices for safety and instruction in both official languages Graphic symbols to CAN/CSA-Z321.
- .7 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 Consultant.

1.13 PROTECTION AND MAINTENANCE OF TRAFFIC

- .1 Follow Owner designated access routes to Construction area and provide temporary relocated roads as / if necessary to maintain traffic with Owner's prior written permission
- .2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Consultant.
- .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 Haul roads: constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided.
- .9 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
- .10 Dust control: adequate to ensure safe operation at all times.
- .11 Location, grade, width, and alignment of construction and hauling roads: subject to approval by Consultant.
- .12 Lighting: to assure full and clear visibility for full width of haul road and work areas during night work operations.
- .13 Provide snow removal during period of Work.
- .14 Remove, upon completion of work, haul roads designated by Consultant.

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.
- .3 Store materials resulting from demolition activities that are salvageable.
- .4 Stack stored new or salvaged material not in construction facilities.

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.
- .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 OF SECTION

Section 01 56 00

Temporary Barriers and Enclosures

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Canadian General Standards Board (CGSB)
 - .1 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
 - .2 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.
- .2 CSA Group (CSA)
 - .1 CSA-O121-M1978 (R2003), Douglas Fir Plywood.
- .3 Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses and Conditions (SACC)-ID: R0202D, Title: General Conditions 'C', In Effect as Of: May 14, 2004.

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 HOARDING

- .1 Erect temporary exterior site enclosures using painted metal fence panels with height of 1.8m by Modu-Loc or alternate.
- .2 Erect temporary interior site enclosures using steel stud framing complete with taped and painted GWB finish. Hoarding wall to contain lockable pedestrian door access.
- .3 Refer to drawings for suggestion hoarding layout. All hoarding locations are to be reviewed and approved by the Owner on site prior to erection.
- .4 Provide one lockable truck entrance gate and at least one pedestrian door as directed and conforming to applicable traffic restrictions on adjacent streets. Equip gates with locks and keys.
- .5 Erect and maintain pedestrian walkways including roof and side covers, complete with signs and electrical lighting as required by law.
- .6 Paint public side of site enclosure in selected colours with one coat primer to CAN/CGSB 1.189 and one coat exterior paint to CGSB 1.59. Maintain public side of enclosure in clean condition.
- .7 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, open stair wells, open edges of floors and roofs, and any other unsafe opening.
- .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 ACCESS TO SITE

- .1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.

1.8 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 public.

1.9 FIRE ROUTES

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

1.10 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.

1.11 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 Consultant and Owner 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 OF SECTION

Section 01 61 00

Common Product Requirements

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-2020, Stipulated Price Contract.
- .2 Within text of each specifications section, reference may be made to reference standards.
- .3 Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .4 If there is question as to whether products or systems are in conformance with applicable standards, Consultant reserves right to have such products or systems tested to prove or disprove conformance.
- .5 Cost for such testing will be born by Owner in event of conformance with Contract Documents or by Contractor in event of non-conformance.

1.2 QUALITY

- .1 Refer to CCDC 2.
- .2 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .3 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.
- .4 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.
- .5 Should disputes arise as to quality or fitness of products, decision rests strictly with Consultant based upon requirements of Contract Documents.
- .6 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .7 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.

1.3 AVAILABILITY

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify

Consultant 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 Consultant at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Consultant reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.4 STORAGE, HANDLING AND PROTECTION

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Store cementitious products clear of earth or concrete floors, and away from walls.
- .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6 Store sheet materials, lumber and any other construction material safely 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 Consultant.
- .9 Touch-up damaged factory finished surfaces to Consultant's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.5 TRANSPORTATION

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

1.6 MANUFACTURER'S INSTRUCTIONS

- .1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Consultant in writing, of conflicts between specifications and manufacturer's instructions, so that Consultant will establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Consultant to require removal and re-installation at no increase in Contract Price or Contract Time.

1.7 QUALITY OF WORK

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

- .2 Do not employ anyone unskilled in their required duties. Consultant 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 Consultant, whose decision is final.

1.8 CO-ORDINATION

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

1.9 CONCEALMENT

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

1.10 REMEDIAL WORK

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

1.11 LOCATION OF FIXTURES

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

1.12 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.

1.13 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.

1.14 PROTECTION OF WORK IN PROGRESS

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

1.15 EXISTING UTILITIES

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and/or building occupants.
- .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 OF SECTION

Section 01 71 00 Examination and Preparation

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-2020, Stipulated Price Contract.
- .2 Owner's identification of existing survey control points and property limits.

1.2 EXISTING SERVICES

- .1 Before commencing work, establish location and extent of service lines in area of Work and notify Consultant of findings.
- .2 Remove abandoned service lines within 2 m of structures. Cap or otherwise seal lines at cut-off points as directed by Consultant.

1.3 LOCATION OF EQUIPMENT AND FIXTURES

- .1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 Inform Consultant 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 Consultant.

1.4 RECORDS

- .1 Maintain a complete, accurate log of control and survey work as it progresses.
- .2 Record locations of maintained, re-routed and abandoned service lines.

1.5 SUBSURFACE CONDITIONS

- .1 Promptly notify Consultant in writing if subsurface conditions at Place of Work differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.
- .2 After prompt investigation, should Consultant determine that conditions do differ materially, instructions will be issued for changes in Work as provided in Changes and Change Orders.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Section 01 73 00 Execution

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

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

1.2 MATERIALS

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

1.3 PREPARATION

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

1.4 EXECUTION

- .1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.
- .2 Fit several parts together, to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.
- .5 Remove samples of installed Work for testing.
- .6 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .7 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .8 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .9 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .10 Restore work with new products in accordance with requirements of Contract Documents.
- .11 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .12 Provide firestopping in accordance with Section 07 84 00 - Firestopping to maintain the integrity of fire separations, including:
 - .1 Protecting penetrations at fire-resistance rated wall, ceiling or floor construction.
 - .2 Using construction joint fire stops and building perimeter fire stops to protect gaps at fire separations and between fire separations and other construction assemblies.
- .13 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .14 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Section 01 74 00 Cleaning

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-2020, Stipulated Price Contract.

1.2 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Owner or other Contractors.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Consultant. Do not burn waste materials on site, unless approved by Consultant.
- .3 Clear snow and ice from access to building, and 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 bins/ containers for collection of waste materials and debris.
- .6 Provide and use marked separate bins for recycling. Refer to Section 01 74 19 - Waste Management and Disposal.
- .7 Dispose of waste materials and debris off site.
- .8 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .9 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .10 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .11 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .12 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 Refer to CCDC 2, GC 3.14.
- .2 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .3 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .4 Prior to final review remove surplus products, tools, construction machinery and equipment.

- .5 Remove waste products and debris including that caused by Owner or other Contractors.
- .6 Remove waste materials from site at regularly scheduled times or dispose of as directed by Consultant. Do not burn waste materials on site, unless approved by Consultant.
- .7 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .8 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.
- .9 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, glazing, door/frames, ceilings, floors and equipment.
- .10 Clean lighting reflectors, lenses, and other lighting surfaces.
- .11 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .12 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
- .13 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .14 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .15 Remove dirt and other disfiguration from exterior surfaces.
- .16 Clean and sweep roofs, gutters, areaways, and sunken wells.
- .17 Sweep and wash clean paved areas.
- .18 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .19 Clean roofs, downspouts, and drainage systems.
- .20 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .21 Remove snow and ice from access to building.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Section 01 74 19 Waste Management and Disposal

Part 1 General

1.1 SUMMARY

.1 This Section includes requirements for management of construction waste and disposal, which forms the Contractor's commitment to reduce and divert waste materials from landfill and includes the following:

- .1 Preparation of a Draft Construction Waste Management Plan that will be used to track the success of the Construction Waste Management Plan against actual waste diversion from landfill.
- .2 Preparation of a Construction Waste Management Plan that provides guidance on a logical progression of tasks and procedures to be followed in a pollution prevention program to reduce or eliminate the generation of waste, the loss of natural resources, and process emissions through source reduction, reuse, recycling, and reclamation.
- .3 Preparation of monthly progress reports indicating cumulative totals representing progress towards achieving diversion and reduction goals of waste materials away from landfill and identifying any special programs, landfill options or alternatives to landfill used during construction.
- .4 Preparation of a Construction Waste Management Report containing detailed information indicating total waste produced by the project, types of waste material and quantity of each material, and total waste diverted and diversion rates indicated as a percentage of the total waste produced.

.2 Owner has established that this project shall generate the least amount of waste possible and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors be employed by the Contractor.

1.2 RELATED REQUIREMENTS

- .1 Section 01 51 00– Temporary Utilities
- .2 Section 01 52 00– Construction Facilities
- .3 Section 02 41 13– Selective Site Demolition

1.3 REFERENCE STANDARDS

- .1 American Society for Testing and Materials (ASTM):
 - .1 ASTM E1609 01, Standard Guide for Development and Implementation of a Pollution Prevention Program
- .2 Recycling Certification Institute (RCI):
 - .1 RCI Certification Construction and Demolition Materials Recycling

1.4 DEFINITIONS

- .1 Clean Waste: Untreated and unpainted; not contaminated with oils, solvents, sealants or similar materials.
- .2 Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, re modeling operations.repair and demolition
- .3 Hazardous: Exhibiting the characteristics of hazardous substances including properties such as ignitability, corrosiveness, toxicity or reactivity.
- .4 Non hazardous: Exhibiting none of the characteristics of hazardous substances, including properties such as ignitability, corrosiveness, toxicity, or reactivity.
- .5 Non toxic: Not poisonous to humans either immediately or after a long period of exposure.
- .6 Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- .7 Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- .8 Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form; recycling does not include burning, incinerating, or thermally destroying waste.
- .9 Return: To give back reusable items or unused products to vendors for credit.
- .10 Reuse: To reuse a construction waste material in some manner on the project site.
- .11 Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- .12 Sediment: Soil and other debris that has been eroded and transported by storm or well production run off water.
- .13 Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- .14 Toxic: Poisonous to humans either immediately or after a long period of exposure.
- .15 Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- .16 Volatile Organic Compounds (VOC's): Chemical compounds common in and emitted by many building products over time through outgassing:
 - .1 Solvents in paints and other coatings;
 - .2 Wood preservatives; strippers and household cleaners;
 - .3 Adhesives in particleboard, fiberboard, and some plywood; and foam insulation.
 - .4 When released, VOC's can contribute to the formation of smog and can cause respiratory tract problems, headaches, eye irritations, nausea, damage to the liver, kidneys, and central nervous system, and possibly cancer.
- .17 Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

.18 Construction Waste Management Plan: A project related plan for the collection, transportation, and disposal of the waste generated at the construction site; the purpose of the plan is to ultimately reduce the amount of material being landfilled.

1.5 ADMINISTRATIVE REQUIREMENTS

.1 Coordination: Coordinate waste management requirements with all Divisions of the Work for the project, and ensure that requirements of the Construction Waste Management Plan are followed.

.2 Preconstruction Meeting: Arrange a pre-construction meeting in accordance with Section 01 31 19 – Project Meetings before starting any Work of the Contract attended by the Owner, Contractor, affected Subcontractor's and Consultant to discuss the Contractor's Construction Waste Management Plan and to develop mutual understanding of the requirements for a consistent policy towards waste reduction and recycling.

1.6 SUBMITTALS

.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

.2 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Draft Construction Waste Management Plan (Draft CWM Plan): Submit to Consultant a preliminary analysis of anticipated site generated waste by listing a minimum of five (5) construction or demolition waste streams that have potential to generate the most volume of material indicating methods that will be used to divert construction waste from landfill and source reduction strategies; Consultant will provide commentary before development of Contractor's Construction Waste Management Plan.

.2 Construction Waste Management Plan (CWM Plan): Submit a CWM Plan for this project prior to any waste removal from site and that includes the following information:

.1 LEED® Diversion Method: Based on LEED® MR Credit Option 2 to generate less than 12.2 kg of construction waste per m² of building floor area.

.2 Material Streams: Analysis of the proposed jobsite waste being generated, including material types and quantities forming a part of identified material streams in the Draft CWM Plan; materials removed from site destined for alternative daily cover at landfill sites and land clearing debris cannot be considered as contributing to waste diversion and will be included as a component of the total waste generated for the site.

.3 Recycling Haulers and Markets: Investigate local haulers and markets for recyclable materials, and incorporate into CWM Plan.

.4 Alternative Waste Disposal: Prepare a listing of each material proposed to be salvaged, reused, recycled or composted during the course of the project, and the proposed local market for each material.

.5 Landfill Materials: Identify materials that cannot be recycled, reused or composted and provide explanation or justification; energy will be considered as a viable alternative diversion strategy for these materials

where facilities exist and are operated in accordance with LEED® Construction and Demolition Waste Management requirements.

- .6 Landfill Materials: Identify materials that cannot be recycled, reused or composted and provide explanation or justification.
- .7 Landfill Options: The name of the landfill where trash will be disposed of; landfill materials will form a part of the total waste generated by the project.
- .8 Materials Handling Procedures: A description of the means by which any recycled waste materials will be protected from contamination, and a description of the means to be employed in recycling the above materials consistent with requirements for acceptance by designated facilities.
- .9 Transportation: A description of the means of transportation of the recyclable materials, whether materials will be site separated and self hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site, and destination of materials.

1.7 PROJECT CLOSEOUT SUBMISSIONS

- .1 Record Documentation: Submit as constructed information in accordance with Section 01 78 00– Closeout Submittals as follows:
 - .1 Construction Waste Management Report (CWM Report): Submit a CWM Report for this project in a format acceptable to LEED® submittal requirements and that includes the following information:
 - .1 Accounting: Submit information indicating total waste produced by the project.
 - .2 Composition: Submit information indicating types of waste material and quantity of each material.
 - .3 Diversion Rate: Submit information indicating total waste diverted from landfill as a percentage of the total waste produced by the project.
 - .4 Diversion Documentation: Submit copies of transportation documents or shipping manifests indicating weights of materials, and other evidence of disposal indicating final location of waste diverted from landfill and waste sent to landfill.
 - .5 Alternative Daily Cover (ADC): Submit quantities of material that were used as ADC at landfill sites, and that form a part of the total waste generated by the project.
 - .6 Multiple Waste Hauling: Compile all information into a single CWM Report where multiple waste hauling and diversion strategies were used for the project.
 - .7 Photographs: Submit photographs of waste diversion facilities documenting location and signage describing usage of waste separation containers.
 - .2 Construction Waste Management Report (CWM Report): Submit a CWM Report for this project in a format that includes the following information:

- .1 Accounting: Submit information indicating total waste produced by the project.
- .2 Composition: Submit information indicating types of waste material and quantity of each material.
- .3 Diversion Rate: Submit information indicating total waste diverted from landfill as a percentage of the total waste produced by the project.
- .4 Diversion Documentation: Submit copies of transportation documents or shipping manifests indicating weights of materials, and other evidence of disposal indicating final location of waste diverted from landfill and waste sent to landfill.
- .5 Alternative Daily Cover (ADC): Submit quantities of material that were used as ADC at landfill sites, and that form a part of the total waste generated by the project.
- .6 Multiple Waste Hauling: Compile all information into a single CWM Report where multiple waste hauling and diversion strategies were used for the project.
- .7 Photographs: Submit photographs of waste diversion facilities documenting location and signage describing usage of waste separation containers.

1.8 QUALITY ASSURANCE

- .1 Resources for Development of Construction Waste Management Report (CWM Report): The following sources may be useful in developing the Draft Construction Waste Management Plan:
 - .1 Recycling Haulers and Markets: Investigate local haulers and markets for recyclable materials, and incorporate into CWM Plan.
 - .2 Waste-to-Energy Systems: Investigate local waste-to-energy incentives where systems for diverting materials from landfill for reuse or recycling are not available.
- .2 Certifications: Provide proof of the following during the course of the Work :
 - .1 Compliance Certification: Provide proof that recycling center is third party verified and is listed as a Certified Facility through the registration and certification requirements of the Recycling Certification Institute.

1.9 DELIVERY, STORAGE AND HANDLING

- .1 Storage Requirements: Implement a recycling/reuse program that includes separate collection of waste materials as appropriate to the project waste and the available recycling and reuse programs in the project area.
- .2 Handling Requirements: Clean materials that are contaminated before placing in collection containers and ensure that waste destined for landfill does not get mixed in with recycled materials:
 - .1 Deliver materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to recycling process.
 - .2 Arrange for collection by or delivery to the appropriate recycling or reuse facility.

- .3 Hazardous Waste and Hazardous Materials: Handle in accordance with applicable regulations.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 CWM PLAN IMPLEMENTATION

- .1 Manager: Contractor is responsible for designating an on site party or parties responsible for instructing workers and overseeing and documenting results of the CWM Plan for the project.
- .2 Distribution: Distribute copies of the CWM Plan to the job site foreman, each Subcontractor, the Owner, the Consultant and other site personnel as required to maintain CWM Plan.
- .3 Instruction: Provide on site instruction of appropriate separation, handling, and recycling, salvage, reuse, composting and return methods being used for the project to Subcontractor 's at appropriate stages of the project.
- .4 Separation Facilities: Lay out and label a specific area to facilitate separation of materials for potential recycling, salvage, reuse, composting and return:
 - .1 Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials.
 - .2 Hazardous wastes shall be separated, stored, and disposed of in accordance with local regulations.
- .5 Progressive Documentation: Submit a monthly summary of waste generated by the project to ensure that waste diversion goals are on track with project requirements:
 - .1 Submission of waste summary can coincide with application for progress payment, or similar milestone event as agreed upon between the Owner, Contractor and Consultant.
 - .2 Monthly waste summary shall contain the following information:
 - .1 The amount in tonnes or m³and location of material landfilled,
 - .2 The amount in tonnes or m³and location of materials diverted from landfill, and
 - .3 Indication of progress based on total waste generated by the project with materials diverted from landfill as a percentage.

3.2 SUBCONTRACTOR'S RESPONSIBILITY

- .1 Subcontractor 's shall cooperate fully with the Contractor to implement the CWM Plan.
- .2 Failure to cooperate may result in the Owner not achieving their environmental goals, and may result in penalties being assessed by the Contractor to the responsible Subcontractor 's.

END OF SECTION

Section 01 77 00 Closeout Procedures

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-2020, Stipulated Price Contract.
- .2 Canadian Environmental Protection Act (CEPA)
 - .1 SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Acceptance of Work Procedures:
 - .1 Contractor's Inspection: Contractor and all Subcontractors shall: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 - .1 Notify Consultant in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
 - .2 Request Consultant's inspection.
 - .2 Consultant's Inspection:
 - .1 Consultant and Contractor to inspect Work and identify defects and deficiencies.
 - .2 Contractor to correct Work as directed.
 - .3 Completion Tasks: submit written certificates in English that tasks have been performed as follows:
 - .1 Work: completed and inspected for compliance with Contract Documents.
 - .2 Defects: corrected and deficiencies completed.
 - .3 Equipment and systems: tested, balanced, adjusted and fully operational.
 - .4 Certificates required by Fire Commissioner, Utility companies and Boiler Inspection Branch: submitted.
 - .5 Operation of systems: demonstrated to Owner's personnel.
 - .6 Work: complete and ready for final inspection.
 - .4 Final Inspection:
 - .1 When completion tasks are done, request final inspection of Work by Consultant, Owner, and Contractor.

- .2 When Work incomplete according to Consultant and/or Owner, complete outstanding items and request re-inspection.
- .5 Declaration of Substantial Performance: when Consultant considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.
- .6 Commencement of Lien and Warranty Periods: date of Owner's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.
- .7 Final Payment:
 - .1 When Consultant considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.
 - .2 Refer to CCDC 2: when Work deemed incomplete by Consultant, complete outstanding items and request re-inspection.
- .8 Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with contractual agreement.

1.3 FINAL CLEANING

- .1 Clean in accordance with Section 01 74 00 - Cleaning.
- .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Section 01 78 00 Closeout Submittals

Part 1 General

1.1 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-warranty Meeting:
 - .1 Convene meeting two week prior to contract completion with Consultant and Owner, in accordance with Section 01 31 19 - Project Meetings to:
 - .1 Verify Project requirements.
 - .2 Review warranty requirements.
 - .2 Consultant to establish communication procedures for:
 - .1 Notifying construction warranty defects.
 - .2 Determine priorities for type of defects.
 - .3 Determine reasonable response time.
 - .3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
 - .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Two weeks prior to Substantial Performance of the Work, submit to the Consultant, three final copies of operating and maintenance manuals in English.
- .3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.
- .4 Provide evidence, if requested, for type, source and quality of products supplied.

1.3 FORMAT

- .1 Organize data as instructional manual submitted in electronic USB key format (1 copy) and printed format (2 copies).
- .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.
 - .1 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 process flow, 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.
 - .1 Bind in with text; fold larger drawings to size of text pages.
- .9 Provide 1:1 scaled CAD files in DWG and PDF format on USB Key.

1.4 CONTENTS - PROJECT RECORD DOCUMENTS

- .1 Table of Contents for Each Volume: provide title of project;
 - .1 Date of submission; names.
 - .2 Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
 - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
 - .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
 - .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
 - .5 Typewritten Text: as required to supplement product data.
 - .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.
 - .6 Training: refer to Section 01 79 00 - Demonstration and Training.

1.5 AS -BUILT DOCUMENTS AND SAMPLES

- .1 Maintain, in addition to requirements in General Conditions, one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to 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.
 - .1 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.
 - .1 Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition.
 - .1 Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Consultant.

1.6 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

- .1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by Consultant.
- .2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress.
 - .1 Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
 - .1 Measured depths of elements of foundation in relation to finish first floor datum.
 - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .4 Field changes of dimension and detail.
 - .5 Changes made by change orders.
 - .6 Details not on original Contract Drawings.
 - .7 Referenced Standards to related shop drawings and modifications.
- .5 Specifications: 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 Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications, field test records, inspection certifications, required by individual specifications sections.
- .7 Provide digital photos, if requested, for site records.

1.7 EQUIPMENT AND SYSTEMS

- .1 For each item of equipment and each system include description of unit or system, and component parts.
 - .1 Give function, normal operation characteristics and limiting conditions.
 - .2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences.
 - .1 Include regulation, control, stopping, shut-down, and emergency instructions.
 - .2 Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 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 co-ordination 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 - Quality Control and other Consultant's Specifications.
- .15 Additional requirements: as specified in individual specification sections.

1.8 MATERIALS AND FINISHES

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

1.9 MAINTENANCE MATERIALS

- .1 Spare Parts:
 - .1 Provide spare parts, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.

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

1.10 DELIVERY, STORAGE AND HANDLING

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

1.11 WARRANTIES AND BONDS

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan, 10 days before planned pre-warranty conference, to Consultant approval.
- .3 Warranty management plan to include required actions and documents to assure that Consultant receives warranties to which it is entitled.
- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.

- .5 Submit, warranty information made available during construction phase, to Consultant for approval prior to each monthly pay estimate.
- .6 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:
 - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
 - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
 - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
 - .4 Verify that documents are in proper form, contain full information, and are notarized.
 - .5 Co-execute submittals when required.
 - .6 Retain warranties and bonds until time specified for submittal.
- .7 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .8 Conduct joint 4 month and 9 month warranty inspection, measured from time of acceptance, by Consultant.
- .9 Include information contained in warranty management plan as follows:
 - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
 - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items.
 - .3 Provide list for each warranted equipment, item, feature of construction or system indicating:
 - .1 Name of item.
 - .2 Model and serial numbers.
 - .3 Location where installed.
 - .4 Name and phone numbers of manufacturers or suppliers.
 - .5 Names, addresses and telephone numbers of sources of spare parts.
 - .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
 - .7 Cross-reference to warranty certificates as applicable.
 - .8 Starting point and duration of warranty period.
 - .9 Summary of maintenance procedures required to continue warranty in force.
 - .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.

- .11 Organization, names and phone numbers of persons to call for warranty service.
- .12 Typical response time and repair time expected for various warranted equipment.
- .4 Contractor's plans for attendance at 4 and 9 month post-construction warranty inspections.
- .5 Procedure and status of tagging of equipment covered by extended warranties.
- .6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .10 Respond in timely manner to oral or written notification of required construction warranty repair work.
- .11 Written verification to follow oral instructions.
- .1 Failure to respond will be cause for the Consultant to proceed with action against Contractor.

1.12 WARRANTY TAGS

- .1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Consultant.
- .2 Attach tags with copper wire and spray with waterproof silicone coating.
- .3 Leave date of acceptance until project is accepted for occupancy.
- .4 Indicate following information on tag:
 - .1 Type of product/material.
 - .2 Model number.
 - .3 Serial number.
 - .4 Contract number.
 - .5 Warranty period.
 - .6 Inspector's signature.
 - .7 Construction Contractor.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Section 01 79 00 Demonstration and Training

Part 1 General

1.1 ADMINISTRATIVE REQUIREMENTS

- .1 Demonstrate scheduled operation and maintenance of equipment and systems to Owner's personnel two weeks prior to date of substantial performance.
- .2 Owner: provide list of personnel to receive instructions, and co-ordinate their attendance at agreed-upon times.
- .3 Preparation:
 - .1 Verify conditions for demonstration and instructions comply with requirements.
 - .2 Verify designated personnel are present.
 - .3 Ensure equipment has been inspected and put into operation in accordance with specifications.
 - .4 Ensure testing, adjusting, and balancing has been performed in accordance with specifications and equipment and systems are fully operational.
- .4 Demonstration and Instructions:
 - .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, warranty, servicing, and maintenance of each item of equipment at agreed upon times, at the equipment location.
 - .2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
 - .3 Review contents of manual in detail to explain aspects of operation and maintenance.
 - .4 Prepare and insert additional data in operations and maintenance manuals when needed during instructions.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Consultant's approval.
- .3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.
- .4 Give time and date of each demonstration, with list of persons present.
- .5 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.3 QUALITY ASSURANCE

- .1 When specified in individual Sections requiring manufacturer to provide authorized representative to demonstrate operation of equipment and systems:

- .1 Instruct Owner's personnel.
- .2 Provide written report that demonstration and instructions have been completed.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Section 03 11 00 Concrete Forming

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 03 15 00 – Concrete Accessories.
- .2 Section 03 20 00 – Concrete Reinforcing.
- .3 Section 03 30 00 – Cast-in-Place Concrete.
- .4 Section 03 35 00 – Concrete Finishing.
- .5 Section 03 39 00 – Concrete Curing.
- .6 The Contractor shall obtain a copy of all sections even if they do not pertain directly to his speciality. When bidding, the Contractor agrees implicitly with articles and requirements of all sections in these specifications, including those he might not have read. The Contractor should consult the table of contents of the specifications to be aware of the complete list of sections.

1.2 PRICING AND PAYMENT PROCEDURE

- .1 No measurement shall be made under this Section.
 - .1 Include formworks pricing in concreting work package in section 03 30 00 – Cast-in-Place Concrete.

1.3 REFERENCES

- .1 American Concrete Institute (ACI).
 - .1 ACI 347R-14, Guide to Formwork for Concrete.
 - .2 ACI 347.3R-13, Guide to Formed Concrete Surfaces.
- .2 American Society for Testing and Materials International (ASTM).
 - .1 ASTM A 36/A 36M-19, Standard Specification for Carbon Structural Steel.
- .3 Canadian Standard Association (CSA)/CSA International.
 - .1 CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
 - .2 CSA O86, Engineering Design in Wood.
 - .3 CSA O121, Douglas Fir Plywood.
 - .4 CSA O151, Canadian Softwood Plywood.
 - .5 CSA O153, Poplar Plywood.
 - .6 CSA O325, Construction Sheathing.
 - .7 CSA O437 Series-93(R2006), Standards on OSB and Waferboard.
 - .8 CSA S269.1, Falsework and Formwork.

- .9 CAN/CSA S269.2, Access Scaffolding for Construction Purposes.
- .10 CSA S136, North American Specification for the Design of Cold-Formed Steel Structural Member
- .4 Notwithstanding the version of the standard mentioned above, it remains the responsibility of the Contractor to consult the most recent version.

1.4 CONTRACTOR'S LIABILITIES

- .1 The Contractor scope of work includes concrete forming, falseworks, their design and installation. No examination or comments from the Owner's Representative or anyone else shall relieve the Contractor of assuming solely all risks and liability regarding these parts of work.
 - .1 Calculations, layout, and construction of formworks are the sole responsibility of the Contractor.
- .2 The schedule of work of the Contractor shall take into account the constraints associated with the execution of other work, including any constraints linked to sequencing such as the necessity of constructing the ground floor slabs prior to beginning of backfilling.

1.5 FORMWORKS AND FALSEWORK DESIGN

- .1 Formwork and falsework design shall be performed by an engineer member of the PEO employed by the Contractor or mandated to do so.
- .2 Formwork and falsework design shall be done in accordance with laws and regulations in place, including but not limited to the Safety Code for the Construction Industry.
- .3 Describe the construction sequence incorporated into the design of structures. Show or describe the position of construction joints provided and, if applicable, the principle of formworks and falseworks reuse. Submit to the Owner's Representative the location of construction joints for approval.
- .4 Calculations shall be made in accordance with recommendations and loads indicated in ACI 347R or ACI 347.2R guides and CSA S269.1.
- .5 The design and supervision of temporary work including formwork is the sole responsibility of the design engineer of such structures and the contractor engaging him. The Owner's Representative shall not be responsible in any way for the design and/or supervision of temporary structures.

1.6 ACTIONS AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit descriptions of all formwork materials in direct contact with wet concrete.
- .3 Submit for approval a drawing including location of all sleeves and openings embedded in concrete.
- .4 Submit formworks and falseworks shop drawings.
 - .1 The drawings shall bear the seal and signature of a Professional Engineer licensed to practice in the Province of Ontario.
- .5 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, ties, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings and formwork drawings.

- .6 Indicate formwork design data in accordance with article 6.5.2.1 of CSA A23.1, including, but not limited to, permissible rate of concrete placement, and temperature of concrete, in forms.
- .7 When falseworks or structural element are connected or lean on an existing structure used as support, shop drawings shall indicate maximum forces transmitted in each direction.
- .8 Before concreting, submit a letter signed by a professional engineer certified by the professional engineer licensed to practice in the Province of Ontario, stating that the construction of falseworks and formworks were done in accordance with the plans submitted. The engineer attesting the conformity of falseworks and formworks shall visit the site of work prior to the production of the letter and attach the report of his visit to the letter. If the Contractor does not use falsework or temporary shoring, the Owner's Representative may request to be provided with a letter signed by a professional engineer stating that temporary shoring is not required.
- .9 Indicate sequence of erection and removal of formwork/falsework as directed by the Owner's representative.

1.7 QUALITY CONTROL

- .1 Realize the following activities and submit required documents:

ART.	PRESCRIPTIONS	PERIOD (FREQUENCY)	REGISTRY BREAKPOINT / MONITORING	RESPONSIBILITY
1.6.4	Formworks and falseworks shop drawings	At least fourteen (14) days prior to beginning work, per the requirements for shop drawings presentation in the tender documents	Transmission letter Inscription to the technical specification registry	Contractor Review by the Owner's Representative
1.6.4 1.5.4	Location of construction joints	At least fourteen (14) days prior to beginning work, per the requirements for shop drawings presentation in the tender documents	Breakpoint. Transmission letter Inscription to the technical specification registry	Contractor Review by the Owner's Representative
1.6.8	Certificate of compliance of falseworks and formworks	Prior to applying loads on falseworks,	Certificate of compliance signed by an engineer and visit report	Contractor Engineer employed by the Contractor
1.6.2	Descriptions of formwork materials in contact with wet concrete	At least seven (7) days prior to beginning work, per the requirements for shop drawings presentation in the tender documents	Transmission letter Inscription to the technical specification registry	Contractor Review by the Owner's Representative

ART.	PRESCRIPTIONS	PERIOD (FREQUENCY)	REGISTRY BREAKPOINT / MONITORING	RESPONSIBILITY
1.6.3	Drawing including location of all sleeves embedded in concrete	At least seven (7) days prior to concreting	Location drawing Inscription to the technical specification registry	Contractor Review by the Owner's Representative
3.3.3	Notice to Owner's Representative	At least twenty-four (24) hours prior to formwork removal and reshore removal	Written notice Formwork and reshore removal registry	Contractor

.2 For all the activities to be carried out in the previous table, keep a register indicating at least the activity carried out, the date of submission by the Specialized contractor and the date of review. The register shall be updated and sent to the Owner's Representative at regular intervals, corresponding at most to the intervals between site meetings.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for reuse/recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .2 Place materials defined as hazardous or toxic in designated containers.
 - .3 Recover and sort packaging for recycling purposes, in accordance with the waste management plan.
 - .4 Divert wood materials from landfill to a recycling, reuse or composting facility as approved by the Owner's Representative.
 - .5 Divert plastic materials from landfill to a recycling, reuse or composting facility as approved by the Owner's Representative.
 - .6 Divert unused form release material from landfill to an official hazardous material collection site as approved by the Owner's Representative.
 - .7 Reference standards
- .2 ASTM International
 - .1 ASTM A1064/A1064M, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
 - .2 ASTM C73-14 Standard Specification for Calcium Silicate Face Brick (Sand-Lime Brick).
- .3 CSA Group (CSA)
 - .1 CAN/CSA-A82, Fired Masonry Brick Made From Clay or Shale.
 - .2 CAN/CSA-A165 SERIES, CSA Standards on Concrete Masonry Units (Consists of A165.1-04 Concrete Block Masonry Units, A165.2 Concrete Brick Masonry Units, A165.3 Prefaced Concrete Masonry Units).
 - .3 CAN/CSA-A179, Mortar and Grout for Unit Masonry.
 - .4 CAN/CSA-A370, Connectors for Masonry.

- .5 CAN/CSA A371, Masonry Construction for Buildings.
- .6 CSA G30.18, Carbon Steel Bars for Concrete Reinforcement.
- .7 CSA S304- Design of masonry structures.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (SDS).

1.9 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for unit masonry products, mortar and grout, connectors, anchorage and reinforcing, and accessories. Include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Submit duplicate samples of each unit exposed in final construction for review and acceptance.
 - .2 Samples will be returned for inclusion into work.

1.10 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .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 masonry products from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: As specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 Formwork materials:
 - .1 For concrete without special architectural features, use wood and wood product formwork materials in accordance with CSA O86, CSA O121, CSA O153 and/or CSA O437 Series.
- .2 Prefabricated formwork: for concealed surface only, steel, cardboard or wood formwork shop-fabricated meeting the same standard for rigidity, watertightness and quality as built-in-place wood formwork.

- .3 Form release agent: use a non-toxic, biodegradable, and low VOC product.
 - .1 Oil: colourless mineral oil, non-toxic, biodegradable, and low VOC, free of kerosene, with viscosity between 15 to 24 mm²/s at 40 degrees C, flashpoint minimum 150 degrees C, open cup.
 - .2 Where applicable, the product used shall be compatible with the application of coating, waterproofing, membrane or any other product to be placed in direct contact with the hardened concrete.
 - .3 Approved products: Formshield Pure by Euclid, MasterFinish RL 100 (formerly Cast-Off) by BASF and King Form Release by KING.
- .4 Form ties:
 - .1 For concrete without special architectural features, use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.
 - .2 Unless otherwise indicated, use watertight snap ties with a neoprene washer in the centre of the tie, able to resist 12 meters high water pressure for foundation walls and retaining walls. In general, use watertight snap ties for all concrete work considered watertight.
 - .3 Sealing mortar for form ties holes:
 - .1 Cementitious, two-component, fast-setting mortar, grey colored and containing a corrosion inhibitor, such as:
 - .1 Sikatop 123 Plus or Sikatop 123 Plus Winter Grade, at low temperature.
 - .2 Verticoat Supreme by EUCLID;
 - .3 Super-top OV by KING;
 - .4 MasterEmaco N 1501HCR Vertical Overhad (former Zero-C Vertical Overhead Mortar) by BASF;
 - .5 Planitop X or XS by MAPEI.
 - .2 For exposed surfaces, refer to article 3.4.3 when selecting the appropriate product.
- .5 Refer to section 03 15 00 for concrete accessories.

Part 3 Execution

3.1 FABRICATION AND ERECTION

- .1 Verify lines, levels, and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings. Allow for a 100 mm tolerance on the elevation of the bottom of excavation at no supplementary charge.
- .2 Prior to concreting, clean formwork and treat surfaces with a form stripping agent in accordance with CSA A23.1.
- .3 Obtain Owner's Representative approval for use of earth forms, or for framing openings not indicated on drawings.

- .4 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .5 Fabricate and erect falsework in accordance with CSA S269.1. Ensure stability and lateral bracing of shores at all times.
- .6 Do not place shores and mud sills on frozen ground. Bottom of excavation shall be protected against frost at all times. Concrete shall never be poured over a frozen surface.
- .7 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .8 Fabricate and erect formwork in accordance with CSA S269.1 to produce finished concrete conforming to shape, dimensions, locations, and levels indicated. Insure proper temporary bracing to maintain the shape of formwork from pouring to hardening of concrete.
- .9 Geometric configuration and localisation shall be within tolerances required by CSA A23.1, article 6.4.
- .10 Align form joints and make them watertight. Keep form joints to minimum. Adequate reinforcements must be placed at the back of the joints between plywood sheets to ensure obtaining a continuous flat surface able to withstand all stages of concreting without deforming or moving.
- .11 Unless otherwise indicated, use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints.
- .12 For all sharp angles of exposed concrete, provide 25 mm chamfers, even where no indications are given on drawings.
- .13 At least twenty-four (24) hours prior to closing forms, advise the Owner's Representative as to allow inspection of reinforcement.

3.2 ANCHORS, SLEEVES AND EMBEDDED ELEMENTS

- .1 The Contractor shall include all requirements for embedded items (drain pipe, waterstop, anchors, sleeves, ducts, machinery anchor bolts, etc.) in the shop drawings in accordance with CSA A23.1 article 6.7. Refer to section 03 15 00 – Concrete Accessories for additional requirements.
- .2 Build in anchors, sleeves, and other inserts required to accommodate work specified in other sections.
 - .1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
 - .2 Prior to concreting, ensure, by survey, that all dimensions required in drawings and specifications and tolerances imposed for the implementation are met.
 - .3 Provide a certificate of compliance signed by an engineer attesting that (1) installation of anchor rods complies to the anchoring plan and (2) concrete foundations reached the strength required to support the erection of steel structure, in accordance with article 3.24.12 of the Safety Code for the construction industry.
- .3 Tolerances shall be in accordance with standard CSA A23.1 article 6.7.3.
- .4 Sleeves and openings with a side larger than 100 mm shall be examined by the Owner's Representative if not indicated on drawings.

- .5 When authorized by the Owner's Representative, incorporate openings, place sleeves, ties, hangers, ducts or pipes and any other embedded elements as indicated in drawings.
- .6 Unless otherwise indicated, the following guidelines shall be met when installing sleeves, ducts or pipes:
 - .1 Do not remove or move rebars to place embedded elements. If placement of embedded elements is impossible where prescribed, any modification needs to be approved by the Owner's Representative.
 - .2 Nothing shall be embedded into a slab on ground exposed to the effect of bad weather.
- .7 Notify the Owner's Representative and wait for his instructions if the preceding requirements cannot be met.
- .8 Coordinate delivery and placement into formworks of embedded elements with subcontractors.
- .9 Aluminium material embedded into concrete shall be covered with a proper coating to prevent aluminium corrosion.

3.3 FORMWORK REMOVAL AND RESHORING

- .1 Leave formwork in place for the following minimum periods of time after placing concrete:
 - .1 One (1) day for footings.
 - .2 Three (3) days for walls less than three (3) meters high and beam sides.
 - .3 Refer to section 03 39 00 – Concrete Curing for the minimum time prior to formwork removal, notwithstanding the indication of the preceding articles. Coordinate the time required before formwork removal with concrete curing.
- .2 The Contractor remains the sole responsible for any damage to concrete following early formwork removal, even if he has been authorized to proceed.
- .3 Reuse formworks and falseworks as indicated in CSA A23.1 standard. Except for exposed surfaces, reuse of formwork is allowed if the surfaces are thoroughly cleaned and are not cracked, nor rough.

3.4 PATCHING OF FORM TIE HOLES

- .1 Refer to article 7.10.3 from CSA A23.1 standard for patching of form tie holes.
- .2 All conical cavities left after removal of the plastic cones on the ends of snap ties shall be filled with grout. Proceed according to the instructions of the grout manufacturer. Moisten the surface beforehand. Ensure a smooth finish with the grout blending into the surrounding concrete surfaces. Allow to cure.
- .3 For exposed surfaces, products used to fill the holes shall have the same texture and color as the concrete. Provide the technical datasheet of the product for approval by the Owner's Representative.

3.5 FIELD QUALITY CONTROL

- .1 Surveys shall be conducted prior to concreting to measure the level of the top of the formwork. At a minimum, one (1) survey shall be taken for the pit base slab and one (1) survey for the pit wall. Provide this survey to the Owner's Representative and wait for his approval before placing concrete.
- .2 Survey points shall be used as guide to control slab thickness during concreting.
- .3 During inspection of concrete reinforcement, formworks and falseworks shall be inspected as well. Formwork quality and its cleanliness shall be inspected.

END OF SECTION

Section 03 15 00 Concrete Accessories

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 03 11 00 – Concrete Forming.
- .2 Section 03 20 00 – Concrete Reinforcing.
- .3 Section 03 30 00 – Cast-in-Place Concrete.
- .4 Section 03 35 00 – Concrete Finishing.
- .5 Section 03 39 00 – Concrete Curing.
- .6 Section 04 20 00 – Unit Masonry
- .7 The Contractor shall obtain a copy of all sections even if they do not pertain directly to his speciality. When bidding, the Contractor agrees implicitly with articles and requirements of all sections in these specifications, including those he might not have read. The Contractor should consult the table of contents of the specifications to be aware of the complete list of sections.

1.2 PRICING AND PAYMENT PROCEDURE

- .1 No measurement shall be made under this Section.
 - .1 Include concrete accessories costs in items of concrete work in section 03 30 00 – Cast-in-Place Concrete.

1.3 REFERENCES

- .1 American Concrete Institute (ACI).
 - .1 ACI RAP Bulletin 1, Structural Crack Repair by Epoxy Injection, 2003.
- .2 American Society for Testing and Materials International (ASTM).
 - .1 ASTM C 39/C 39M, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - .2 ASTM C 496/C 496M, Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.
 - .3 ASTM C 920, Standard Specification for Elastomeric Joint Sealants;
 - .4 ASTM C 1107/C 1107M-20, Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
 - .5 ASTM D 638, Standard Test Method for Tensile Properties of Plastics.
 - .6 ASTM E 1745-17, Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
- .3 Canadian Standard Association (CSA)/CSA International.

- .1 CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
- .2 CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .4 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB 19.24-M90, Multicomponent, Chemical-Curing Sealing Compound.
 - .2 CAN/CGSB 51.34-M86 and CAN/CGSB 51.34-M86 AMEND, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .5 Notwithstanding the version of the standard mentioned above, it remains the responsibility of the Contractor to consult the most recent version.

1.4 ATTACHMENTS

- .1 When attachments or anchors are required for concrete work to support vertically or laterally architectural elements, precast concrete panels, mechanical or electrical equipment, or other, manufacturer of said elements is the sole responsible for the design and calculations of attachments.
- .2 Steel plates, angles, steel rods, bolts, studs, anchoring elements, or any hardware parts in direct contact with, embedded or partially embedded into concrete shall be considered attachments.

1.5 ACTIONS AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets.
- .3 Submit documents and samples in accordance with section 01 47 15 - Sustainable development - Construction, and coordinate the requirements of this section with those set out therein.
- .4 Submit shop and location drawings for all steel elements embedded in concrete. When forces are induced into the concrete by embedded steel elements, provide forces and direction of forces applied to concrete works where they are embedded.
 - .1 The drawings shall bear the seal and signature of a Professional Engineer licensed to practice in the Province of Ontario.
- .5 Submit location drawings for all embedded fasteners and anchors including force and strains induced into substrate.

1.6 QUALITY CONTROL

- .1 Realize the following activities and submit required documents:

ART.	PRESCRIPTIONS	PERIOD (FREQUENCY)	REGISTRY BREAKPOINT / MONITORING	RESPONSIBILIT Y
1.5.4	Shop and location drawings for embedded steel element	Fourteen (14) days prior to beginning works, per the requirements for shop drawings presentation in the tender document	Transmission letter Inscription into the shop-drawing registry	Contractor Review by the Owner's Representative
1.5.5	Location drawings for fasteners and anchors	Fourteen (14) days prior to beginning works, per the requirements for shop drawings presentation in the tender document	Transmission letter Inscription into the shop-drawing registry	Contractor Review by the Owner's Representative
1.5.1 2.1	Technical descriptions of concrete accessories	Seven (7) days prior to beginning concrete works, per the requirements for shop drawings presentation in the tender document	Transmission letter Inscription into the technical specification registry	Contractor Review by the Owner's Representative
3.5.2	Inspection of horizontal and overhanging anchors	Continuously when installing horizontal or overhanging anchors	Inspection report	Laboratory or Inspector designated by the Owner

.2 For all the activities to be carried out in the previous table, keep a register indicating at least the activity carried out, the date of submission by the Specialized contractor and the date of review. The register shall be updated and sent to the Owner's Representative at regular intervals, corresponding at most to the intervals between site meetings.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:

- .1 Separate waste materials for reuse/recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Recover and sort packaging for recycling purposes, in accordance with the waste management plan.
- .4 Divert wood materials from landfill to a recycling, reuse or composting facility as approved by the Owner's Representative.
- .5 Divert plastic materials from landfill to a recycling, reuse or composting facility as approved by the Owner's Representative.
- .6 Divert unused hazardous material from landfill to an official hazardous material collections site as approved by the Owner's Representative.

Part 2 Products

2.1 MATERIALS

.1 Waterstops.

- .1 Ribbed, extruded PVC blade meeting the following requirements:
 - .1 Tensile resistance: to ASTM D 638, 11.4 MPa minimum.
 - .2 Elongation: to ASTM D 638, 275 % minimum.
 - .3 Tear resistance: to ASTM D 624 Die 'B' Method, 50 kN/m minimum.
- .2 Blades shall be of sizes indicated. If no indications are given, use 150 mm wide and 10 mm thick waterstops.
- .3 In T-, L- or X-shaped intersections use precut, prefabricated waterstops. Waterstops shall be welded together for all joints in all directions and shall be continuous everywhere (horizontally, vertically, or transversally).
- .4 Take special care when installing waterstops and when concreting over waterstops to prevent movement or deformation. Waterstops shall remain straight as indicated on drawings.
- .5 Dilatation or expansion joints: approved products: Durajoint type 7C, Earth Shield PVC938 de JP Specialties or Greenstreak type 718.
- .6 Construction joints: approved products: Durajoint type 4, Earth Shield PVC636 de JP Specialties or Greenstreak type 703.

.2 Damp proof membrane, under slab on ground: 0.40 mm thick polyethylene film, to ASTM E 1745, type A and CSA A23.1 clause 6.2.5.

.3 Bonding agent: water-based epoxy-cementitious bonding agent, three-component, acting as a corrosion inhibitor, such as:

- .1 SikaTop Armatec 110 EpoCem by Sika.
- .2 DuralPrep A.C. by Euclid.
- .3 MasterEmaco P124 by Master Builders.
- .4 Planibond 3C by MAPEI.

.4 Steel for embedded steel elements: to CSA G40.20/G40.21 grade 350W or superior.

.5 Chemical adhesive system: structural epoxy resin, two-components. Unless otherwise indicated, use:

- .1 Hilti RE-500-V3 or Dewalt PURE-110+ adhesive in general.
- .2 Hilti HIT HY-200 or Dewalt AC200+ adhesive for applications where quick setting is required such as overhead applications, or for use at low temperature, between -10°C and 10°C.
- .3 Hilti HIT ICE adhesive for use in cold temperatures above -23°C.

.6 Shrinkage compensating grout: premixed compound to ASTM C 1107/C 1107M type C, 50 MPa minimum compressive resistance after twenty-eight (28) days such as:

- .1 SikaGrout 212 by Sika.
- .2 Dry Pact Grout by Euclid.
- .3 In-Pakt Construction Grout or In-Pakt Precision Grout CT by KING (Sika) depending on weather conditions.

- .4 PlanigROUT 712 by MAPEI.
- .7 Crack injection epoxy: two-component structural resin, 100% solid, moisture insensitive, low-viscosity, in accordance with ASTM C 881/C 881M type IV, grade 1, class A or B, such as:
 - .1 Euco 452 LV by Euclid.
 - .2 MasterInject 1380 by Master Builders.
 - .3 Sikadur 52 by Sika.
 - .4 Sikadur 35 Hi-MOD LV by Sika.
- .8 Epoxy grout for base plates/equipment base: three-component epoxy system, such as:
 - .1 Sikadur 42 Grout pak Multi-Flo by Sika (6:1 ratio).
 - .2 Masterflow 648 by Master Builders.
 - .3 E³-Deep Pour by Euclid.
 - .4 PlanigROUT 350 de MAPEI.
- .9 Epoxy grout for repairs: one or more component, moisture-insensitive, rapid strength gaining epoxy repair mortar such as:
 - .1 Sikadur 43 Patch Pak by Sika.
 - .2 MasterEmaco T 1061 by Master Builders.
 - .3 Duraflex Fastpatch by Euclid.
 - .4 Planitop 18 by MAPEI.
- .10 Cement-based mortar for horizontal repair: shrinkage-compensated, cementitious based mortar containing a corrosion inhibitor, such as:
 - .1 Sikatop 122 PLUS.
 - .2 Eucocrete Supreme by Euclid.
 - .3 Planitop 25 ou MAPECEM 202 de MAPEI.
- .11 Cement-based mortar for vertical or overhead repair: shrinkage-compensated, cementitious based mortar containing a corrosion inhibitor, such as:
 - .1 Verticoat Supreme from Euclid.
 - .2 Sikatop 123 PLUS or Sikatop 123 PLUS Winter Grade by Sika depending on weather conditions.
 - .3 MasterEmaco N 420 CI by Master Builders.
 - .4 Planitop 23 or Planitop XS (low thickness repairs) by MAPEI.
- .12 Self-consolidating repair concrete: self-levelling, premixed concrete, such as:
 - .1 Sikacrete 08 SCC or Sikacrete 211 Flow PLUS by Sika.
 - .2 Tamms Form and Pour by Euclid.
 - .3 MasterEmaco S 440MC by Master Builders.
 - .4 Planitop 11 SCC or Planitop 15 by MAPEI.
 - .5 MS-S6 or MS-S10 by KING (SIKA) depending on required thickness.

Part 3 Execution

3.1 GENERAL

- .1 In general, the procedure for installing accessories must comply with the manufacturer's requirements and recommendation. If no specification is given in this specification for the installation of accessories, follow the manufacturer's procedure. If the manufacturer's procedure is more restrictive than the specifications, follow the most restrictive procedure.

3.2 DAMP PROOF MEMBRANE

- .1 Install damp proof membrane under concrete slabs-on-grade inside building, in accordance with ASTM E 1643.
- .2 Lap damp proof membrane minimum 150 mm at joints and seal.
- .3 Seal punctures in damp proof membrane before placing concrete. Use patching material at least 150 mm larger than puncture and seal.

3.3 EMBEDDED STEEL

- .1 Fabrication of embedded steel elements in accordance with CSA S16.
- .2 Install embedded parts in accordance with the tolerances in article 6.7.3 of the CSA A23.1 standard which are considered to be the minimum requirements applicable to all steel elements (anchors, plates, angles, hardware, etc.) unless otherwise indicated.
- .3 Ensure galvanic separation (galvanization, neoprene or other) between any steel and aluminium element.

3.4 CRACK INJECTION

- .1 Refer to ACI RAP Bulletin 1 Structural Crack Repair by Epoxy Injection.
- .2 No crack injection shall take place unless concrete temperature is between 15 and 30 °C. Temperature of epoxy component must remain between 20 and 30 °C prior to injection.
- .3 Clean the surface area 13 mm wide on each side of the crack, using "oil-free" compressed air.
- .4 Install entry ports at a maximum spacing of 200 mm or the thickness of the concrete element, whichever is less. Use surface-mounted entry ports when adequate, except for blocked cracks where socket-mounted ports shall be used. Seal the surface around entry points and cracks. Install entry ports where crack is clean and of maximum width whenever possible, even if spacing between entry ports vary slightly. Place first and last entry port at a distance corresponding to half the usual spacing.
- .5 Use equipment such as electrical or hydraulic piston pumps, with a maximum pressure of 200 psi, for crack injection.
- .6 When surface sealant has hardened, inject epoxy into entry ports. Start the injection at the widest section of a horizontal crack or at the bottom of a vertical crack. Continue the injection until refusal. When an adjacent port starts bleeding, cap the port being injected and continue injecting at the furthest bleeding port.

- .7 Upon completion of the injection process, when epoxy has hardened, grind concrete surface to eliminate leftover epoxy and sealant. Surfaces shall present a high-quality finish.
- .8 Quality control: The Owner's Representative may require that concrete cylinders, drilled in concrete after crack injection, shall be submitted to compressive or indirect tensile strength tests, in accordance with ASTM C 42 (sampling), ASTM C 39 (compressive strength) and ASTM C 496 (tensile strength) standards.
- .9 When crack injection is required to correct deficiencies resulting from work done by the Contractor, all direct and indirect costs related to crack injection shall be assumed by the Contractor.

3.5 EXECUTION – CHEMICAL ADHESIVE SYSTEM

- .1 Adhesive anchors to vertical or overhanging surfaces shall be installed by personal certified through the ACI-CRSI Adhesive Anchor Installer Certification Program.
- .2 The installation of adhesive anchors to vertical or overhanging surfaces is subject to continuous inspection by a qualified inspector designated for this task. The inspector will provide a report attesting that the execution of the work was carried out in compliance with the contractual documents and the procedures required by the supplier of the anchoring product.
- .3 Anchor installers shall be trained by the supplier of the product used and have proof to this effect.
- .4 Drill hole normal to the surface, 4 mm larger than anchor rods, or more, as indicated by anchoring system manufacturer.
- .5 Borehole shall be free of dust, debris, ice, oil, grease, and other contaminants. Use a hammer drill set in rotation-hammer mode for drilling. Use round steel brush and oil-free compressed-air blower for cleaning, per manufacturer's recommendation. The use of a diamond drill is subject to the approval of the Owner's Representative.
- .6 Prepare and apply epoxy as indicated in the manufacturer's technical datasheet. Consider the indication on temperature and setting time.
- .7 Partially fill hole with epoxy before placing anchor rod. Inject epoxy to fill out the hole.
- .8 Unless otherwise indicated, anchor depth shall be the largest value between 150 mm or fifteen (15) times the diameter of the anchor in concrete.

3.6 EXECUTION – BONDING AGENT

- .1 Using dry or wet sand blast, remove all deteriorated concrete, dirt, oil, grease and any other contaminants from surfaces.
- .2 Moisten concrete surface at least four (4) hours prior to concreting, as to obtain saturated-surface dry (SSD) substratum.
- .3 Apply per manufacturer instructions a no less than 0.5 mm thick layer of bonding agent using a stiff paint brush or roller.
- .4 Pour repair concrete or mortar within six (6) hours after bonding agent is applied or less, following manufacturer's recommendations.

END OF SECTION

Section 03 20 00 Concrete Reinforcing

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 03 11 00 – Concrete Forming.
- .2 Section 03 15 00 – Concrete Accessories.
- .3 Section 03 30 00 – Cast-in-Place Concrete.
- .4 Section 03 35 00 – Concrete Finishing.
- .5 Section 03 39 00 – Concrete Curing.
- .6 The Contractor shall obtain a copy of all sections even if they do not pertain directly to his speciality. When bidding, the Contractor agrees implicitly with articles and requirements of all sections in these specifications, including those he might not have read. The Contractor should consult the table of contents of the specifications to be aware of the complete list of sections.

1.2 PRICING AND PAYMENT PROCEDURE

- .1 No measurement shall be made under this Section.
 - .1 Include reinforcement costs in items of concrete work in section 03 30 00 – Cast-in-Place Concrete.
- .2 Measure reinforcing steel in kilograms of steel incorporated into Work, computed from theoretical unit mass specified in CSA G30.18 for lengths and sizes of bars as indicated or authorized in writing by Owner's Representative.

1.3 REFERENCES

- .1 American Concrete Institute (ACI).
 - .1 ACI 315R-18, Guide to Presenting Reinforcing Steel Design Details.
 - .2 ACI 318-19, Building Code Requirements for Structural Concrete with Commentary.
 - .3 ACI MNL-66(20), ACI Detailing Manual 2020.
- .2 American Society for Testing and Materials International (ASTM).
 - .1 ASTM A 641/A 641M, Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - .2 ASTM A 1044/A 1044M-22a, Standard Specification for Steel Stud Assemblies for Shear Reinforcement of Concrete.
 - .3 ASTM A 1060/A 1060M-22, Standard Specification for Zinc-Coated (Galvanized) Steel Welded Wire Reinforcement, Plain and Deformed, for Concrete.
 - .4 ASTM A 1064/A 1064M-24, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

- .3 Canadian Standard Association (CSA)/CSA International.
 - .1 CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
 - .2 CSA A23.3, Design of Concrete Structures.
 - .3 CSA G30.18 (Weldable), Carbon Steel Bars for Concrete Reinforcement.
 - .4 CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .5 CSA W186:21, Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .4 Reinforcing Steel Institute of Canada (RSIC).
 - .1 RSIC, Manual of Standard Practice.
- .5 Notwithstanding the version of the standard mentioned above, it remains the responsibility of the Contractor to consult the most recent version.

1.4 ACTIONS AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets.
- .3 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice, ACI 315R, and ACI MNL-66 standard.
- .4 Submit shop drawings. Indicate placing of reinforcement and:
 - .1 Bar bending details.
 - .2 Lists of reinforcing elements.
 - .3 Quantities of reinforcement.
 - .4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Owner's Representative, with identifying code marks to permit correct placement without reference to structural drawings.
 - .5 Indicate sizes, spacings and locations of chairs, spacers and hangers.
 - .6 Adapt the shop drawings with the location of the construction joints, whether indicated on plans or according to the location determined by the formwork contractor.
 - .7 Highlight using clouds the modifications made between the different versions of the shop drawings.
- .5 Submit, in conjunction with shop drawings, lists of steel reinforcing elements corresponding to shop drawings.
- .6 Verify on field all dimensions and levels not defined on drawings or that may depend on field conditions.
- .7 The Owner's Representative may take up to ten (10) working days to verify and return shop drawings.

- .8 Corrections and comments made on shop drawings during the revision process do not limit the Contractor responsibility to respect requirements of drawings and specifications. Review of shop drawings is done only to ensure the general conformity regarding design and contract requirements. Contractor shall confirm and correlate all dimensions and characteristics, choose method of fabrication and construction, and execute work safely.
- .9 If revision required on shop drawings are too numerous or too important, Owner's Representative will return drawings without annotations, awaiting a new submittal. If drawings are submitted more than two times, the Contractor shall pay, by mean of a permanent deduction, the cost of review.
- .10 Work shall not begin before shop drawings have been reviewed by the Owner's Representative.
- .11 The Contractor assumes full responsibility for the exactness of his drawings. He may not claim any extra charge for delays resulting from the discovery, be it on the field or before, of mistakes on his drawings, even if they were examined by the Owner's Representative.

1.5 REBAR DETAILING

- .1 In general, use details in accordance with RSIC *Reinforcing Steel Manual of Standard Practice* and ACI *Detailing Manual*.
- .2 Unless otherwise indicated, development lengths and cover shall be in accordance with articles 7 and 12 of CSA A23.3 standard.
- .3 Detail lap lengths and bar development lengths as type B tension lap splices unless otherwise indicated. Refer to *RSIC Reinforcing Steel Manual of Standard Practice*, table 14B, for lap lengths, unless otherwise indicated.
- .4 Dimensions of ties, spiral reinforcing, hangers and stirrups shall be determined in accordance with minimum concrete cover from article 6.6.6 of CSA A23.1 standard.
- .5 Unless otherwise indicated, hooks required, including stirrups and ties, shall be standard hooks as defined in article 6.6.6.2 of CSA A23.1 standard.
- .6 Unless otherwise indicated on drawings, the hooks of the stirrups and ligatures of the elements that are part of the seismic force resistance system (SFRS) shall comply with the definition of seismic hooks in article 3.1 of the CSA A23.3 standard. These hooks shall have an extension of at least 100 mm at an angle of 135 degrees. Any shear wall, elevator shaft or stairwell are considered part of the SRFS.
- .7 Consider the location of construction joints before submitting rebar detailing.
- .8 Unless otherwise indicated, development lengths, lap splices and length of projection beyond critical section of composite reinforcing bars shall be determined in accordance with article 9 of CSA S806.

1.6 QUALITY CONTROL

- .1 Realize the following activities and submit required documents:

ART.	PRESCRIPTIONS	PERIOD (FREQUENCY)	REGISTRY BREAKPOINT / MONITORING	RESPONSIBILITY
2.2.6	Mill test reports for reinforcement	At least fourteen (14) days prior to beginning reinforcing work	Mill test report	Contractor

ART.	PRESCRIPTIONS	PERIOD (FREQUENCY)	REGISTRY BREAKPOINT / MONITORING	RESPONSIBILITY
1.4.4	Concrete reinforcing shop drawings	At least fourteen (14) days prior to beginning work, per the requirements for shop drawings presentation in the tender documents	Transmission letter Inscription to the technical specification registry	Contractor Review by Owner's Representative
1.4.5	Steel reinforcing schedule	At least fourteen (14) days prior to beginning work, per the requirements for shop drawings presentation in the tender document	Transmission letter Inscription to the technical specification registry	Contractor Review by Owner's Representative
1.4.1 2.1	Technical description of concrete reinforcing products	At least fourteen (7) days prior to beginning work, per the requirements for shop drawings presentation in the tender document	Transmission letter Inscription to the technical specification registry	Contractor Review by Owner's Representative
3.4.2	Certificate of compliance for underslab fill	Prior to placing reinforcing steel for slab on grade	Breakpoint Certificate of compliance for underslab fill	Contractor
3.4.3	Certificate of compliance for formworks	Prior to placing reinforcing steel	Certificate of compliance for formworks	Contractor
3.4.13	Notice to Owner's Representative for concrete reinforcing inspection	At least forty-eight (48) hours prior to concreting	Breakpoint Inspection report	Contractor

.2 For all the activities to be carried out in the previous table, keep a register indicating at least the activity carried out, the date of submission by the Specialized contractor and the date of review. The register shall be updated and sent to the Owner's Representative at regular intervals, corresponding at most to the intervals between site meetings.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:

- .1 Separate waste materials for reuse/recycling in accordance with Section 01 74 14 - Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Recover and sort packaging for recycling purposes, in accordance with the waste management plan.
- .4 Divert wood materials from landfill to a recycling, reuse or composting facility as approved by the Owner's Representative.
- .5 Divert plastic materials from landfill to a recycling, reuse or composting facility as approved by the Owner's Representative.

.6 Divert unused hazardous material from landfill to an official hazardous material collections site.

Part 2 Products

2.1 MATERIALS

.1 Substitute different size bars only if permitted in writing by Owner's Representative.

.2 Reinforcing steel: unless otherwise indicated, billet bars, to CSA G30.18 grade 400W, or ASTM A 706/A 706M, grade 60.

.3 Steel welded wire reinforcement: welded wire reinforcement (mesh), to ASTM A 1064/A 1064M.

.1 Provide in flat sheets only.

.4 Galvanized carbon steel wire: to ASTM A 641/A 641M.

.5 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.

.6 Mechanical splices: to ACI 318 art. 18.2.7.1 or CSA A23.3 art. 21.2.7.3.1, type I, subject to approval of Owner's Representative, such as:

.1 Rebar coupler with lock shear bolts :

.1 D-250SCA Bar Lock by Dayton Superior.

.2 Zap Screwlok SL Series by Barsplice.

.3 Any rebar coupler conforming to ACI 318 type 2, including products identified in article 0.

.2 Threaded rebar coupler :

.1 D50 DBR Coupler System by Dayton Superior; 1

.2 BPI Barsplicer Standard by Barsplice.

.3 HRC 400 Series by HRC.

.4 Any rebar coupler conforming to type 2, including products identified in article 0.

.7 Mechanical splices at end of rebars: threaded, welded or pressed coupler to ACI 318 article 25.4.4.1, CSA 23.3 article 7.1.4.1 and ASTM A 970/A 970M class A, with a net area equivalent to at least five (5) times the area of the rebar attached to it.

.1 Lenton Terminator D6 by Lenton.

.2 D251 Bar-Lock or D351 Taper-Lock by Dayton Superior.

.3 BPI ButtonHead 5Ab or BPI Barsplicer Doughnut Term by BarSplice Products.

.8 Mechanical splices at end of rebars: threaded, welded or pressed coupler to CSA A23.3 article 7.1.4.2 and ASTM A 970/A 970M class B, with a net area equivalent to at least ten (10) times the area of the rebar attached to it.

.1 Lenton Terminator D14 by Lenton.

.2 D158 End Anchor (10 Ab) by Dayton Superior.

.3 BPI ButtonHead 10Ab or BPI Barsplicer Doughnut DNX by BarSplice Products.

- .9 Chemical adhesive system: structural epoxy resin, two-components. Unless otherwise indicated, use:
 - .1 Hilti RE-500-V3 or Dewalt PURE-110+ adhesive in general.
 - .2 Hilti HIT HY-200 or Dewalt AC200+ adhesive for applications where quick setting is required such as overhead applications, or for use at low temperature, between -10°C and 10°C.
 - .3 Hilti HIT ICE adhesive for use in cold temperatures above -23°C.

2.2 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CSA A23.1 and RSIC Reinforcing Steel Manual of Standard Practice.
- .2 Fabrication tolerances shall be in accordance with RSIC manual chapter 6 or the following paragraphs, as determined by the more stringent requirement. Bars fabricated without conforming to those tolerances will be rejected.
 - .1 General tolerance: ± 25 mm.
 - .2 For ties, stirrups and spirals with a diameter less than 750 mm, the tolerance is ± 13 mm.
- .3 Obtain Owner's Representative's written approval for locations of reinforcement splices other than those shown on shop drawings.
- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.
- .5 All reinforcing steel shall be bent to be parallel to the edge of concrete works, as indicated on drawings. Bending shall be done in shop, as indicated on shop drawings. For fibre-reinforced polymer, absolutely no bending shall be done on worksite.
- .6 Identify bundles of bar reinforcement and wire mesh, in accordance with shop drawings, bar bending details and lists before shipping.
- .7 All rebars shall be identified during fabrication. Identification shall include diameter, grade, and fabricator. Rebar not properly identified will not be allowed on site.

2.3 SOURCE QUALITY CONTROL

- .1 Upon request, provide Owner's Representative with certified copy of mill test report of reinforcing steel, minimum two (2) weeks prior to beginning reinforcing work. Test reports shall indicate physical and chemical properties of steel.
 - .1 The mill test report shall include the information specified in article 18 of CSA standard G30.18.
 - .2 Inform the Owner's Representative of the proposed source of supply for the materials to be supplied.

Part 3 Execution

3.1 STORAGE AND HANDLING

- .1 Store materials off ground over wood studs or indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area to prevent rusting.

- .2 Protect reinforcing steel if stored over a long period.
- .3 Replace defective or damaged materials with new.

3.2 FIELD BENDING

- .1 Do not field bend or field weld reinforcement except for a written approval by Owner's Representative.
- .2 When field bending is authorized, bend without heat, applying slow and steady pressure.
- .3 Replace bars which develop cracks or splits.
- .4 Unless otherwise indicated, field weld reinforcement is prohibited. When authorized, weld specially identified rebars.
- .5 Composite reinforcing bars shall not be bent.

3.3 CONNECTION TO EXISTING WORK

- .1 When connecting to existing work, prior to preparing shop drawings, verify dimensions and condition of existing work, report discrepancies and potential problem areas to Owner's Representative for direction before commencing fabrication. Dimensions of steel elements shall be modified to adapt for the existing conditions and modifications shall be submitted to Owner's Representative for approval.
- .2 For reinforcement anchored to an existing reinforced concrete or masonry element, use the following procedure, under the sole responsibility of the specialized contractor:
 - .1 Detect existing reinforcement bars prior to drilling to locate anchors.
 - .2 Use manual percussion drilling to drill anchor loads and protect existing reinforcement.
- .3 For reinforcement anchored to an existing unreinforced masonry element, use rotatory drilling to drill anchors as to protect the existing work. The contractor may use a different mean of drilling only if he is able to demonstrate that no damage will occur to the existing work due to drilling. If the contractor uses an alternative mean of drilling, any damage occurring to the existing work following drilling shall be automatically considered his responsibility.
- .4 Where new concrete is placed in contact with existing concrete or masonry works, follow the directions below, unless otherwise indicated:
 - .1 Drill holes with a minimum depth of 150 mm up to a maximum of two thirds of the depth of the existing work.
 - .2 Place holes at the centre of the existing element, at 300 mm centre-to-centre maximum.
 - .3 Place 20M reinforcing bars used as dowels in holes and pack solidly with adhesive and hold dowels in positions until the adhesive is set.
 - .4 Unless otherwise indicated, use chemical adhesive in accordance with article 2.1.9. Refer to article 3.10 of section 03 15 00 – Concrete Accessories for the installation of the adhesive anchor system.

3.4 PLACING REINFORCEMENT

- .1 Clean reinforcing steel before placement. Steel shall be free from mud, oil, or other coatings that adversely affect bond strength. Bar surface shall be in accordance to CSA A23.1 article 6.1.6.
- .2 Prior to placing concrete reinforcement for slabs on grade, Contractor shall demonstrate to the Owner's Representative the compliance of underslab fill .
- .3 Prior to placing concrete reinforcement in general, Contractor shall demonstrate to the Owner's Representative the compliance of formworks (see section 03 11 00).
- .4 Place reinforcing steel as indicated on placing drawings and in accordance with CSA A23.1. Refer to article 6.6.7 of this standard for placement and number of supports.
- .5 Attach reinforcing steel solidly to supports to prevent any movement during concreting.
- .6 Support bars are not included on drawings. Use 15M reinforcing bar spaced at 1 000 mm on center to support top reinforcing steel.
- .7 When concrete will never be exposed to weather conditions, use chairs and hangers with nylon- or plastic-covered extremities.
- .8 When concrete will be exposed to weather conditions or sandblasted, use chairs and hangers with nylon- -covered extremities or fabricated with stainless steel.
- .9 For slab-on-grade and footings, reinforcing steel is placed on chairs, supports and/or cement brick, spaced on center 1 000 mm maximum.
- .10 Rocks, piece of rocks, woods or pipes shall not be used to support reinforcing steel.
- .11 Lifting the reinforcing steel with a hook at the time of concreting is prohibited.
- .12 Overlap wire mesh by 150 mm minimum, unless otherwise indicated.
- .13 At least forty-eight (48) hours prior to placing concrete, advise Owner's Representative for inspection of reinforcing material and placement. Provide notice when completion of reinforcing placement is expected within the next twenty-four (24) hours.
- .14 Ensure cover to reinforcement is maintained during concrete pour.
- .15 During concreting, a worker shall be assigned to replacing reinforcing steel that may have been displaced during the operation.
- .16 Drill holes into concrete, place adhesive and anchor steel into existing concrete per manufacturer's recommendations.
- .17 Protect reinforcement coating during concreting.

3.5 CONCRETE COVER

- .1 Unless otherwise indicated, cover thickness for reinforcement in concrete, shall be:

Exposure condition	Exposure class			
	Not exposed	Exposed to freezing thawing	Exposed to chlorides	Parking structures
Cast against and permanently exposed to earth, including footings, piles, pile caps, and grade beams	75	75	75	75
Columns and walls (principal reinforcement)	50	50	60	50
Slabs	25	40	60	45 top 30 bottom
Ratio of cover to nominal bar diameter	1.0	1.5	2.0	1.5
Ratio of cover to nominal maximum aggregate size	1.0	1.5	2.0	1.5

"Not exposed" concrete refers only to concrete that will be continually dry within the conditioned space (i.e., members entirely within the vapour barrier of the building envelope).

3.6 WELDING

- .1 Unless written approval, do not weld reinforcement.
- .2 When welded splice are specified and location has been approved by the Owner's Representative, weld reinforcement in accordance with CSA W186 and article 6.6.10 of CSA A23.1 standard. Weldable (W) grade reinforcement shall be used.
- .3 Welding shall be done by contractor certified by the Canadian Welding Bureau.

END OF SECTION

Section 03 30 00

Cast-in-place Concrete

Part 1 Generals

1.1 RELATED REQUIREMENTS

- .1 Section 03 11 00 – Concrete Forming.
- .2 Section 03 15 00 – Concrete Accessories.
- .3 Section 03 20 00 – Concrete Reinforcing.
- .4 Section 03 35 00 – Concrete Finishing.
- .5 Section 03 39 00 – Concrete Curing.
- .6 The Contractor shall obtain a copy of all sections even if they do not pertain directly to his speciality. When bidding, the Contractor agrees implicitly with articles and requirements of all sections in these specifications, including those he might not have read. The Contractor should consult the table of contents of the specifications to be aware of the complete list of sections.

1.2 PRICING AND PAYMENT PROCEDURE

- .1 Measure cast-in-place concrete in cubic meters, as determined by dimensions indicated on drawings. All associated and required items related to the concrete work shall be included in the unit price per cubic meter.
 - .1 Unless special authorization is given by Owner's Representative, cast-in-place concrete poured in surplus of what is indicated on drawings shall not be included in volume for pricing.
 - .2 Furniture and installation of concrete reinforcing, formworks, waterstops, anchor bolts, nuts, washers, and any element related to cast-in-place concrete is considered part of the works and shall not be measured.
 - .3 Finishing and curing is considered part of the cast-in-place concrete works.

1.3 REFERENCES

- .1 American Concrete Institute (ACI).
 - .1 ACI 309R, Guide for Consolidation of Concrete.
 - .2 ACI 355.4, Qualification of Post-Installed Adhesive Anchors in Concrete.
 - .3 ACI 308R, Guide to External Curing of Concrete.
- .2 American Society for Testing and Materials International (ASTM).
 - .1 ASTM C 31/C 31M-24b, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - .2 ASTM C 33/C 33M-23, Standard Specification for Concrete Aggregates.

- .3 ASTM C 39/C 39M-24, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- .4 ASTM C 143/C 143M-20, Standard Test Method for Slump of Hydraulic-Cement Concrete.
- .5 ASTM C 173/C 173M-24a, Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
- .6 ASTM C150, Standard Specification for Portland Cement.
- .7 ASTM C171, Standard Specification for Sheet Materials for Curing Concrete.
- .8 ASTM C 260/C 260M, Standard Specification for Air-Entraining Admixtures for Concrete.
- .9 ASTM C 330/C 330M-23, Standard Specification for Lightweight Aggregates for Structural Concrete.
- .10 ASTM C 457/C 457M-23a, Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete
- .11 ASTM C 494/C 494M, Standard Specification for Chemical Admixtures for Concrete.
- .12 ASTM C 535-16, Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- .13 ASTM C 618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
- .14 ASTM C 873/C 873M, Standard Test Method for Compressive Strength of Concrete Cylinders Cast in Place in Cylindrical Molds.
- .15 ASTM C 989/C 989M, Standard Specification for Slag Cement for Use in Concrete and Mortars.
- .16 ASTM C 1611/C 1611M-21, Standard Test Method for Slump Flow of Self-Consolidating Concrete.
- .3 Canadian Standard Association (CSA)/CSA International.
 - .1 CSA A23.1/A23.2-24, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA A23.3-24, Design of Concrete Structures.
 - .3 CSA A283-19, Qualification Code for Concrete Testing Laboratories.
 - .4 CSA A3000-23, Cementitious Materials Compendium.
 - .5 CSA A3001-23, Cementitious materials for use in concrete.
- .4 OBC, Ontario Building Code.
- .5 OHSA, Occupational Health and Safety Act – Ontario Regulation for Construction Projects.
- .6 OPSS.PROV 904, Construction Specification for Concrete Structures.
- .7 International Organization for Standardization (ISO).
 - .1 ISO 14025, Environmental labels and declarations - Type III environmental declarations - Principles.

.8 Notwithstanding the version of the standard mentioned above, it remains the responsibility of the Contractor to consult the most recent version.

1.4 DESIGN CRITERIA

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

1.5 ACTIONS AND INFORMATIONAL SUBMITTALS

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

.2 Submit Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets.

.3 Minimum four (4) weeks prior to starting concrete work, submit to Owner's Representative test reports and certificate from testing laboratory certifying that the following materials meet the requirements of this section:

- .1 Portland cement.
- .2 Blended hydraulic cement.
- .3 Supplementary cementing material.
- .4 Admixtures.
- .5 Aggregates.
- .6 Water.

.4 Provide Owner's Representative, minimum fourteen (14) days prior to starting concrete work, with valid and recognized certificate from plant delivering concrete. Certificate shall indicate that plant, materials, and methods used in fabricating concrete are in accordance with CSA A23.1 standard.

- .1 Concrete provider shall be certified by RMCAO for plants supplying concrete to Contract.
- .2 Concrete provider to provide Environmental Product Declaration, in accordance with ISO 14025 and ISO 21930 Type III, third party verified eco-label for each concrete mixture type or each concrete mixture to be used.

.5 At minimum fourteen (14) days prior to starting concrete work, provide Owner's Representative and testing Laboratory with concrete mix formulas including admixtures for this project.

- .1 Include analysis results certifying that aggregates used are non-reactive. Provider shall demonstrate that aggregates contain non-significant quantities of pyrrhotite or other harmful minerals.
- .2 When the compressive strength specified for a given concrete mix is for a term greater than 28 days, the Contractor shall provide the strength gain curve including compressive resistance values at a time of 7, 14, 28, 56 days and at the specified term. The strength gain curve shall be based on strength data from at least 3 different batches of the same mix. The Owner's Testing Laboratory will produce strength curves on the same basis during the first on-site concreting of the same mix to validate the accuracy of the curves provided.

- .6 Minimum fourteen (14) days prior to beginning concrete work, provide Owner's Representative with an undamaged test cylinder made in accordance with CSA A23.2-3C for each concrete mix including white cement.
- .7 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet the specified resistance.
- .8 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.

1.6 QUALITY CONTROL

- .1 Pre-installation Meetings: in accordance with section 01 32 16.19 - Construction Progress Schedules - Bar (GANTT) Chart. Convene pre-installation meeting one week prior to beginning concrete works.
 - .1 Ensure key personnel, site supervisor, Owner's Representative, speciality contractor - finishing, forming, concrete producer and testing laboratories attend.
 - .2 Verify project requirements.
- .2 Realize the following activities and submit required documents:

ART.	PRESCRIPTIONS	PERIOD (FREQUENCY)	REGISTRY BREAKPOINT / MONITORING	RESPONSIBILITY
1.5.3 1.8	Technical descriptions of products and components of cast-in place concrete	At least fourteen (14) days prior to beginning concrete works, per the requirements for shop drawings presentation in the tender documents	Transmission letter Inscription into the technical specification registry	Contractor Review by the Owner's Representative / Testing Laboratory
1.5.5	Concrete mix formulas including strength gain curve when required	At least fourteen (14) days prior to beginning work	Transmission letter Inscription into the technical specification registry	Contractor Review by the Owner's Representative / Testing Laboratory
1.5.4. 1.5.7	Compliance certificate for concrete provider and concrete mixes	Prior to beginning work	Breakpoint Compliance certificate	Contractor
1.11.1	Environmental product declaration (EPD) for concrete mixes	At least fourteen (14) days prior to beginning concrete works	Environmental product declaration (EPD)	Contractor Review by the Owner's Representative
2.1.2 section 03 20 0 0	Notice to Owner's Representative for concrete reinforcing inspection	At least forty-eight (48) hours prior to concreting	Breakpoint Inspection report	Contractor Inspection by the Owner's Representative
2.1.13	Concrete pour registry	Every concrete pour	Concrete pour registry. Delivery slip	Contractor
1.1	Inspection of concrete reinforcement	Prior to concreting	Inspection report	Contractor Inspection by the Owner's Representative

ART.	PRESCRIPTIONS	PERIOD (FREQUENCY)	REGISTRY BREAKPOINT / MONITORING	RESPONSIBILITY
2.9.5	Notice to the Owner's Representative	At least twenty-four (24) hours prior to repairing concrete	Breakpoint Inspection report	Contractor Inspection by the Owner's Representative

.3 For all the activities to be carried out in the previous table, keep a register indicating at least the activity carried out, the date of submission by the Specialized contractor and the date of review. The register shall be updated and sent to the Owner's Representative at regular intervals, corresponding at most to the intervals between site meetings.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Concrete hauling time: deliver to site of work and discharged within one hundred and twenty (120) minutes maximum after batching.

- .1 Do not modify maximum time limit without receipt of prior written agreement from Owner's Representative and concrete producer as described in CSA A23.1.
- .2 Deviations to be submitted for review by Owner's Representative.

.2 Deliver concrete using means to prevent separation of concrete mix component or any alteration to consistency.

.3 Waste management and disposal:

- .1 Separate waste materials for reuse/recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
- .2 Divert unused concrete and concrete materials to local quarry after receipt of written approval from Owner's Representative.
- .3 Provide on-site adequate space for the safe washing of concrete trucks.
- .4 Divert unused admixtures from landfill to an official hazardous material collections site.
- .5 Recover and sort packaging for recycling purposes, in accordance with the waste management plan.
- .6 Do not dispose of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.
- .7 Prevent admixtures and additive materials from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with inert, non-combustible material and remove for disposal. Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

1.8 MATERIALS

- .1 Portland Cement: to CSA A3001 or ASTM C 1157, type GU or GUL, unless otherwise indicated.
- .2 Blended hydraulic cement: to CSA A3001 or ASTM C 1157, type GUb-SF, unless otherwise indicated.
- .3 Supplementary cementing materials: to CSA A3001.

- .1 Fly ash (FA) and natural pozzolan (N): to ASTM C 618.
- .2 Ground granulated blast-furnace slag (S): to ASTM C 989/C 989M.
- .3 Silica fume (SF): to ASTM C 1240.
- .4 Water: to CSA A23.1, article 4.2.2.
- .5 Non-reactive to alkalis aggregates: to CSA A23.1, article 4.2.3 and ASTM C 33/C 33M, normal weight coarse aggregate.
 - .1 The particles must be clean, durable, without dust or deleterious materials, containing less than 25% of flat particles and less than 45% elongated particles, as determined by testing to CSA A23.2-13A.
 - .2 Loss by abrasion (to ASTM C 535, CSA A23.2-16A) shall be less than 50%. Loss shall be less than 12% after five (5) cycles of testing soundness by use of sodium sulfate or magnesium sulfate (ASTM C 88, CSA A23.2-9A).
 - .3 The use of potentially reactive aggregates shall be permitted only if compensatory measures as defined in CSA A23.2-27A are used. The use of a mixture containing potentially reactive aggregates is subject to the written approval of the Owner's Representative, under favorable opinion of the laboratory responsible for the quality control of materials.
- .6 Fine aggregates (sand): to CSA A23.1, article 4.2.3 and ASTM C 33/C 33M, normal weight.
- .7 Lightweight aggregates: to ASTM C 330/C 330M.
- .8 Recycled aggregates for non-structural use: to NQ 2560-600.
- .9 Admixtures:
 - .1 Air entraining admixture: to ASTM C 260/C 260M.
 - .2 Chemical admixture: to ASTM C 494/C 494M or ASTM C 1017/C 1017M when added to flowing concrete. Owner's Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.
 - .3 Anti-washout admixture: Eucon AWA by Euclid, MasterMatrix UW450 by Master Builders or Sika Stabilizer Aquagel by Sika.
 - .4 Retardating admixtures: to ASTM C 494/C 494M type D such as Sika Plastiment XR by Sika, MasterSet R 100 by Master Builders or Eucon 727 by Euclid.
 - .5 Shrinkage-compensating admixture: to ASTM C 494/C 494M type S, using type K, M or S expansive component as defined in ACI 223R such as Conex by Euclid or Sika Control NS by Sika.
 - .6 Corrosion inhibiting admixtures: to ASTM C 1582/C 1582M, such as Sika CNI, MasterLife CI 222 by Master Builders or Eucon CIA by Euclid.
- .10 Evaporation retardant: such as MasterKure ER 50 by Master Builders, Eucobar by Euclid or Evapre by W.R. Meadows.

1.9 MIXES

- .1 Provide concrete to meet content and performance requirements defined by Owner's Representative in accordance with CSA A23.1 on following articles. Refer to table 1 and table 2 of CSA A23.1 for requirements related to class of exposure.

.2 Refer to the following table for the characteristics of the concrete mixes. If an item can belong to more than one category, consider the most restrictive characteristics, and notify the Owner's Representative.

T Y P E	Use	Primary binder	Maximum dimensio n coarse aggregat e	Slump or slump flow	Air content	Class of exposure	Ion chloride permeabil ity	Min. compressi ve strength	Water on cementitio us material (max)	Max cementiti ous content except SF	Notes
			mm	mm	%	coulombs	MPa				
5	All concrete works unless otherwise indicated, footings, foundation walls and concrete for supports, , 35 MPa	GU, GUL	20	80 ± 30	0 to 3	N	---	35 at 28d	0.5	---	
8	Concrete slab infill and Thickening (landings included)	GU, GUL	14	80 ± 30	0 to 3	N	---	25 at 28d	0.55	---	
10	Exterior concrete works, without reinforcement (sidewalks, curbs, others)	GUb-SF	20	80 ± 30 30 ± 20 (curbs)	5 to 8	C-2	---	35 at 28d	0.45	20% FA	
11	Exterior concrete works, with reinforcement (curbs, bollards, lamppost foundations, pilasters, etc.)	GUb-SF	20	80 ± 30 30 ± 20 (curbs)	5 to 8	C-1	≤ 1 500	35 at 28d	0.40	20% FA	
20	Lean concrete	GU, GUL	20	80 ± 30	5 to 8	N	---	20 at 28d		---	
Unless otherwise indicated, use of premixed bagged concrete is subject to Owner's Representative's approval.											

- .3 Where the average strength of the concrete consistently exceeds the values specified in this section, the following additional requirements may apply in whole or in part at the discretion of the Owner's Representative.
 - .1 The requirements of article 8.8 of CSA A23.1 apply to the concrete mix.
 - .2 The curing time is extended for up to seven (7) days after the period specified in section 03 39 00.
- .4 For concrete mix used for CSC 4 exposed concrete, the requirements of article 8.8 of CSA A23.1 apply.
- .5 Concrete supplier and Contractor shall ensure that all concrete meet the following requirements:
 - .1 Unless otherwise indicated, aggregates shall be of normal weight.
 - .2 Slump or slump flow is measured at the point of discharge.
 - .3 The chloride ion content is inferior to the limits specified on article 4.1.1.2 of CSA A23.1.
 - .4 For all parts of work, concrete mix shall be homogeneous and when cured, have the strength, resistance to deterioration, durability, appearance, and other properties required by this specification.
 - .5 Mix design shall ensure durability, strength, workability, and other properties required for concrete.
 - .6 Mix shall ensure that concrete flows everywhere into formworks, wrap up reinforcing bars completely but without allowing segregation of materials or excessive bleeding.
 - .7 Concrete shall be free from surface blemishes, loss of mortar or color variations.
- .6 For floors with a trowel finish, Concrete Provider and Contractor shall ensure that concrete mix is appropriate to obtain the level of quality desired for the slab finish.
 - .1 For slab poured directly on a vapor retarding membrane, use a maximum water-to-cementitious ratio of 0.45 or less. If using a mix with a ratio higher than 0.45, the Contractor shall allow for a longer drying period for the slab to obtain the relative humidity appropriate to place floor covering.
 - .2 To ensure proper placement and finishing, consider using superplasticizer. Initial concrete slump should be near 60 mm and final slump should reach near 130 mm following addition of superplasticizer.
- .7 When concrete thickness of vertical items is less than 200 mm, the maximum size of coarse aggregate shall be 14 mm.
- .8 Nominal size of coarse aggregate indicated for mixes should be considered a maximum rather than an absolute. The Contractor may, at his discretion, use smaller aggregates to facilitate concrete placement or for any other consideration, if it results in concrete with equal properties.
- .9 For vertical elements, the use of a concrete formulation producing an air content higher than the specified content may be acceptable if it does not affect the other properties of the concrete, in particular the strength or the appearance of the concrete, subject to the approval of the Owner's Representative.

1.10 SPECIAL REQUIREMENTS

- .1 Use of admixtures.
 - .1 Provide samples of admixtures on Owner's Representative's request.
 - .2 Follow manufacturer's recommendations for admixtures use.
 - .3 Ensure compatibility of admixtures, between them and with all components of concrete mix.
 - .4 Use of admixture shall never affect adversely concrete durability including resistance under freeze-thaw cycles.
- .2 The slump value indicated in the table in article 1.9 for each mix may be modified upwards by the Contractor depending on the required workability of the concrete, the required finish of the concrete surfaces and the conditions of placement, provided that:
 - .1 The modification is accepted by all stakeholders involved in the concreting (formwork contractor, finishing contractor, concrete supplier, etc.).
 - .2 The modification is made by adding admixtures (superplasticizer) and does not affect the other properties of the concrete.
 - .3 The Contractor notifies the Owner's Representative and the Laboratory prior to issuing the concreting notice.
 - .4 The final slump value has a maximum value of 180 ± 30 mm.
- .3 Internal vibrators shall be used for consolidating concrete.
- .4 Do not modify concrete mix formulas without Owner's Representative approval. If source of supply for concrete materials is modified, new concrete mix formulas need be approved by Owner's Representative.
- .5 Unless written authorization is given by Owner's Representative, no water shall be added into concrete mix during transport or after arrival on work site.

1.11 LOW-CARBON CONCRETE

- .1 Submit Type III Environmental Product Declarations (EPDs), complying with ISO 14025, demonstrating the Global Warming Potential (GWP) of all specified concrete materials.
- .2 Prepare and submit a carbon budget for the project describing the total GWP in tons of CO₂ equivalent for the reference concrete mixes and the total GWP CO₂ equivalent for the concrete mixes actually used.
- .3 For the purpose of preparing the carbon budget, the indications in article 1.9 regarding the type of binder shall be considered for the reference concrete mixes. However, the use of composite, binary, ternary or quaternary binders is permitted despite the indications in article 1.9 in the concrete formulation of the project.
 - .1 For example, for Type 1 concrete, the reference concrete mix may consist of a GU binder, and for Type 10 concrete, the reference formulation must contain a binder of type GUb-SF. The concrete mixes actually used may contain additional cementitious material apart from the binder indicated, without however exceeding the maximum limits indicated in the table.
- .4 The carbon budget shall be continually adjusted and updated based on actual concrete volumes used for the project.

- .5 Once all concrete work is completed, calculate and submit the final carbon budget, including the calculated greenhouse gas (GHG) reduction for the concrete work.
- .6 The GWP reduction target measured in CO₂ equivalent for the project, as associated with the supply of concrete, is 20% compared to the baseline.

1.12 METHODS OF TEST FOR CONCRETE

- .1 Reference values indicated in this section shall be obtained from tests in accordance with standards indicated in the following table:

TESTS	STANDARD
Air content	ASTM C 173/C 173M, ASTM C 457/C 457M, CSA A23.2-4C, CSA A23.2-7C
Compressive strength of 50 mm cube specimens	ASTM C 109/C 109M
Compressive strength of concrete cylinders	ASTM C 873/C 873M, CSA A23.2-9C
Degradation of coarse aggregates	ASTM C 535, CSA A23.2-16A
Degradation of fine aggregates	ASTM C 88, CSA A23.2-9A
Flat and elongated particles in coarse aggregate	CSA A23.2-13A
Ion chloride content	ASTM C 1218/C 1218M, CSA A23.2-4B
Ion chloride permeability	ASTM C 1202, CSA A23.2-23C
Obtaining and curing concrete test specimens	CSA A23.2-3C
Obtaining and testing drilled cores of concrete (compressive resistance)	ASTM C 42/C 42M, ASTM C 39/C 39M, CSA A23.2-14C
Obtaining concrete test specimens	ASTM C 31/C 31M, CSA A23.2-1C
Slump	ASTM C 143/C 143M, CSA A23.2-5C
Slump-flow (self-consolidating concrete)	ASTM C 1611/C 1611M, CSA A23.2-19C

- .2 Tests shall be carried out by an independent testing laboratory.

Part 2 Execution

2.1 PREPARATION

- .1 Place formworks in accordance with section 03 11 00 – Concrete Forming. Place embedded elements and concrete reinforcing in accordance with sections 03 15 00 – Concrete Accessories and 03 20 00 - Concrete Reinforcing.
- .2 Obtain Owner's Representative's approval before placing concrete.
 - .1 Provide forty-eight (48) hours minimum notice prior to placing of concrete.
- .3 During concreting operations:
 - .1 Development of cold joints is not allowed.
 - .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
 - .3 Placing of concrete shall be done in accordance with article 7.5 of CSA A23.1 standard.

- .4 Pumping of concrete is permitted only after approval of equipment and mix, conditional to execution in accordance with testing laboratory recommendations.
- .5 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .6 Prior to placing concrete, formworks shall be cleaned and free of water.
- .7 Calcium chloride and other de-icing salts shall not be used as de-icing agents for cleaning purposes in formwork.
- .8 Prior to placing of concrete, obtain Owner's Representative's approval of proposed method for protection of concrete during placing and curing.
- .9 Approval is given before concreting, conditional to:
 - .1 Previous approval of formworks and concrete reinforcing after inspection by the Owner's Representative.
 - .2 Favorable climatic conditions, namely an external temperature between 10 and 25°C and the absence of rain or snow, unless the Owner's Representative has approved arrangements (shelter, heating, etc.) previously.
- .10 Protect previous work from staining.
- .11 Take special precautions where concrete will be exposed to prevent any damage.
- .12 Clean and remove stains prior to application for concrete finishes.
- .13 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken. Submit concrete works registry at the end of each phase of work.
- .14 Where new concrete is placed in contact with existing concrete or masonry works, follow the directions in section 03 20 00, unless otherwise indicated on drawings.
- .15 Do not load new concrete until authorized by Owner's Representative.

2.2 PRODUCTION OF CONCRETE

- .1 Provide ready-mixed concrete, fabricated in concrete plant, delivered, and offloaded to site in accordance with article 5.2 of CSA A23.1 standard.
- .2 Producer of ready-mixed concrete is the sole responsible for formulation of concrete. Producer shall take all steps required to ensure production of high quality, uniform concrete.
- .3 Request from concrete provider delivery slip for each delivery of concrete and hand over one copy to Owner's Representative. Delivery slip shall include name and address of the batch plant, truck number, name of Contractor, designation of the job (name and location), class or designation of the concrete, amount of concrete delivered and cumulative amount, time of loading, of beginning of unloading and of end of unloading, maximum size of coarse aggregate, slump and air content required, admixtures used, amount and type of cement and water quantity.
- .4 **Adding water after initial batching at concrete plant is prohibited**, notwithstanding any indications given in article 5.2.5.3.2 of CSA A23.1 standard. Use water-reducing admixture to ASTM C 494, type F or G, to correct concrete's slump.
- .5 Plan fabrication of concrete and spread deliveries to site to ensure that pouring is continuous.
- .6 Never again batch concrete or mortar after beginning of hardening.

- .7 Concrete temperature at discharge shall be within limits of table 14 of CSA A23.1, tested to article 5.2.5.4 of the same standard. Use protective means whenever necessary.
- .8 Quality control at plant :
 - .1 The concrete supplier shall allow access to its facilities at the request of the Owner's Representative.
 - .2 The testing laboratory designated by the Owner may visit the plant to observe the batching process, the management of the aggregates, the temperature of the raw materials, the method for incorporating fibers in the mix or any other element which could affect the quality of the concrete.

2.3 CONCRETE CURING AND FINISHING

- .1 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.
- .2 Using chisel, break concrete projections left by the open joints of the formwork.
- .3 Finishing to section 03 35 00 – Concrete Finishing.
- .4 Curing to section 03 39 00 – Concrete Curing.
- .5 Do not place load upon new concrete before concrete has reached the required strength.

2.4 TOPPINGS ON THE BOTTOM SLAB OF THE PIT

- .1 Unless otherwise indicated, any topping shall be considered bonded topping as defined in article 7.9.1 of CSA A23.1 standard.
- .2 Clean substrate to obtain a surface free of foreign matter, dusts, damaged concrete, etc.
- .3 Prepare surface to CSA A23.1 article 7.9.3.2, method c) or d). All laitance, dirt, dust, debris, grease, or any other foreign matter that may adversely affect bond between existing and new concrete shall be removed. Surface shall be rough and clean before placing new concrete.
- .4 The roughness of the concrete surface shall correspond to a CSP 6 surface profile or higher unless otherwise indicated on the drawings.
- .5 Apply bonding agent (grout or epoxide) just before placing new concrete, to CSA A23.1 article 7.9.4.2 and the following requirements:
 - .1 Whenever possible, use method a) or b) for bonding.
 - .2 Place concrete topping over moist adhesive. If adhesive has hardened and surface is not sticky anymore, apply a new layer of adhesive.
- .6 Place topping to CSA A23.1, article 7.9.
- .7 Location of joints in topping shall match those in base course and shall be of the same type.
- .8 No circulation is allowed on topping until it has reached 100% of specified strength and the hardener or sealer has been applied. The Contractor shall be deemed responsible of any damage to topping if not complying with the above requirement.

2.5 CONSTRUCTION TOLERANCES

- .1 Follow requirements of CSA A23.1, article 6.4, for construction tolerances for cast-in-place concrete.

.2 In case of non-compliance, the Owner's Representative may require the demolition of the non-compliant element and the construction of a new one, following tolerances to article 6.4, without any additional cost. Alternatively, a permanent deduction may be applied to the global price of the contract as a compensation for the lower quality of the work. The Owner's Representative will be the sole judge of the appropriate withholding amount, which may amount up to the equivalent cost of the demolition and reconstruction of the element.

2.6 FIELD QUALITY CONTROL

.1 Conduct tests as follows and in accordance with section 01 45 00 - Quality Control.

.2 Inspection and testing of concrete and concrete materials shall be carried out by testing laboratory, certified to CSA A283, designated by Owner's Representative for review to CSA A23.1. In general, inspection and testing is done in accordance with procedures complying with CSA A23.2-25C.

.3 The Contractor shall cooperate fully to facilitate testing by allowing access to work site and equipment, providing manpower and materials needed to prepare cylinders, and providing a proper secure space for storing samples.

.1 Inform testing laboratory at least twenty-four (24) hours before pouring concrete, no matter the volume of concrete to be poured.

.2 Set aside on site a place protected against weather conditions where concrete cylinders will be stored, at a temperature of at least 10°C and at most 25°C before being delivered to laboratory.

.4 Except as noted in article 2.6.5, one group of tests shall be carried out to evaluate compressive strength for every 50 m³ of concrete, but not less than one group of tests for each class of concrete poured in a given day.

.5 When concrete is produced using a volumetric concrete mixer, one group of tests shall be carried out to evaluate compressive strength for every 20 m³ of concrete maximum, but not less than one group of tests for each class of concrete poured in a given day.

.6 Tests shall be carried out in accordance with the indication of article 1.12 of this specification. A group of tests shall include, as a minimum, three (3) cylinders, one slump test and one air content test. Test air content for each concrete truck when concrete will be exposed to freeze-and-thaw cycles or exposed to de-icing salts.

.7 For concrete with fibres, the first group of tests for each concrete mix shall include flexural testing of two (2) 150 x 150 x 500 mm beams to ASTM C 1609/C 1609M.

.8 Slump tests shall be carried out in sufficient number to ensure uniform consistency of concrete.

.9 Testing laboratory shall take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.

.10 The Owner shall pay for the costs of tests indicated above.

.11 Non-Destructive Methods for Testing Concrete shall be conducted to CSA A23.2.

.12 Inspection and testing by Owner's Representative or testing laboratory cannot replace nor complete the Contractor's quality control. No inspection can liberate the Contractor from his obligations in this respect.

.13 If tests demonstrate that concrete resistance is inferior to specification or to requirements of CSA standards, the Owner's Representative may require obtaining drilled cores from the concrete work for testing. If said tests demonstrate that concrete resistance follows requirements, cost of tests shall be assumed by the Owner. If not, costs shall be paid by the Contractor. The Owner's Representative may require that drilled cores be obtained and tested when, based on his opinion, concrete pouring or curing was not done in accordance with the specifications of this section.

2.7 INTERPRETATION OF COMPRESSIVE STRENGTH TEST RESULTS

.1 Interpretation of compressive strength test results shall be done in accordance with article 4.4.2.3.1 of CSA A23.1 standard. Concrete meets the requirements of this specification for compressive strength if:

- .1 The average value of a group of three (3) consecutive tests equals or exceeds the specified strength.
- .2 Compressive strength equals at least the specified resistance minus 3.5 MPa for all individual tests.

.2 When test results do not meet the above requirements, the Owner's Representative may require, without any additional costs from the Contractor, that:

- .1 Mix proportions are changed for the remainder of work.
- .2 Additional curing is done on the portion of the work represented by test specimens.
- .3 Cores be drilled from the portion of structure in question, in accordance with ASTM C 42/C 42M, ASTM C 39/C 39M and CSA A23.2-14C, interpreted to article 4.4.2.3.2 of CSA A23.1.
- .4 The portion of structure is submitted to load tests, to CSA A23.3, article 20.

.3 When the specified resistance applies to a period greater than 28 days, the interpretation of the results is carried out as follows:

- .1 The 28-day resistance obtained by the tests is compared to the reference value of the strength gain curve obtained from the supplier, using the interpretation method described in article 2.7.1 above.
- .2 If the results of the 28-day tests do not meet the resistance of the reference value, the concrete is deemed to have a structural deficiency. The corrective measures required by article 2.7.22.7.2 are then applied, without waiting for results to be obtained at a later date. For example, the Owner's Representative may require at this time that the formula be modified for future concrete work.
- .3 If the strength of the concrete is found to be compliant when the results are obtained at the specified deadline, the deficiency will be lifted, but any expense incurred for the corrective measures done pre-emptively remain the sole responsibility of the contractor.

2.8 NON-COMPLIANT WORK

.1 Structural defect.

.1 Work or part of work has a structural defect when concrete strength, as interpreted by article 2.7 of this specification, does not meet the specified resistance.

.2 Moreover, work or part of work presents a structural defect if one of the following conditions occur:

- .1 Concrete mix formula was not approved prior to pouring,
- .2 Owner's Representative and/or testing laboratory was not informed before concreting,
- .3 Concrete pouring was not done following the requirements of this specification.
- .4 Concrete was poured without explicit approval of Owner's Representative.
- .5 Concrete work or part thereof has frozen, even if no damage is apparent.

.3 Notwithstanding the results of any tests done during concrete pouring, work or part of work presenting a structural defect as interpreted by article 2.8.1.2 is considered as if not meeting the specified strength requirement per article 2.7.1.

.4 When specific requirements are given for mixes formula, such as chloride ion permeability or spalling due to salt, to ensure or improve durability of concrete, failure to meet these requirements is considered a structural defect.

.2 Esthetic defect.

- .1 Work or part of work has an esthetic defect when concrete is soiled, contaminated by debris, contains honeycombs, surface voids or bug holes, protrusion, smudges, change in colors or any other similar defect. Concrete work that does not meet the finishing criteria defined in section 03 11 00 – Concrete Forming is also considered to have an aesthetic deficiency.
- .2 The following definitions shall be used when determining esthetic deficiencies:
 - .1 Surface voids or bug holes: Small regular or irregular cavities, usually not exceeding 12 mm in diameter, resulting from entrapment of air bubbles in the surface of formed concrete during placement and compaction.
 - .2 Honeycombs: Concrete or part of concrete that, due to lack of the proper quantity of fine aggregates or vibrations, contains abundant interconnected large voids or cavities; honeycombs may result from improper consolidation. Any regular or irregular voids exceeding 12 mm in diameter are considered honeycombs.
 - .3 Protrusion: any part of concrete work protruding 5 mm or more from concrete work where rough-form finish is specified. Where smooth-form finish is required, any protrusion from concrete work is considered a defect.
 - .4 Smudges: any spillage of concrete from formwork.
 - .5 Changes in color: any change in color that affects adversely the overall look of the concrete work.

.3 Cracking in new concrete work:

- .1 Presence of cracks with openings of 0.5 mm or more in new concrete work is considered a defect.

2.9 CORRECTIVE WORK

.1 Structural defect.

- .1 If, after taking actions as defined in section 2.7.2 of this specification, the Owner's Representative still believes that concrete of part of or of all of the works does not meet the strength requirements, he may require strengthening or replacement (demolition and reconstruction) of part of or of the whole work as appropriate. All costs shall be assumed by the Contractor.
- .2 When a structural defect is identified resulting in a lesser durability of the work, but without affecting strength, the Owner's Representative may require that:
 - .1 One or more compensatory measures to obtain a work of a durability equivalent, in the opinion of the Owner's Representative, to that which would have been obtained with the use of a concrete meeting the requirements of this specification, without costs to the Owner.
 - .2 A permanent deduction may be applied to the global price of the contract as a compensation for the lower quality of the work. The Owner's Representative will be the sole judge of the appropriate withholding amount determined on the basis of future expenses (maintenance and repairs) due to the lesser durability, which may amount up to the equivalent of the cost of demolition and reconstruction of the element.
- .2 Esthetic defect.
 - .1 Make sure the Owner's Representative has inspected defects before beginning surface repairs.
 - .2 Any damaged or soiled concrete, or concrete containing debris shall be repaired in accordance with the Owner's Representative directives.
 - .3 Honeycombs made visible after removal of formworks shall be scraped to solid concrete, to a minimum depth of 10 mm. Repairs shall be circumscribed by saw cuts of a regular shape without angles of 60 degrees or less. Zone of repairs shall extend at least 150 mm into sound concrete all-around the perimeter of honeycombs.
 - .4 When necessary, concrete faces shall be cut to obtain sharp regular edges using saw. Surfaces shall be cleaned, and cavities coated with an epoxy bonding agent then filled with an epoxy modified grout, held in place by formworks if necessary.
 - .5 Protrusions, burrs, smudges, etc. due to formworks shall be grinded.
 - .6 If concrete faces finish is not satisfactory, if the extent of repair needed is too extensive or if concrete presents significant changes of colors, the Owner's Representative may require the application of a coating product (cement-based paint, epoxy-based grout, or any other product deemed appropriate) on all exposed faces, without any costs to the Owner.
 - .7 Corrective work shall conform to section 03 11 00 – Formwork.
- .3 Cracks in new concrete.
 - .1 Cracks with openings of 0.5 mm or more shall be injected as described in section 03 15 00 – Concrete Accessories.
 - .2 Where a network of cracks is present, the Owner's Representative may require one of the following measures:
 - .1 Application of a coating product (cement-based paint, epoxy-based grout, or any other product deemed appropriate).
 - .2 Partial demolition and reconstruction with an appropriate product.

.4 Procedure for repairing deficiencies.

.1 The Contractor is responsible to submit methods for repairing deficiencies. He needs to obtain the Owner's Representative approval of said method before proceeding with reparations.

.2 Refer to Guideline No. 310.1R *Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion* by ICRI when preparing methods for repairing deficiencies. Refer to chapters 5 to 7 when determining geometry and extent of surfaces to demolish prior to repairing.

.3 Refer to Guideline No. 320.2R *Guide for Selecting and Specifying Materials for Repair of Concrete Surfaces* by ICRI when selecting repair materials.

.4 Refer to Guideline No. 320.1R *Guide for Selecting Application Methods for the Repair of Concrete Surfaces* by ICRI when selecting application method for repair materials.

.5 Inform the Owner's Representative after finishing demolition prior to reparation, at least forty-eight (48) hours before applying repair materials, to allow for inspection.

.6 All costs associated with additional work site supervision due to defect repairs are considered the responsibility of the Contractor and shall be paid by applying a permanent deduction to the contract.

END OF SECTION

Section 03 35 00 Concrete Finishing

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 02 81 00 – Transportation and Disposal of Hazardous Materials.
- .2 Section 03 11 00 – Concrete Forming.
- .3 Section 03 15 00 – Concrete Accessories.
- .4 Section 03 20 00 – Concrete Reinforcing.
- .5 Section 03 30 00 – Cast-in-Place Concrete.
- .6 Section 03 39 00 – Concrete Curing.
- .7 The Contractor shall obtain a copy of all sections even if they do not pertain directly to his speciality. When bidding, the Contractor agrees implicitly with articles and requirements of all sections in these specifications, including those he might not have read. The Contractor should consult the table of contents of the specifications to be aware of the complete list of sections.

1.2 PRICING AND PAYMENT PROCEDURE

- .1 No measurement shall be made under this Section.
 - .1 Include concrete finishing pricing in concreting work package in section 03 30 00 – Cast-in-Place Concrete.
 - .2 Include concrete finishing pricing in formwork casting work package in section 03 11 00 – Concrete Forming.
- .2 Measure concrete finishing using area of slabs, as determined by dimensions indicated on drawings.

1.3 REFERENCES

- .1 American Concrete Institute (ACI).
 - .1 ACI 302.1R, Guide for Concrete Floor Slab Construction.
- .2 Canadian Standard Association (CSA)/CSA International.
 - .1 CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
 - .2 CSA A283, Qualification Code for Concrete Testing Laboratories.
- .3 Concrete Floor Contractors Association of Canada (CFCA).
 - .1 Specification Bulletin, Polished Concrete – Gloss & Aggregate Exposure, April 12, 2011.
- .4 International Concrete Repair Institute (ICRI).

- .1 Guideline No 310.2R- Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.
- .5 Notwithstanding the version of the standard mentioned above, it remains the responsibility of the Contractor to consult the most recent version.

1.4 PERFORMANCES

- .1 Products and workmanship quality: in accordance with section 01 61 00 – Common Product Requirements.
- .2 Submit written declaration that components used are compatible and will not adversely affect finished flooring products and their installation adhesives.

1.5 TECHNICAL DATASHEETS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets.
- .3 Submit instructions relating to products application.

1.6 QUALITY CONTROL

- .1 Realize the following activities and submit required documents:

ART.	PRESCRIPTIONS	PERIOD (FREQUENCY)	REGISTRY BREAKPOINT / MONITORING	RESPONSIBILIT Y
1.4.2	Declaration of compatibility of products	At least seven (7) days prior to beginning work, per the requirements for shop drawings presentation in the tender documents	Transmission letter Inscription to the technical specification registry	Contractor
1.5	Technical datasheets for concrete finishing products	At least seven (7) days prior to beginning work, per the requirements for shop drawings presentation in the tender documents	Transmission letter Inscription to the technical specification registry	Contractor Review by the Owner's Representative
2.6.2	Corrective method in case of reinforcement ripple	At least seven (7) days prior to beginning work, per the requirements for shop drawings presentation in the tender documents	Corrective method	Contractor Review by the Owner's Representative
2.1.5	Evaluation of moisture content of substrate	Before application of products	Breakpoint. Test report	Contractor Testing by Laboratory
2.6.1	Repair procedure for levelness and flatness of slabs	Prior to beginning repair works	Repair procedure	Contractor Review by the Owner's Representative

.2 For all the activities to be carried out in the previous table, keep a register indicating at least the activity carried out, the date of submission by the Specialized contractor and the date of review. The register shall be updated and sent to the Owner's Representative at regular intervals, corresponding at most to the intervals between site meetings.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal

- .1 Separate waste materials for reuse/recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Collect and sort packaging for recycling, in accordance with the waste management plan.
- .4 Ensure that empty recipients are sealed and stored properly before elimination.
- .5 Divert unused hazardous material from landfill to an official hazardous material collections site as approved by the Owner's Representative, in accordance with all applicable legislation.
- .6 Dispose of waste generated by work (scarification, stripping of floor, etc.) in an environmentally sound manner.

Part 2 Execution

2.1 ENVIRONMENTAL REQUIREMENTS

- .1 Temporary lighting:
 - .1 Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40 square meters of floor being treated.
- .2 Electrical power:
 - .1 Provide sufficient electrical power to operate equipment normally used during construction.
- .3 Work area:
 - .1 Make work area watertight, protected against rain and detrimental weather conditions.
- .4 Temperature:
 - .1 Maintain ambient temperature of not less than 10 degrees C from 7 days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.
- .5 Moisture:
 - .1 Ensure concrete substrate is within moisture limits prescribed by flooring manufacturer. Moisture content shall be controlled by laboratory test and a written report presented prior to product application.

2.2 FINISHING OF FORMED SURFACES

- .1 Clean and finish formed surfaces in accordance with article 7.10.2 of CSA A23.1 standard. Use smooth-form finish in accordance with article 7.10.2.6 for exposed surfaces. Finish shall enable installation of membrane whether thermofusible or not. Rough-form finish in accordance with article 7.10.2.5 is deemed acceptable for all other surfaces (surface not exposed to view or in the absence of membranes).
- .2 For all corners of exposed concrete, chamfer corners to 25 mm, even if no indications are given on drawings.
- .3 Refer to section 03 11 00 – Concrete Forming for patching of form tie holes.

2.3 PREPARATION OF SLABS

- .1 Examine slab surfaces and environmental and workmanship conditions to ensure that all manufacturer's requirements are met for the application of finishing products. Verify slab levels and compare to shop drawings and manufacturer's requirements.

2.4 SLAB FLATNESS TOLERANCES

- .1 Tolerances for slab and floor finish shall be in accordance to table 21 of CSA A23.1 standard. Method to ASTM E 1155/E 1155M shall be used to determine slab flatness by determining F numbers.
- .2 Refer to articles 7.7.1.1 and 7.7.1.4 of CSA A23.1 and the following table to determine slab flatness and methods of finishing. When a slab does not belong specifically to a category listed on the following table or no other specifics indications are given elsewhere, use tolerances associated with class B.

Class	Examples	Possible Method	Global F number	
			F _F	F _L
A	“Conventional” slab	Hand screeded and single trowel finished	20	15
B	“Flat” slab	Manual or mechanical screeding, pan floating and trowelling.	25	20
C	“Very Flat” slab on ground	Manual or mechanical screeding, bull floating and trowelling using steel trowels.	35	25
D	“Extremely Flat” slab on ground	Concreting in narrow strips, mechanical screeding, bull floating and trowelling using steel trowels	45	30

*Refer to table 21 of CSA A23.1 standard. The above table was developed using the information contained in table 21.

- .3 Refer to following table to determine which class applies to different concrete surfaces.

Class	Surfaces
A	Floors to support terracotta or ceramic tiles or terrazzo Roof to support insulating panel, composite roof or waterproofing membrane
B	Ramps for pedestrian or vehicle Floors permanently covered (glued tiles, linoleum, carpets, etc.) Any exposed concrete surface not belonging to a superior category.
C	Warehouse
D	Loading dock

2.5 SLAB FINISH

- .1 Concrete slab finish shall be done in accordance with CSA A23.1 article 7.7 and ACI 308R requirements. Requirements hereby presented shall be read in conjunction with those standards.
- .2 Do not sprinkle dry cement or dry cement and sand mix on concrete surfaces.
- .3 Control excess bleeding water using methods in accordance with CSA A23.1. Avoid any damage to concrete surfaces.
- .4 Initial Finishing.
 - .1 After the placing, spreading, and vibrating of concrete, screed surfaces using properly designed screed or straight-edge.
 - .2 Using bull float, darby or mechanical equipment as appropriate, work concrete to remove high spots and ridges and to fill voids and hollows. Coarse aggregate shall be slightly embedded into concrete. Surface level shall be as indicated on drawings.
 - .3 Complete initial finishing before any bleeding or free water appears on the surface of concrete.
- .5 Final Finishing – General.
 - .1 Final finishing includes edging, grooving, floating, and trowelling. Commence final finishing as soon as bleed water has disappeared, and concrete has hardened enough to prevent working of excess mortar to the surface.
 - .2 Unless otherwise indicated, surfaces shall be monolithic, trowelled using steel trowel to obtain a smooth, non-slip, without streaks, trowel marks or ripples.
 - .3 Finishing quality shall meet all quality requirements for the installation of flooring.
 - .4 A trowel finish shall not be applied to air-entrained concrete. This does not preclude the use of pan floating on air-entrained concrete.
 - .5 Floating aims to embed the aggregates and consolidate the surface paste prior to trowelling or may represent a part of the finishing steps.
 - .6 Pan floating is a separate operation from troweling, even if similar tools may be used.

- .6 Ensure that tolerances indicated in section 2.4 are met.
- .7 Other works.
 - .1 Using carborundum, grind straight edges of concrete to obtain a 3 mm radius.

2.6 CORRECTION OF DEFICIENCIES

- .1 When a slab does not meet the stated flatness requirements, a correction method shall be submitted. Unless this is not possible, the preferred method of correction is grinding, as described in article 7.7.2 of CSA A23.1. Alternatively, refer to the indications in article 2.7 of this section. The surface shall be tested again, at the expense of the Contractor, following the completion of the corrective work, regardless of the period that has elapsed since the concreting of the structure.
- .2 Before carrying out work to place concrete slabs, submit a corrective method in case of a slab presenting surface undulations (reinforcement ripple) visible following finishing operations. Favor a method that allows defects to be corrected while the concrete is still in its plastic state.
 - .1 During the execution of slab concreting work, look for the appearance of surface undulations (reinforcement ripple) and notify the Owner's Representative. The Contractor is responsible for correcting the defects immediately according to the method previously submitted, without waiting for the opinion of the Owner's Representative or any other third party.
 - .2 If surface undulations are visible for the slab after the concrete has set, the slab will be considered as not meeting the flatness requirements and the requirements of article 2.6.1 of this section shall apply.
- .3 For formed surfaces with defects, refer to the requirements of sections 03 11 00, 03 30 00 and CSA A23.1 in general.

2.7 SLAB LEVELLING

- .1 Where slab flatness does not meet requirements, apply a cementitious floor screed in accordance with section 03 15 00 – Concrete Accessories to obtain a levelled surface.
- .2 Prepare surfaces by sandblasting, by manual scarification or manual chipping using a "Needle Gun" to provide a surface profile CSP-4 as specified in guideline 310.2R *Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair* of ICRI.
- .3 Apply cementitious floor screed per manufacturer's recommendations.

END OF SECTION

Section 03 39 00 Concrete Curing

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 03 11 00 – Concrete Forming.
- .2 Section 03 15 00 – Concrete Accessories.
- .3 Section 03 20 00 – Concrete Reinforcing.
- .4 Section 03 30 00 – Cast-in-Place Concrete.
- .5 Section 03 35 00 – Concrete Finishing.
- .6 The Contractor shall obtain a copy of all sections even if they do not pertain directly to his speciality. When bidding, the Contractor agrees implicitly with articles and requirements of all sections in these specifications, including those he might not have read. The Contractor should consult the table of contents of the specifications to be aware of the complete list of sections.

1.2 PRICING AND PAYMENT PROCEDURE

- .1 No measurement shall be made under this Section. Curing shall be considered integral part of concreting works.
 - .1 Include concrete curing pricing in concreting work package in section 03 30 00 – Cast-in-Place Concrete.

1.3 REFERENCES

- .1 American Association of State Highway and Transportation Officials (AASHTO).
 - .1 AASHTO M 182-05(2021), Standard Specification for Burlap Cloth Made from Jute or Kenaf and Cotton Mats.
- .2 American Concrete Institute (ACI).
 - .1 ACI 308R, Guide to Curing Concrete.
- .3 American Society for Testing and Materials International (ASTM).
 - .1 ASTM C 171, Standard Specification for Sheet Materials for Curing Concrete.
 - .2 ASTM C 309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .3 ASTM C 1315, Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
- .4 Canadian Standard Association (CSA)/CSA International.
 - .1 CSA A23.1/A23.2-24, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .5 Canadian General Standards Board (CGSB).

- .1 CAN/CGSB 19.24-M90, Multicomponent, Chemical-Curing Sealing Compound.
- .6 Notwithstanding the version of the standard mentioned above, it remains the responsibility of the Contractor to consult the most recent version.

1.4 ACTIONS AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with section 01 33 00 – Submittal Procedures.
- .2 Submit Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets.
- .3 At least fourteen (14) days prior to curing concrete, submit to Owner's Representative methods for curing concrete and to control quality of concrete curing.

1.5 QUALITY CONTROL

- .1 Realize the following activities and submit required documents:

ART.	PRESCRIPTIONS	PERIOD (FREQUENCY)	REGISTRY BREAKPOINT / MONITORING	RESPONSIBILITY
1.4.3	Method for curing concrete	At least fourteen (14) days prior to beginning work	Transmission letter Inscription to the technical specification registry	Contractor Review by the Owner's Representative
1.4.1	Technical datasheets for curing products, including blankets and membrane	At least seven (7) days prior to beginning work, per the requirements for shop drawings presentation in the tender documents	Transmission letter Inscription to the technical specification registry	Contractor

- .2 For all the activities to be carried out in the previous table, keep a register indicating at least the activity carried out, the date of submission by the Specialized contractor and the date of review. The register shall be updated and sent to the Owner's Representative at regular intervals, corresponding at most to the intervals between site meetings.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal
 - .1 Separate waste materials for reuse/recycling in accordance with section 01 74 19 - Waste Management and Disposal.
 - .2 Place materials defined as hazardous or toxic in designated containers.
 - .3 Collect and sort packaging for recycling, in accordance with the waste management plan.
 - .4 Ensure that empty recipients are sealed and stored properly before elimination.
 - .5 Divert unused hazardous material from landfill to an official hazardous material collections site as approved by the Owner's Representative, in accordance with all applicable legislation.
 - .6 Dispose of waste generated by work in an environmentally sound manner.

Part 2 Products

2.1 MATERIALS

- .1 Water: to CSA A23.1, article 4.2.2.
- .2 Membranes, sheet materials: to ASTM C 171.
 - .1 Approved products: UltraCure NCF by Sika, Transguard 4000 by Reef Industries, Reliable Cure by Reliable Concrete Accessories or Conkure by Raven Industries.
- .3 Curing compound: white or colorless, to CSA A23.1, ASTM C 309 or CAN/CGSB 19.24. Compound to ASTM C 1315 may be used conditional to approval.
- .4 Jute or burlap cloth: to ASTM C 171 and AASHTO M 182.

Part 3 Execution

3.1 GENERAL REQUIREMENTS

- .1 Follow requirements of section 03 30 00 – Cast-in Place Concrete for concreting.
- .2 Concrete curing in accordance with CSA A23.1, article 7.8 and ACI 308R. Refer to those standards when choosing curing methods.
- .3 Wet curing shall begin as soon as possible, following concrete finishing and as soon as the setting of the concrete allows, regardless of the time of day or night.
- .4 Use of curing compound is prohibited unless written authorization is given. If the Contractor wishes to use curing compounds, he shall submit in writing curing methods and all relating documents including technical datasheets for compounds. Owner's Representative may or may not approve use of curing compounds.
- .5 Whenever possible, curing methods shall be chosen such that concrete is moistened by direct contact with water.
 - .1 Use methods reviewed to Owner's Representative satisfaction and as defined in CSA A23.1 standard to eliminate bleeding water. Ensure no damage is done to concrete surfaces.
- .6 During curing, ensure that concrete remains unloaded and is protected against chocks, vibrations, weather conditions or any other element that might affect quality of works.
- .7 The curing method shall be compatible with temperature control measures, such as the use of insulating fabrics in cold weather or with measure to control the temperature of mass concrete.

3.2 WET CURING

- .1 Water used for curing concrete shall be clean and without matters that may leave marks on concrete.
- .2 Exposed faces of concrete shall be moistened for at least seven (7) days and protected against weather conditions and other works. Concrete temperature shall remain at or above ten (10) degrees Celsius.
- .3 When concrete is protected against cold weather, maintain protection at least twelve (12) hours after the end of wet curing.

- .4 When temperature is twenty-five (25) degrees Celsius or more, use water jet, wet sand, or jute for initial curing of concrete.
 - .1 Moisten formworks before concreting and until formworks are removed.
- .5 If required by ambient conditions, exposed concrete surfaces must be covered with tarpaulins or protected by other means acceptable to the Owner's Representative.
- .6 Use two layers of constantly wet jute or burlap clothes for curing walls or other vertical elements.
- .7 Non-formed concrete surfaces shall remain wet for a minimum of seven (7) days.
- .8 Formed concrete surface (beams, columns, walls, etc.) shall be cured for at least seven (7) days, as follows:
 - .1 Before formwork removal: three (3) days, but not less than the duration in section 03 11 00 – Concrete Forming.
 - .2 Wet curing following formwork removal: four (4) days.
- .9 For mass concrete, the preferred method of curing is to maintain a layer of standing water of constant temperature on the concrete surface. Continuous watering of the surface is not permitted for mass concrete. Refer to article E.6 of CSA A23.1.

3.3 MEMBRANE CURING

- .1 Rather than using a method in accordance with article 3.1.7 of this section, the Contractor may use blankets specially designed for curing concrete. Depending on weather conditions, use sheet materials designed for hot weather. Method for using sheet materials shall be as follow:
 - .1 Begin placing immediately after concrete has hardened enough to prevent damages.
 - .2 Spray water over a first strip where sheet materials will be installed. Surface shall be covered by 3 to 6 mm of water.
 - .3 Unroll sheet materials over wet concrete. Add water when needed.
 - .4 Use squeegee to smooth out wrinkles and air bubbles.
 - .5 Spray water over next strip and repeat preceding operations. Lap strips over 75 mm minimum. At roll ends, overlap over 300 mm minimum. Cover the entire surface of slab.
 - .6 Inspect slab frequently and repair immediately any damage to sheet materials.
 - .7 Remove sheet materials after seven (7) days of curing or later. Do not reuse sheet materials.

3.4 USE OF CURING COMPOUNDS

- .1 Only if a written authorization is obtained, curing compounds may be used if compatible with floor finish.
 - .1 Curing compound shall be used following manufacturer's recommendations. Compound shall be selected so that dust will not deposit on concrete surface and so that evaporation of water contained in concrete does not occur. Curing compound should not affect architectural flooring.

.2 Use curing compounds compatible with finishing products. Submit a written document certifying that all products applied on concrete surfaces are compatible. The Contractor is the sole responsible to determine and demonstrate compatibility between all products applied on concrete surfaces.

3.5 WATER MANAGEMENT

.1 Regardless of the curing method used, the contractor shall take appropriate measures to prevent the water used for curing from damaging existing structures.

.2 The specialized contractor shall ensure that the disposal of water does not compromise the continuation of the work, whether it is his own work or work carried out by another specialty.

END OF SECTION

Section 04 20 00

Unit Masonry

Part 1 General

1.1 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM A1064/A1064M-17 Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
 - .2 ASTM C73-14 Standard Specification for Calcium Silicate Face Brick (Sand-Lime Brick).
- .2 CSA Group (CSA)
 - .1 CAN/CSA-A82-14, Fired Masonry Brick Made From Clay or Shale.
 - .2 CAN/CSA-A165 SERIES-04 (R2014), CSA Standards on Concrete Masonry Units (Consists of A165.1-04 Concrete Block Masonry Units, A165.2 Concrete Brick Masonry Units, A165.3 Prefaced Concrete Masonry Units).
 - .3 CAN/CSA-A179-04 (R2014), Mortar and Grout for Unit Masonry.
 - .4 CAN/CSA-A370-14, Connectors for Masonry.
 - .5 CAN/CSA A371-04 (R2014), Masonry Construction for Buildings.
 - .6 CSA G30.18-09 (R2014), Carbon Steel Bars for Concrete Reinforcement.
 - .7 CSA S304-14 - Design of masonry structures.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (SDS).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for unit masonry products, mortar and grout, connectors, anchorage and reinforcing, and accessories. Include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Submit duplicate samples of each unit exposed in final construction for review and acceptance.
 - .2 Samples will be returned for inclusion into work.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

- .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 masonry products from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: As specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

1.4 COLD WEATHER REQUIREMENTS

- .1 Supplement requirements of CAN3-A371 as follows:
 - .1 Maintain temperature of mortar between -5C and 50C until used.

1.5 HOT WEATHER REQUIREMENTS

- .1 Supplement requirements of CAN3-A371 as follows:
 - .1 Protect freshly laid masonry from drying too rapidly by means of waterproof, non-staining coverings.

Part 2 Products

2.1 MASONRY UNITS

- .1 Standard concrete block units: to CAN/CSA-A165.1.
 - .1 Normal Weight Classification:
 - .1 Hollow units: H/15/A/O, H/20/A/O and H/25/A/O
 - .2 Semi-solid units: SS/15/A/O, SS/20/A/O and SS/25/A/O
 - .3 Full solid units: SF/15/A/O, SF/20/A/O and SF/25/A/O
 - .2 Light Weight Classification:
 - .1 Hollow units: H/15/C/O
 - .2 Semi-solid units: SS/15/C/O
 - .3 Full solid units: SF/15/C/O
 - .3 Colour: Grey
 - .4 Size: Metric
 - .5 Special shapes: provide square units for exposed corners. Provide purpose-made shapes for lintels and bond beams. Provide additional special shapes as indicated.

2.2 REINFORCEMENT AND CONNECTORS

- .1 Bar reinforcement: to CAN/CSA-A371, Grade 400.
- .2 Wire reinforcement: wire to ASTM A 1064/A 1064M, truss type.

- .3 Connectors: to CAN/CSA-A370.
 - .1 Corrosion resistance: to CAN/CSA-A370

2.3 MORTAR AND GROUT

- .1 Mortar: to CAN/CSA-A179.
 - .1 Use aggregate passing 1.18 mm sieve where 6 mm thick joints are indicated.
 - .2 Colour: ground coloured natural aggregates or metallic oxide pigments, .
- .2 Mortar Type:
 - .1 Exterior non-loadbearing walls and parapet walls: N based on proportion specifications.
 - .2 Interior non-loadbearing walls: Type N based on proportion specifications.
- .3 Mortar for foundation walls, manholes, sewers, pavements, walks, patios and other exterior masonry at or below grade: type M based on proportion specifications.
- .4 Following applies regardless of mortar types and uses specified above:
 - .1 Mortar for stonework: type N based on proportion specifications.
 - .2 Mortar for grouted reinforced masonry: type S based on proportion specifications.
- .5 Grout: to CAN/CSA-A179, Table 3.
- .6 Parging mortar: to CAN/CSA-A179.

2.4 ACCESSORIES

- .1 Weep hole vents: purpose-made galvanized steel.
- .2 Cavity screening: three dimensional random weave plastic mesh, thickness to match cavity, minimum height 3 brick masonry courses.
- .3 Anchor Bolts: 12 mm diameter x 150 mm long with embedded ends bent 50 mm at 90 degrees, exposed ends threaded with washer and nut.
- .4 Embedded Flexible Flashings: Self-adhering sheet 1.0 mm thick consisting of rubberized asphalt compound banded to high density cross laminated polyethylene film, complete with manufacturer's recommended primer.
 - .1 Primers: VOC limit 50 g/L maximum to SCAQMD Rule 1113
 - .2 Coatings: VOC limit 275 g/L maximum to SCAQMD Rule 1113.

Part 3 Execution

3.1 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 Visually inspect substrate in presence of Consultant.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied

3.2 INSTALLATION

- .1 Do masonry work in accordance with CAN/CSA-A371 except where specified otherwise.
 - .1 Bond: running stretcher bond with vertical joints in perpendicular alignment and centred on adjacent stretchers above and below.
 - .2 Ensure coursing matches existing
 - .3 Jointing: tool where exposed or where paint or other finish coating is specified to provide smooth compressed surface.
- .2 Build masonry plumb, level, and true to line, with vertical joints in alignment.
- .3 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

3.3 CONSTRUCTION

- .1 Exposed masonry:
 - .1 Remove chipped, cracked, and otherwise damaged units, in exposed masonry and replace with undamaged units.
 - .2 Cut out for electrical switches, outlet boxes, and other recessed or built-in objects. Make cuts straight, clean, and free from uneven edges.
- .2 Building-in:
 - .1 Install masonry connectors and reinforcement where indicated on drawings.
 - .2 Build in items required to be built into masonry.
 - .3 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.
 - .4 Brace door jambs to maintain plumb. Fill spaces between jambs and masonry with mortar.
 - .5 Install loose steel lintels centered over openings where indicated, with minimum 200 end bearing.
- .3 Concrete block lintels:
 - .1 Install reinforced concrete block lintels over openings in masonry where steel or reinforced concrete lintels are not indicated.
 - .2 End bearing: not less than 200 mm as indicated on drawings.
- .4 Provision for movement:
 - .1 Leave 6 mm space below shelf angles.
 - .2 Leave 6 mm space between top of non-load bearing walls and partitions and structural elements. Do not use wedges.
 - .3 Built masonry to tie in with stabilizers, with provision for vertical movement.
 - .4 Build expansion and control joints where and as indicated.
- .5 Interface with other work:
 - .1 Cut openings in existing work as indicated.
 - .2 Openings in walls: approved by Consultant.

- .3 Make good existing work. Use materials to match existing.
- .6 Build in flashings in masonry in accordance with CAN/CSA-A371.
 - .1 Install flashings under exterior masonry bearing on foundation walls, slabs, shelf angles, and steel angles over openings. Install flashings under weep hole courses and as indicated. Seal laps, penetrations and terminations to resist water penetration.
 - .2 In cavity walls and veneered walls, carry flashings from front edge of masonry, under outer wythe, then up backing not less than 150 mm, and as follows:
 - .1 For self-adhesive flashing, apply primer and firmly press sheet against backing. Lap under air-barrier membrane. Seal penetrations with recommended sealant or mastic. Installation shall be free of wrinkles, fish-mouths and punctures.
 - .2 Provided turned up end dams minimum 50 mm high at ends of all flashings.
 - .3 For masonry backing embed flashing 25 mm in joint.
 - .4 For concrete backing, insert flashing into reglets.
 - .5 For wood frame backing, staple flashing to walls behind sheathing paper.
 - .6 For gypsum board backing, bond to wall using manufacturer's recommended adhesive.
 - .3 Lap joints 150 mm and seal with adhesive or mastic.
- .7 Install weep hole vents in vertical joints immediately over flashings, in exterior wythes of cavity wall and masonry veneer wall construction, at maximum horizontal spacing of 600 mm on center.
- .8 Place drainage mesh in cavity as indicated as construction progresses.

3.4 REINFORCING AND CONNECTING

- .1 Install masonry connectors and reinforcement in accordance with CAN/CSA-A370, CAN/CSA-A371 and CSA S304.1 unless indicated otherwise.
- .2 Prior to placing concrete, obtain Consultant's approval of placement of reinforcement and connectors.

3.5 BONDING AND TYING

- .1 Bond walls of two or more wythes using metal connectors in accordance with CAN/CSA-A371, and as indicated.
- .2 Tie masonry veneer to backing in accordance with National Building Code of Canada (NBC) 2015, CAN/CSA-A371, CSA S304.1 and as indicated.

3.6 MODIFICATIONS TO EXISTING MASONRY

- .1 Match existing bond and coursing height of adjacent masonry to remain.
- .2 Tooth new masonry into existing masonry in run of wall and at intersections with existing partitions.
- .3 At new openings in masonry walls, remove units, clean and re-install rotated to conceal cut and expose finish surface.

- .4 Clean bond areas of adjacent masonry to remain, remove loose material and prepare masonry to receive new masonry toothed in.
- .5 Install reinforcement as necessary to provide continuity of reinforcing and stability between existing and new masonry work.
- .6 Provide repair anchors as necessary to stabilize existing masonry adjacent to and affected by the Work.

3.7 REINFORCED LINTELS AND BOND BEAMS

- .1 Reinforce masonry lintels and bond beams as indicated.
- .2 Place and grout reinforcement in accordance with CAN/CSA-A179, CAN/CSA-A371.

3.8 GROUTING

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

3.9 ANCHORS

- .1 Supply and install metal anchors as indicated.

3.10 LATERAL SUPPORT AND ANCHORAGE

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

3.11 SITE TOLERANCES

- .1 Tolerances of CAN/CSA-A371 apply.

3.12 FIELD QUALITY CONTROL

- .1 Inspection and testing will be carried out by Testing Laboratory designated by the client.

3.13 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .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 00 - Cleaning.
- .3 Waste Management:
 - .1 separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .2 Return pallets to masonry manufacturer for re-use.
 - .3 Return surplus masonry materials to manufacturer for recycling and/or re-use.

3.14 PROTECTION

- .1 Keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect from wind-driven rain until masonry work is completed and protected by flashings or other permanent construction.
- .2 Protect masonry and other work from marking and other damage. Protect completed work from mortar droppings. Use non-staining coverings.

.3 Repair damage to adjacent materials caused by masonry products installation.

END OF SECTION

Section 05 12 00

Structural Steel for Buildings

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 05 31 00 – Steel Decking.
- .2 Section 09 91 93 – Interior Painting.
- .3 The Contractor shall obtain a copy of all sections even if they do not pertain directly to his speciality. When bidding, the Contractor agrees implicitly with articles and requirements of all sections in these specifications, including those he might not have read. The Contractor should consult the table of content of the specifications to be aware of the complete list of sections.

1.2 PRICING AND PAYMENT PROCEDURE

- .1 No measurement will be made under this Section. Include structural steel for building pricing in global building pricing.
- .2 Measure structural steel for building in kilograms, computed from mass of steel elements indicated on structural documents. Structural steel includes any component of steel frame not specifically designated in another section – steel joists or joist girders and steel decking will be measured separately.
 - .1 Pricing shall include materials and erection as well as computation, materials and installation of connecting elements.
 - .2 Supply and installation of all elements needed to realize structural steel works will not be measured and are considered part of structural steel works.

1.3 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM A 29/A 29M, Standard Specification for General Requirements for Steel Bars, Carbon and Alloy, Hot-Wrought.
 - .2 ASTM A 36/A 36M, Standard Specification for Carbon Structural Steel.
 - .3 ASTM A 108, Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
 - .4 ASTM A 123/A 123M, Standard Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Product.
 - .5 ASTM A 193/A 193M, Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service or High Pressure Service and Other Special Purpose Application.
 - .6 ASTM A 194/A 194M, Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.

- .7 ASTM A 500/A 500M, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- .8 ASTM A 563/A 563M, Standard Specification for Carbons and Alloy Steel Nuts.
- .9 ASTM A 572/A 572M, Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
- .10 ASTM A 780/A 780M, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- .11 ASTM A 786/A 786M, Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates
- .12 ASTM A 913/A 913M, Standard Specification for High-Strength Low-Alloy Steel Shapes of Structural Quality, Produced by Quenching and Self-Tempering Process.
- .13 ASTM A 992/A 992M-22, Standard Specification for Structural Steel Shapes.
- .14 ASTM A 1011/A 1011M-18a, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
- .15 ASTM A 1085/A 1085M, Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS).
- .16 ASTM C 1107/C 1107M, Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
- .17 ASTM D 6386, Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.
- .18 ASTM F 436/F 436M, Standard Specification for Hardened Steel Washers Inch and Metric Dimensions.
- .19 ASTM F 959/F 959M-17a, Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners, Inch and Metric Series.
- .20 ASTM F 1136/F 1136M, Standard Specification for Zinc/Aluminum Corrosion Protective Coatings for Fasteners.
- .21 ASTM F 1554-20, Standard Specification for Anchor Bolts, Steel, 105 ksi Yield Strength.
- .22 ASTM F 3125/F 3125M, 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.
- .2 Canadian Standards Association (CSA)/CSA International.
 - .1 CSA B167-16, Overhead travelling cranes - Design, inspection, testing, maintenance, and safe operation.
 - .2 CSA G30.18, Carbon Steel Bars for Concrete Reinforcement.
 - .3 CSA G40.20/G40.21 General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .4 CSA S16, Design of Steel Structures.

- .5 CAN/CSA S136, North American Specification for the Design of Cold Formed Steel Structural Members.
- .6 CSA W47.1, Certification of companies for fusion welding of steel.
- .7 CSA W48, Filler Metals and Allied Materials for Metal Arc Welding.
- .8 CSA W55.3-08, Certification of companies for resistance welding of steel and aluminium.
- .9 CSA W59, Welded steel construction.
- .10 CSA W178.2, Certification of Welding Inspectors.
- .3 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB 1.40-97, Anticorrosive Steel Alkyd Primer.
 - .2 CAN/CGSB 1.105-M91, Quick-drying Primer.
 - .3 CAN/CGSB 1.181-99, Ready-mix Organic Zinc-Rich Coating.
 - .4 CAN/CGSB 31-GP-108MA, Inhibited Phosphoric Acid Base Metal Conditioner and Rust Remover.
 - .5 CAN/CGSB 85.10-99, Protective Coatings for Metals.
 - .6 CAN/CGSB 85.100-93, Painting.
- .4 Canadian Institute of Steel Construction (CISC) / Canadian Paint and Coatings Association (formerly known as Canadian Paint Manufacturers Association – CPMA).
 - .1 Handbook of Steel Construction, 11th Edition.
 - .2 Code of Standard Practice, 8th Edition, 2015.
 - .3 Guide for Specifying Architecturally Exposed Structural Steel, 2nd Edition, March 2012.
 - .4 CISC/CPMA 1-73a, A Quick-drying One-coat Paint for Use on Structural Steel.
 - .5 CISC/CPMA 2-75, A Quick-drying Primer for Use on Structural Steel.
- .5 Master Painters Institute.
 - .1 Architectural Painting Specification Manual, June 2019.
 - .1 MPI-INT 5.1, Structural Steel and Metal Fabrications.
 - .2 MPI EXT 5.1, Structural Steel and Metal Fabrications.
- .6 The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers (NACE) International.

SSPC SP 1-15, Solvent Cleaning.

- .2 SSPC SP 2, Hand Tool Cleaning.
- .3 SSPC SP 6/NACE No. 3-07, Commercial Blast Cleaning.
- .4 SSPC SP 7/NACE No. 4-07, Brush-Off Blast Cleaning.
- .5 SSPC SP 7 (WAB)/NACE WAB 4, Brush-Off Wet Abrasive Blast Cleaning (NACE SP1015).
- .6 SSPC SP 11, Bare Metal Power Tool Cleaning.

.7 Notwithstanding the version of the standard mentioned above, it remains the responsibility of the Contractor to consult the most recent version.

1.4 DESIGN CRITERIA

- .1 Design details and connections in accordance with requirements of CSA S16 and CAN/CSA S136 to resist forces, moments, shears and allow for movements indicated.
- .2 Beam assemblies shall have a depth equal to at least 50% of its depth.
- .3 Shop assemblies shall be welded. Field assemblies shall be bolted, using at least two (2) high-strength bolts per assembly.
- .4 Refer to an established manual recognized within the industry for connections design, such as the *Handbook of Steel Construction*.
- .5 Additional forces into connecting elements:
 - .1 Design connections as to not generate additional forces into connected elements.
 - .2 Connections generating torsion or flexure into connected elements are prohibited and will not be accepted by the Engineer of record.
 - .3 Any modifications to details and connections due to changes requested by the Owner's Representative shall be made free of charge.
- .6 Unless otherwise indicated, design connections to withstand the following loads:

Elements	Loads
Element loaded in bending (beam, column)	Maximum of support reaction considering the uniform load corresponding to the member strength in bending or 50% of the member strength in shear
Element resisting significant point loads	Member strength in shear

1.5 SHOP DRAWINGS

- .1 Submit shop drawings, including fabrication and erection drawings, as well as list of materials used in accordance with section 01 33 00 – Submittal Procedures.
- .2 Submit erection drawings indicating details and information necessary for assembly and erection purposes including:
 - .1 the location of the various components of the structure and their erection marks;
 - .2 the main dimensions and their respective levels;
 - .3 the type of bolts used and their diameter;
 - .4 the welds to be done on site;
 - .5 the temporary structural components; and
 - .6 the number of rows of bridging and their position, if applicable.
- .3 Erection procedure: In addition to erection drawings, submit erection procedure including:
 - .1 the installation method and the erection stages of the structure;
 - .2 the measures to be taken to ensure that the structure components are stable;

- .3 the measures to protect workers from falling; and
- .4 the hoisting procedure.
- .4 Ensure that drawings submitted for connections, including all members and connection components designed by the fabricator are stamped and signed by a qualified engineer licenced in the Province of Ontario. A letter stamped and signed by the engineer listing all drawings with applicable revisions and stating that the connections have been designed and reviewed under the engineer's guidance may be provided rather than stamping and signing each individual shop drawing.
- .5 Refer to articles 4.2 and 4.3 of CSA S16 standard for information that must be indicated on shop and erection drawings. Include locations and dimensions of the protected zones as well as a complete description of the fabrication operation that are prohibited in those zones.
- .6 If the Owner's Representative considers that significant or numerous revisions are required on drawings, they shall be returned without annotations to be submitted again. If more than two revisions are required to drawings, the Contractor is liable for the cost associated with any further review.
- .7 Contractor remains sole responsible for the exactness of drawings. No charge may be added for costs incurred by delays occurring due to mistakes uncovered on the Contractor's drawings on the work site, regardless of whether the drawings have been or have not been examined by the Owner's Representative.
- .8 Unless special authorization by Owner's Representative, structural steel fabrication shall not begin before approval of shop and erection drawings.

1.6 QUALITY CONTROL

- .1 Submit an electronic copy of mill test reports fourteen (14) days prior to fabrication of structural steel. Include following information:
 - .1 Mill test reports to show chemical and physical properties and other details of steel to be incorporated in project.
 - .2 Provide mill test reports certified by metallurgists qualified to practice in Quebec. Reports shall state that tests were made in accordance with CSA G40.20/G40.21.
- .2 Provide structural steel fabricator's affidavit stating that materials and products used in fabrication conform to applicable material and products standards specified and indicated.
- .3 Realize the following activities and submit required documents:

ART.	PRESCRIPTIONS	PERIOD (FREQUENCY)	REGISTRY BREAKPOINT / MONITORING	RESPONSIBILITY
3.1.3	Welders and welding company certificate of qualification	Fourteen (14) days prior to beginning work	Certificate of qualification	Contractor Laboratory

ART.	PRESCRIPTIONS	PERIOD (FREQUENCY)	REGISTRY BREAKPOINT / MONITORING	RESPONSIBILITY
1.5.1	Shop drawings for structural steel frame elements	Fourteen (14) days prior to fabrication, per the requirements for shop drawings presentation in the tender documents	Transmission letter Inscription into the shop drawing registry	Contractor (steel manufacturer)
1.5.2	Erection drawings for structural steel frame elements	Fourteen (14) days prior to delivery, per the requirements for shop drawings presentation in the tender documents	Inscription into the work procedure registry	Contractor (steel manufacturer)
1.5.3	Erection procedure for structural steel frame elements	Fourteen (14) days prior to delivery, per the requirements for shop drawings presentation in the tender documents	Inscription into the work procedure registry	Contractor (steel erector)
1.6.1 1.6.2	Mill test reports and affidavit	Fourteen (14) days prior to fabrication of structural steel	Mill test reports, certificates and affidavit	Contractor (steel manufacturer)
3.6.1	Inspection and tests of materials and connections	After erection	Test reports	Laboratory
3.1.4	Welded connection certificate	After erection	Certificate for welded connections to Canadian Welding Bureau requirements	Contractor

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse/recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Collect and separate packaging materials for recycling, in accordance with waste management plan.
- .3 Divert unused metal products to a metal recycling facility approved by the Owner's Representative.
- .4 Divert unused paints material from landfill to an official hazardous material collections site as approved by the Owner's Representative.
- .5 Do not dispose of unused paint materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

Part 2 Products

2.1 MATERIALS

- .1 Structural steel: unless otherwise indicated, use:

- .1 W-, WT-, HP-, M- and S-sections: to CSA G40.20/G40.21 350W or ASTM A 913/A 913M or ASTM A 992/A 992M, grade 50;
- .2 Square and rectangular hollow structural section (HSS): to ASTM A 500/A 500M class C, grade C (50 ksi);
 - .1 HSS to CSA G40.20/G40.21 350W class H
- .3 Angle (L-) and channels (C-): to CSA G40.20/G40.21 350W;
- .4 Plates: to CSA G40.20/G40.21 350W, yield strength of 350 MPa or to ASTM A 572/A 572M grade 50 (345 MPa);
- .2 Anchor rods: as indicated on drawings and as follows:
 - .1 Reinforcing bars: to CSA G30.18, grade 400W or 500W;
 - .2 High strength anchor rods: to ASTM F 1554 grade 105.
- .3 Structural bolts: to ASTM F 3125/F 3125M, unless otherwise indicated. Use type 1 bolts, except for weathering steel for which type 3 bolts shall be used.
 - .1 For zinc/aluminium coated bolt, coating shall comply with ASTM F 1136/F 1136M.
- .4 Nuts: to ASTM A 563/A 563M:
 - .1 For bolts, use recommended nuts to table 1 of ASTM F 3125/F 3125M. Nuts to ASTM A 194/A 194M grade 2H may be used as specified in note 'E' of this table.
 - .2 For high-strength anchor rods, use nuts of grade D (38 mm diameter or less) or DH (more than 38 mm diameter) to ASTM A 563/A 563M.
- .5 Washers: to ASTM F 436/F 436M.
- .6 Compressible washer: to ASTM F 959/ F 959M.
- .7 Tension control structural bolt, nut and washer: to ASTM F 3125/F 3125M grade F 1852 or F 2280.
- .8 Welding material: to CSA W48 and CSA W59, certified by the Canadian Welding Bureau (CWB).
 - .1 Welding material shall comply with article 27.1.5.3 of CSA S16 when appropriate.
- .9 Hot-dipped galvanizing: to ASTM A 123/A 123M.
- .10 Conditioner and rust remover: to CAN/CGSB 31-GP-108MA.
- .11 Zinc-rich coating:
 - .1 Use zinc-rich coating to CAN/CGSB 1.181 and ASTM A 780/A 780M containing at least 92% of metallic zinc in dried coat, brush applied.
 - .2 Approved products:
 - .1 Zinc-paste 70-40 by Metaflux;
 - .2 ZRC Galvilite by Meta-Plus;
 - .3 Rust-anode by Galvatech (distributor).
 - .4 Zinga by Galvanisation Zinga (distributor).
 - .5 Galvacon by Lanco.

- .3 For a connection acting only in shear, requirements of the preceding article need not apply.
- .4 Material shall have a maximal thermal conductivity of 0.300 W/mK and a thickness of 25 mm, unless otherwise indicated on drawings.
- .12 Shrinkage compensating grout: premixed compound to ASTM C 1107/C 1107M type C, 50 MPa minimum compressive resistance after twenty-eight (28) days such as:
 - .1 SikaGrout 212 by Sika;
 - .2 In-Pakt Construction Grout or In-Pakt Construction Grout CT by KING depending on weather conditions;
 - .3 PlanigROUT 755 by MAPEI;
 - .4 Dry Pact Grout by Euclid.

2.2 SHOP PAINTING

- .1 Unpainted steel shall be used for structural steel on the interior of building not exposed to view. Take special precautions to minimize outside storage of unpainted elements. Refer to section 2.3 Storage.
- .2 The following surfaces shall not be painted:
 - .1 Surfaces to be encased in concrete.
 - .2 Surfaces to receive field installed stud shear connectors and steel decks.
 - .3 Surfaces and edges to be field welded.
 - .4 Faying surfaces of friction-type connections.
 - .5 Below grade surfaces in contact with soil or concrete, including base plates.
- .3 Shop paint primer:
 - .1 To CISC/CPMA 1 and CAN/CGSB 1.105 for structural steel on the interior of building, exposed to view and without topcoat.
 - .2 To CISC/CPMA 2 and CAN/CGSB 1.40 for any other use of structural steel. Primer shall be compatible with topcoats.
- .4 Shop-applied finish paint:
 - .1 Refer to section 09 91 00 for shop-applied finish paint.
- .5 Clean, prepare surfaces and shop prime structural steel in accordance with CSA S16, CAN/CSA S136, MPI INT 5.1/MPI EXT 5.1 except where members are to be encased in concrete.
- .6 Clean members, remove loose mill scale, rust, oil, dirt and foreign matter. Prepare surface to:
 - .1 SSPC SP 2 for structural steel on the interior of building, exposed to view and without topcoat;
 - .2 SSPC SP 7 or SSPC SP 7 (WAB)/NACE WAB 4 for structural steel on the interior of building, exposed to view where topcoat will be applied;

- .7 Apply one coat to steel surfaces to achieve dry film thickness of 1.5 to 2.0 mils (37 to 50 µm) for all painted steel surfaces.
- .8 Apply paint under cover, on dry surfaces, when surface and air temperatures are above 5 degrees C.
- .9 Maintain dry condition and 5 degrees C minimum temperature until paint is thoroughly dry.
- .10 Strip paint from bolts, nuts, sharp edges and corners before prime coat is dry.
- .11 Unless otherwise indicated, do not apply primer on steel elements to be fireproofed. If, upon approval, primers are used, products shall be compatible with fireproofing product.
- .12 Identify protected zones using a distinct shop-paint or paint color. Apply labels on each face of the members. When members in protected zones are exposed to view, refer to architectural requirements and requirements on drawings.

2.3 STORAGE

- .1 Store materials off ground over wood studs or indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area as to prevent rusting.
- .2 Protect structural steel if stored over a long period.
- .3 Replace defective or damaged materials with new ones.

Part 3 Execution

3.1 GENERAL

- .1 Structural steel work: in accordance with CSA S16 and CAN/CSA S136.
- .2 Welding: in accordance with CSA W59.
- .3 Companies to be certified under Division 1 or 2 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components or both as applicable. Part of the work may be sublet to a division 3 fabricator or erector; however, the Division 1 or 2 fabricator or erector shall retain responsibility for the sublet work.
- .4 Submit certification that welded joints are qualified by Canadian Welding Bureau (CWB).
- .5 Provide to trade responsible for these works templates and steel elements to be embedded into concrete or masonry.
- .6 Ensure galvanic separation (galvanization, neoprene or other) between any steel and aluminium element or treated wood.

3.2 FABRICATION

- .1 Fabricate structural steel in accordance with CSA S16 and CAN/CSA S136 and in accordance with reviewed shop drawings. Structural steel shall be brand-new, free of loose mill scale, rust, oil, dirt and foreign matter.
- .2 Prior to ordering/buying structural steel, final shop drawings shall be approved by the Owner's Representative.
- .3 Do not substitute members without written approval from Owner's Representative.

- .4 Structural bolt holes shall be drilled or punched. Do not use thermally or manually cut holes. Fastener holes shall be made in accordance with article 28.4 of CSA S16.
- .5 In location subject to plastic hinge, fastener holes shall be either sub-punched and reamed or drilled full size.
- .6 Steel fabrication shall be done in accordance with CSA S16 article 28 for tolerances, especially article 28.6.
- .7 Do not splice steel elements unless otherwise indicated on drawings.
- .8 Reinforce openings so as to maintain the original strength of the element.

3.3 CONNECTION TO EXISTING WORK

- .1 When connecting to existing work, prior to preparing shop drawings, verify dimensions and condition of existing work, report discrepancies and potential problem areas to Owner's Representative for direction before commencing fabrication. Dimensions of steel elements shall be modified to adapt for the existing conditions and modifications shall be submitted to Owner's Representative for approval.
- .2 For plates anchored to an existing reinforced concrete or masonry element, use the following procedure, under the sole responsibility of the specialized steel contractor:
 - .1 Detect existing reinforcement bars prior to drilling to locate anchors;
 - .2 Use manual percussion drilling to drill anchor loads and protect existing reinforcement.
 - .3 Measure anchor location on site after drilling prior to fabricating steel plates and adapt dimensions as needed without charges.
- .3 For plates anchored to an existing unreinforced masonry element, use diamond drilling to drill anchor as to protect the existing work. The contractor may use a different mean of drilling only if he is able to demonstrate that no damage will occur to the existing work due to drilling. If the contractor uses an alternative mean of drilling, any damage occurring to the existing work following drilling shall be automatically considered his responsibility.

3.4 MARKING

- .1 Mark materials in accordance with CSA G40.20/G40.21. Do not use die stamping. When steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection.
- .2 Match marking: shop mark bearing assemblies and splices for fit and match.

3.5 ERECTION

- .1 Prior to beginning erection, ensure that the certificate of compliance for anchor rods installation has been provided, in accordance with section 03 11 00 of the technical specifications. Confirm the availability of erection procedures on jobsite.
- .2 Erect structural steel, as indicated and in accordance with CSA S16 and CAN/CSA S136 and in accordance with reviewed erection drawings.
- .3 Erection shall be done in accordance with CSA S16 article 29 for tolerances, especially article 29.3.
- .4 Field cutting or altering structural members: to approval of Owner's Representative.

- .5 Any defect shall be submitted to Owner's Representative as quickly as possible. Owner's Representative will determine corrections needed.
- .6 During erection, brace structure to ensure stability and lateral load resistance. Contractor shall use temporary bracing wherever necessary to maintain work integrity and ensure workers safety. Contractor is the sole responsible for determining erection methods and means of temporary bracing.
- .7 Once the structural steel frame has been set in place, adjusted and aligned, tighten bolts (snug-tight) and put in place non-shrink grout under the columns. Ensure that the grout covers 100% of the surface under the base plate, without leaving any voids. Do not proceed with final tightening of bolts, if required, until the grout has achieved a strength of at least 75% of the specified strength.
- .8 For bolted assemblies, tighten bolts in accordance with the following requirements:
 - .1 Assemblies subject to fatigue or impact, including all assemblies associated with lifting equipment: install bolts snug-tight in accordance with article 23.7.1 of CSA S16, then pretension by rotation of the nut in accordance with article 23.7.2 and table 7;
 - .2 Other assemblies: unless otherwise indicated, install bolts snug-tight as indicated in article 23.7.1 of CSA S16.
- .9 Twist-off structural bolts to ASTM F 1852 may be used where ASTM F 3125/F 3125M grade A325 structural bolts are specified (or ASTM F 2280 for grade A490 bolts) except for slip-critical assemblies where twist-off structural bolts shall never be used.
- .10 Clean with mechanical brush and touch up shop primer bolts, rivets, welds and burned or scratched surfaces at completion of erection.
- .11 Follow the requirements of article 27.1.9 of CSA S16 standard for members of the protected zones. Generally speaking, connecting any element on members within protected zones is prohibited unless specifically indicated on structural drawings.

3.6 FIELD QUALITY CONTROL

- .1 Inspection and testing of materials and workmanship will be carried out by testing laboratory designated by Owner's Representative. Inspectors shall be certified by the Canadian Welding Bureau in accordance with CSA W178.2. Depending on the nature of elements inspected, inspection may take place on shop or on jobsite.
- .2 The following non-exhaustive list presents elements likely to be inspected:
 - .1 Origin of structural steel;
 - .2 Certification of welders and erector;
 - .3 Braces connections and details: all braces assemblies will be inspected;
 - .4 Bolted connections: tension, type, diameter and grade;
 - .5 Welded connections: workmanship quality, conformity to drawings and shop drawings requirements, welding quality;
 - .6 Plumbness (verticality) of columns;
 - .7 Steel deck fastening;
 - .8 General workmanship.

- .3 Origin of structural steel:
 - .1 The Inspector shall validate the source of structural steel and its conformity to the specifications.
- .4 Certification of welders and erector:
 - .1 The Inspector shall validate certification of erector and welders. Include copies of certification cards in inspection report.
- .5 Bolted connections:
 - .1 Inspection shall validate compliance with the requirements of tables 6 and 7 of CSA S16 standard.
- .6 Welded connections:
 - .1 Testing laboratory shall inspect all welds visually. Non-destructive testing are performed following request by the Owner's Representative.
 - .2 Where required, non-destructive tests shall be carried out by mean of: magnetic particle, radiography or ultrasonic testing. Owner's Representative, in collaboration with inspector will determine the method of testing.
- .7 General workmanship:
 - .1 General workmanship and conformity to drawings and specifications requirements shall be reviewed. Evaluation by visual inspection shall determine any non-conformity, with special attention to connections, presence of slotted holes not specifically required, presence of reinforcing members for holes and quality of coatings (paints, galvanization) including touch up.
- .8 The Contractor shall cooperate freely to allow testing by providing all the necessary assistance on site required by the testing laboratory. If an item (welding or bolted connection, column, etc.) is deemed defective by the Owner's Representative, another inspection shall be performed on the elements immediately preceding and following the defective item. The Contractor shall assume costs of additional testing. All corrective work required shall be performed, without charges, to the satisfaction of the Owner's Representative.
- .9 Provide safe access and working areas for testing on site, as required by testing agency and as authorized by Owner's Representative.
- .10 Submit test reports to Owner's Representative within three (3) days of completion of inspection.
- .11 Any element identified as non-compliant shall be corrected and inspected again. When additional inspections are required to validate corrections on non-compliant elements, the Contractor shall assume the cost of inspection.

3.7 FIELD PAINTING

- .1 Touch up damaged surfaces and surfaces without shop coat with primer identical to shop-applied primer, after preparation to SSPC SP 6/NACE No. 3 or SSPC SP 6 (WAB)/NACE WAB-3. Apply in accordance with CAN/CGSB 85.10 and MPI Architectural Painting Specification Manual.

END OF SECTION

Section 05 31 00

Steel Decking

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 03 11 00 – Concrete Forming.
- .2 Section 03 15 00 – Concrete Accessories.
- .3 Section 03 20 00 – Concrete Reinforcing.
- .4 Section 03 30 00 – Cast-in Place Concrete.
- .5 Section 05 12 23 – Structural Steel for Building.
- .6 The Contractor shall obtain a copy of all sections even if they do not pertain directly to his speciality. When bidding, the Contractor agrees implicitly with articles and requirements of all sections in these specifications, including those he might not have read. The Contractor should consult the table of contents of the specifications to be aware of the complete list of sections.

1.2 PRICING AND PAYMENT PROCEDURE

- .1 No measurement shall be made under this Section.
 - .1 Include steel decking in items of structural steel works in section 05 12 00 – Structural Steel for Building.
- .2 Measure steel decking by square meter, computed from areas determined using dimensions indicated on structural documents. Provide different pricing for each type of steel decking.
 - .1 Pricing shall include materials and erection as well as computation, materials and installation of connecting elements.
 - .2 Supply and installation of all elements needed to realize steel decking works will not be measured and are considered part of steel decking works.

1.3 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM A 653/A 653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM A 792/A 792M, Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - .3 ASTM B 633, Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
- .2 Canadian Standards Association (CSA)/CSA International.
 - .1 CSA C22.2 No. 79–16, Cellular metal and cellular concrete floor raceways and fittings.

- .2 CSA S16, Design and construction of steel structures.
- .3 CAN/CSA S136, North American Specification for the Design of Cold Formed Steel Structural Members.
- .4 CSA W47.1, Certification of companies for fusion welding of steel.
- .5 CSA W48, Filler metals and materials for metal arc welding.
- .6 CSA W55.3-08, Certification of companies for resistance welding of steel and aluminium.
- .7 CSA W59, Welded steel construction (Metal arc welding).
- .3 Canadian Sheet Steel Building Institute (CSSBI).
 - .1 CSSBI 10M, Standard for Steel Roof Deck.
- .4 Canadian General Standards Boards (CGSB).
 - .1 CAN/CGSB 1.181-99, Ready-mix Organic Zinc-Rich Coating.
 - .2 CAN/CGSB 85.10-99, Protective Coatings for Metals.
- .5 Notwithstanding the version of the standard mentioned above, it remains the responsibility of the Contractor to consult the most recent version.

1.4 DESIGN CRITERIA

- .1 Steel decking has been computed to resist gravity loads when continuous over three spans. When steel decking must be installed over one or two spans, steel decking manufacturer shall verify resistance of decking and increase thickness if necessary.
- .2 Design steel decking to CAN/CSA S136, and CSSBI 10M, .
- .3 Steel deck and connections to steel framing to carry dead, live, snow and other loads including lateral loads, diaphragm action, composite deck action, and uplift as indicated.
- .4 Deflection under specified live or snow load not to exceed 1/300 of span for roofs, unless otherwise indicated on drawings.
- .5 Where the type of decking does not specifically correspond to the profile indicated on the drawings, the manufacturer shall demonstrate that the resistance of the decking is equivalent to that indicated on the drawings.

1.5 SHOP DRAWINGS

- .1 Submit shop drawings and temporary shoring drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit shop drawings and shoring drawings stamped and signed by professional engineer licensed in the Province of Ontario. A letter stamped and signed by the engineer listing all drawings with applicable revisions and stating that the steel decking and their connections have been designed and reviewed under the engineer's guidance may be provided rather than stamping and signing each individual shop and erection drawing.
- .3 Indicate deck plan, profile, dimensions, base steel thickness, metallic coating designation, connections to supports and spacings, projections, openings, reinforcement details and accessories.

1.6 QUALITY CONTROL

.1 Realize the following activities and submit required documents

ART.	PRESCRIPTIONS	PERIOD (FREQUENCY)	REGISTRY BREAKPOINT / MONITORING	RESPONSIBILITY
3.1.3	Welders and welding company certificate of qualification	At least fourteen (14) days prior to beginning work	Certificate of qualification	Contractor Laboratory
1.5	Shop drawings	At least fourteen (14) days prior to fabrication, per the requirements for shop drawings presentation in the tender documents	Transmission letter Inscription into the shop drawings registry	Contractor
2.1	Technical datasheets of steel decking and related products	At least seven (7) days prior to beginning work, per the requirements for shop drawings presentation in the tender documents	Technical datasheets Inscription into the technical datasheets registry	Contractor

1.7 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal

- .1 Separate waste materials for reuse/recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Collect and separate packaging materials for recycling, in accordance with waste management plan.
- .4 Divert unused metal products to a metal recycling facility approved by the Owner's Representative.
- .5 Divert unused paints material from landfill to an official hazardous material collections site as approved by the Owner's Representative.
- .6 Do not dispose of unused paint materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

Part 2 Products

2.1 MATERIALS

- .1 Galvanized steel sheet: Zinc (Z) coated steel sheet to ASTM A 653/A 653M, structural quality grade 275, with Z275 (G90) coating, 0.76 mm minimum base steel thickness, for exterior surfaces exposed to weather.
- .2 Aluminum-zinc alloy (AZ) coated steel sheet: to ASTM A 792/A 792M structural quality grade 275, with AZM150 (AZ50) coating, 0.91 mm minimum base steel thickness, for exterior surfaces exposed to weather.

- .3 Steel plates: to CSA G40.20/G40.21 350W, yield strength of 350 MPa or to ASTM A 572/A 572M grade 50 (345 MPa);
- .4 Sheet steel: to ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, grade 50 designation SS.
- .5 Closures: as indicated and in accordance with manufacturer's recommendations.
- .6 Cover plates, cell closures and flashings: steel sheet with minimum base steel thickness of 0.91 mm minimum. Metallic coating same as deck material.
- .7 Zinc-rich coating for touch-ups:
 - .1 Use zinc-rich coating to CAN/CGSB 1.181 and ASTM A 780/A 780M containing at least 92 % of metallic zinc in dried coat, brush applied.
 - .2 Approved products:
 - .1 Zinc-paste 70-40 by Metaflux;
 - .2 ZRC 221 by Meta-Plus.
 - .3 Rust-anode by Galvatech2000 (distributor).
 - .4 Zinga by Galvanisation Zinga (distributor).
 - .5 Galvacon by Lanco.
- .8 Welding material: to CSA W48 and CSA W59 certified by the Canadian Welding Bureau (CWB).
- .9 Deck nails: with knurled shank, with 12 mm minimum diameter steel washers, electroplated zinc coating to ASTM B 633, Sc.1, Type III, meeting design requirements of the Steel Deck Institute (SDI) and CSSBI, approved by the Factory Mutual.

Fasteners (deck to support): mechanical fasteners as required by the design.

- .11 Fasteners (deck to deck): Self-tapping screws, as indicated on drawings (gage 10 minimum).

2.2 TYPES OF DECKING

- .1 Steel roof deck: 0.91 mm minimum base steel thickness unless otherwise indicated, 76 mm maximum deep profile, non-cellular, overlapping side laps.
 - .1 Approved products: P-2404 by Canam, RD306 by Vicwest or 3NL-32 GR-50 by Vulcraft.

Part 3 Execution

3.1 GENERAL

- .1 Structural steel work: in accordance with CAN/CSA S136, and CSSBI 10M.
- .2 Welding: in accordance with CSA W59.
- .3 Companies to be certified under Division 1 or 2 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components or both as applicable. Part of the work may be sublet to a division 3 fabricator or erector; however, the Division 1 or 2 fabricator or erector shall retain responsibility for the sublet work.

3.2 ERECTION

- .1 Erect steel deck as indicated and in accordance with CAN/CSA S136, CSSBI 10M and CSSBI 12M and in accordance with reviewed erection drawings
- .2 Lap ends: lap deck ends over 50 mm minimum, except on top of composite beams where deck shall not lap, unless otherwise indicated.
- .3 Immediately after deck is permanently secured in place, touch up metallic coated top surface with compatible primer where burned by welding.

3.3 FASTENING

- .1 Secure the decking in accordance with the design requirements, utilizing the Hilti DX system as specified in the following articles.:
 - .1 Top flange or chord 3 to 10 mm thick: X-HSN 24 nails.
 - .2 Top flange 6 mm or thicker: X-ENP-19 L15 nails.
 - .3 Alternatively, choose one of the two types of nails presented above as determined by performing test fastenings on the work site prior to installation of decking, under supervision of the fastener manufacturer's technical representative.
- .4 Installers shall be trained and certified by fastener manufacturer's representative on the general use of powder actuated technology and fastening guidelines for the attachment of steel deck.
- .2 Locate fasteners so that clearances to edge of steel, end of decking panels, and the side of deck troughs meet fastener and deck manufacturer's guidelines.
- .3 Ensure that nail heads standoffs measurements meet fastener manufacturer's recommendations.
- .4 Unless otherwise indicated, fasten steel deck to supports using fasteners at 300 mm on center maximum and 150 mm maximum on the perimeter of building.

3.4 CLOSURES

- .1 Provide and install angle or folded plate around the entire periphery of floors and roofs as required to support the decking.
- .2 Install closures in accordance with approved details.
- .3 Install closures and accessories required to allow concreting over composite floor decking, following manufacturer's recommendations.

3.5 OPENINGS AND AREAS OF CONCENTRATED LOADS

- .1 No reinforcement required for openings cut in deck which are smaller than 150 mm square, unless otherwise indicated.
- .2 Frame deck openings with any one dimension between 150 to 300 mm as recommended by manufacturer, except as otherwise indicated.
- .3 Openings are not necessarily shown on structural drawings. Examine other trades (architectural, mechanical, electrical, etc.) drawings to obtain dimensions and location of openings not shown on drawings.

3.6 CONNECTIONS

- .1 Install connections in accordance with CSSBI recommendations as indicated
- .2 Touch up damaged and unpainted surfaces with paint to CAN/CGSB 1.181. Apply in accordance with manufacturer's recommendations and CAN/CGSB 85.10 standard. For galvanized deck, use zinc-rich coating to CAN/CGSB 1.181 and ASTM A 780/A 780M as indicated in article 2.1.9 of this section

END OF SECTION

Section 05 50 00 Metal Fabrications

Part 1 General

1.1 REFERENCE STANDARDS

- .1 ASTM International (ASTM)
 - .1 ASTM A 53/A 53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A269M-15a, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - .3 ASTM A307-14, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 CSA Group (CSA)
 - .1 CSA G40.20-13 /G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CSA S16-14, Design of Steel Structures.
 - .4 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
 - .5 CSA W59-13, Welded Steel Construction (Metal Arc Welding) Metric.
- .3 Green Seal Environmental Standards (GS)
 - .1 GS-11-2011, Paints and Coatings.
- .4 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual - current edition.
- .5 ULC Standards (ULC)
 - .1 UL 2768-2011, Architectural Surface Coatings.
 - .2 UL 2760-2011, Surface Coatings - Recycled Water-borne.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for all 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 Ontario, Canada.

.2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

1.3 QUALITY ASSURANCE

.1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

.2 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 - Common Product Requirements.

.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 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return of packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

.1 Steel sections and plates: to CSA G40.20/G40.21, Grade 300W.

.2 Welding materials: to CSA W59.

.3 Welding electrodes: to CSA W48 Series.

.4 Bolts and anchor bolts: to ASTM A307.

.5 Stainless steel (SS) to be type 304 (18-8), brushed S finish

.1 18 GA. for shelves, bent per drawings

.2 20 GA. for bases

.3 base to be scribed on site to suit floor conditions

.6 Steel supports for hood enclosures

.1 50mm x 50mm steel HSS

.7 Handrail

.1 40 x 40 HSS c/w welded mitred corners, steel base plate

.2 Painted finish

.8 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 flat headed screws on items requiring assembly by screws or as indicated.
- .3 Where possible, fit and shop assemble work, ready for erection.
- .4 Exposed welds 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/m² to CAN/CSA-G164.
- .2 Chromium plating: chrome on steel with plating sequence of 0.009 mm thickness of copper 0.010 mm thickness of nickel and 0.0025 mm thickness of chromium.
- .3 Shop coat primer: MPI- 5.1B.
- .4 Zinc primer: zinc rich, ready mix to MPI-INT 5.2C in accordance with chemical component limits and restrictions requirements and VOC limits of ???.

2.4 ISOLATION COATING

- .1 Isolate aluminum from following components, by means of bituminous paint:
 - .1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.
 - .2 Concrete, mortar and masonry.
 - .3 Wood.

2.5 SHOP PAINTING

- .1 Primer: VOC limit 250 g/L maximum to UL 2768.
- .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. Paint when temperature minimum 7 degrees C.
- .4 Clean surfaces to be field welded; do not paint.

2.6 ANGLE LINTELS

- .1 Steel angles: prime painted, sizes indicated for openings. Provide 150 mm minimum bearing at ends.
- .2 Weld or bolt back-to-back angles to profiles as indicated.
- .3 Finish: shop painted.
 - .1 Primer: VOC limit 250 g/L maximum to GS-11 when applied onsite.

2.7 PIPE RAILINGS

- .1 Stainless Steel pipe: refer to drawings nominal outside diameter, formed to shapes and sizes as indicated.

2.8 ACCESS LADDERS

- .1 Stringers: x x mm thick,
- .2 Steel Rungs:, welded to stringers at mm on centre.
- .3 Brackets: sizes and shapes as indicated, weld to stringers at mm on centre, complete with fixing anchors.
- .4 Galvanize finish for exterior, prime paint for interior.
- .5 Galvanize exterior ladders after fabrication.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts acceptable for metal fabrications installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions remedied and after receipt of written approval to proceed from Consultant.

3.2 ERECTION - GENERAL

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage acceptable to Consultant such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .4 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .5 Supply components for work by other trades in accordance with shop drawings and schedule.
- .6 Weld field connection and Make field connections with bolts to CSA S16 as per indicated.
- .7 Deliver items over for casting into concrete and building into masonry together with setting templates to appropriate location and construction personnel.
- .8 Touch-up rivets, field welds, bolts and burnt or scratched surfaces with primer after completion of:
 - .1 Primer: maximum VOC limit 250 g/L to GS-11.
- .9 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 00 - Cleaning.
 - .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 00 - Cleaning.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.
.2 Repair damage to adjacent materials caused by metal fabrications installation.

END OF SECTION

Section 06 10 53

Miscellaneous Rough Carpentry

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American National Standards Institute/National Particleboard Association (ANSI/NPA)
 - .1 ANSI/NPA A208.1-2009 Particleboard.
- .2 ASTM International
 - .1 ASTM A123/A123M-15, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .2 ASTM A153/A153M-09 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - .3 ASTM A307-14 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength.
 - .4 ASTM A653/A653M-15, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .5 ASTM D 5055-13e1, Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.
 - .6 ASTM D 5456-14b, Standard Specification for Evaluation of Structural Composite Lumber Products.
 - .7 ASTM F1667-13 Standard Specification for Driven Fasteners: Nails, Spikes and Staples.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-11.3-M87, Hardboard.
 - .2 CAN/CGSB-71.26-M88, Adhesive for Field-Gluing Plywood to Lumber Framing for Floor Systems.
- .4 Canadian Wood Council
 - .1 Wood Design Manual 2010 (R2014) Edition
 - .2 Engineering Guide for Wood Frame Construction 2014
- .5 CSA Group (CSA)
 - .1 CAN/CSA-A123.2-03 (R2013), Asphalt Coated Roofing Sheets.
 - .2 CSA B111-1974 (R2003), Wire Nails, Spikes and Staples.
 - .3 CSA O86-14 Engineered Design in Wood
 - .4 CSA O112.9-10, Evaluation of Adhesives for Structural Wood Products (Exterior Exposure).
 - .5 CSA O121-08 (R2013), Douglas Fir Plywood.
 - .6 CSA O141-05 (R2014), Softwood Lumber.

- .7 CSA O151-09 (R2014), Canadian Softwood Plywood.
- .8 CSA O153-13, Poplar Plywood.
- .9 CSA O325-07 (R2012), Construction Sheathing.
- .10 CAN/CSA-S406-92 (R2008), Construction of Preserved Wood Foundations.
- .11 CAN/CSA-Z809-08, Sustainable Forest Management.
- .6 Forest Stewardship Council (FSC)
 - .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.
- .7 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2010.
- .8 National Research Council Canada (NRC)
 - .1 National Building Code of Canada 2015 (NBC).
- .9 South Coast Air Quality Management District (SCAQMD), California State (SCAQMD)
 - .1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.
- .10 Sustainable Forestry Initiative (SFI)
 - .1 SFI-2015-2019 Standard.
- .11 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S706-09, Standard for Wood Fibre Insulating Boards for Buildings.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for wood products and accessories and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Include manufacturer's pre-engineered floor, ceiling and roof joist span charts, and manufacturer's pre-engineered installation details.
 - .3 Submit certified test reports for prefabricated structural members from approved independent laboratory indicating compliance with specifications for specified performance characteristics and physical properties.
 - .4 Submit CCMC Product Evaluation Report for engineered wood products.
 - .5 Submit manufacturer's installation instructions.
- .3 Shop Drawings:
 - .1 For structural applications or conditions beyond the scope of the manufacturer's pre-engineered design information, submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Include on drawings:
 - .1 Design data in accordance with CAN/CSA-O86 and CWC Engineering Guide for Wood Frame Construction.

- .2 Indicate configuration and spacing of joists, hanger and connector types, fasteners, locations and design values; bearing details.
- .3 Submit stress diagrams or print out of computer design indicating design loads for members. Indicate allowable load and stress increase.
- .4 Indicate arrangement of webs or other members to accommodate ducts and other specialties.

1.3 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .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 materials off ground with moisture barrier at both ground level and as a cover forming a well-ventilated enclosure, with drainage to prevent standing water.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 FURRING AND BLOCKING

- .1 Furring, blocking, nailing strips, grounds, rough bucks, cants, curbs, fascia backing and sleepers:
 - .1 Board sizes: "Standard" or better grade.
 - .2 Dimension sizes: "Standard" light framing or better grade.
 - .3 Post and timbers sizes: "Standard" or better grade.
- .2 Where indicated, provide pressure treated materials for furring, blocking, nailing strips, grounds, rough bucks, cants, curbs, fascia backing and sleepers

2.2 PANEL MATERIALS AND APPLICATION

- .1 Electrical equipment mounting boards:
 - .1 Plywood, DFP, CSP or PP, square edge 19mm thick.
 - .2 Fire retardant treated.
- .2 Plywood blocking
 - .1 Where indicated on drawings
 - .2 Plywood, DFP, CSP or PP square edge 19mm thick.
 - .3 Fire retardant treated

2.3 ACCESSORIES

- .1 General purpose adhesive: to CSA O112.9.

- .2 Nails, spikes and staples: to ASTM F1667.
- .3 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.
- .4 Fastener Finishes:
 - .1 Galvanizing: to ASTM A653, use galvanized fasteners for exterior work.
 - .2 Plated finish: use cadmium plated fasteners for interior work.

Part 3 Execution

3.1 FURRING AND BLOCKING

- .1 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding electrical equipment mounting boards, and other work as required.
- .2 Install furring to support siding applied vertically where there is no blocking and where sheathing is not suitable for direct nailing.
 - .1 Align and plumb faces of furring and blocking to tolerance of 1:600.
- .3 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.
- .4 Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using galvanized fasteners.

3.2 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .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 00 - Cleaning.

3.3 WASTE MANAGEMENT

- .1 Separate waste materials for reuse or recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
- .2 Re-use scrap lumber to the greatest extent possible. Separate scrap lumber for use on site as accessory components, including: shims, bracing, and blocking.
- .3 Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill. Prevent saw dust and wood shavings from entering the storm drainage system.
- .4 Do not burn scrap lumber that has been pressure treated.
- .5 Do not send lumber treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.

3.4 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by rough carpentry installation.

END OF SECTION

Section 06 20 00

Finish Carpentry

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 06 10 53 Miscellaneous Rough Carpentry
- .2 Section 09 91 23 Interior Painting: Site finishing for finish carpentry.
- .3 Section 07 92 00 Joint Sealants

1.2 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI)
 - .1 ANSI A208.1-09, Particleboard.
 - .2 ANSI A208.2-09, Medium Density Fibreboard (MDF) for Interior Applications.
 - .3 ANSI/HPVA HP-1-10, American National Standard for Hardwood and Decorative Plywood.
 - .4 ANSI/BHMA A156.16 Auxiliary Hardware.
 - .5 ANSI/ASME 18.6.1 1981 (R2012) Wood Screws (Inch Series).
- .2 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)
 - .1 Architectural Woodwork Quality Standards, 2nd edition, 2014.
- .3 ASTM International
 - .1 ASTM A 153/A 153M-16, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - .2 ASTM E1333-14 Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber.
 - .3 ASTM F1667-13 Standard Specification for Driven Fasteners: Nails, Spikes and Staples.
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-11.3-M87, Hardboard.
- .5 CSA Group (CSA)
 - .1 CSA O121-08 (R2013), Douglas Fir Plywood.
 - .2 CSA O151-09 (R2014), Canadian Softwood Plywood.
 - .3 CSA O153-M13, Poplar Plywood.
 - .4 CAN/CSA-Z809-08 (R2013), Sustainable Forest Management.
- .6 Forest Stewardship Council (FSC)
 - .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

- .7 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (SDS).
- .8 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.
- .9 Sustainable Forestry Initiative (SFI)
 - .1 SFI-2015-2019 Standard.
- .10 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S104-10, Standard Method for Fire Tests of Door Assemblies.
 - .2 CAN/ULC-S105-09, Standard Specification for Fire Door Frames.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature, data sheets and catalogue pages for specified products. Include product characteristics, performance criteria, dimensions and profiles, finish and limitations on use.
- .3 Shop Drawings:
 - .1 Indicate profiles and dimensions, assembly techniques, jointing, methods of fastening, terminations and other related details.
 - .2 Indicate materials, thicknesses, finishes and hardware.
 - .3 Where necessary, show location and type of blocking and backing required within supporting assemblies.
- .4 Samples:
 - .1 Submit duplicate 300 mm x 300 mm long representative samples of all wood and wood veneer finishes
 - .2 Applied coating samples:
 - .1 For transparent finish, submit duplicate samples of each species and cut of wood veneer to be used, finished as specified.
- .5 Certifications: submit certificates signed by manufacturer certifying materials comply with specified performance characteristics, physical properties and requirements of referenced standards.

1.4 QUALITY ASSURANCE

- .1 Perform Work of this Section by finish carpentry contractor with minimum 5 years of current experience and having completed minimum one project in the past 5 years with value within 20% of the cost of the work of this Section.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with AWS recommendations and as follows.

- .2 Deliver finish carpentry materials only when area of work is enclosed, plaster and concrete work is dry, area is broom clean and site environmental conditions are acceptable for installation.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Maintain indoor temperature and humidity within range recommended by AWS for location of the Work.
 - .3 Store products on site as specified for minimum 72 hours prior to installation.
 - .4 Store and protect finish carpentry products from moisture, nicks, scratches, and blemishes.
 - .5 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 MDF (medium density fibreboard) core: to ANSI A208.2, density 769 kg/m³, 19 mm thick unless indicated otherwise.
 - .1 Use moisture resistant MR grade for countertops and splash-backs to receive plumbing fixtures.
- .2 Interior mat-formed wood particleboard: to ANSI/NPA A208.1, industrial grade M-2 or M-3, medium density (640-800 kg/m³), thickness 19 mm unless indicated otherwise.
 - .1 Use moisture resistant grade 2-M-2 or 2-M-3 for countertops and splash-backs to receive plumbing fixtures.
- .3 Douglas fir plywood (DFP): to CSA O121, standard construction.
- .4 Canadian softwood plywood (CSP): to CSA O151, standard construction.
- .5 Hardwood plywood: to ANSI/HPVA HP-1.
- .6 Poplar plywood (PP): to CSA O153, standard construction.
- .7 Hardboard: to CAN/CGSB-11.3.
- .8 Low density fibreboard: to CSA-A247M.

2.2 FLAME SPREAD RATING OF WOOD FINISHES

- .1 Where wood material is used for wall finishes construction, the Flame Spread rating must be 150 or less on any exposed surface, or any surface that would be exposed by cutting through the material in any direction, unless noted otherwise. Use fire retardant spray to meet flame spread ratings required .
- .2 Where wood material is used in ceiling construction, the Flame Spread rating must be 25 or less on any exposed surface, or any surface that would be exposed by cutting through the material in any direction, unless noted otherwise. Use fire retardant spray to meet flame spread ratings required.
- .3 To achieve the above noted Flame Spread Rating, all the associated wood materials are to be finished with:

- .1 Manufacturer: The Sansin Corporation
- .2 coats of Firestop 99 and 1 final coat of Resolution
- .3 All materials are to be applied as per manufacturer's specifications.
- .4 Colour/Tint: Custom tint to be selected by architect from samples as requested.
- .5 Provide finished samples of the wood material finished with the above noted system for review prior to proceeding with full scope of work.
- .6 Alternates can be submitted for review and must be accepted by the architect prior to use.

2.3 FASTENINGS

- .1 Provide screws, bolts, expansion shields and other fastening devices required for satisfactory installation.
- .2 Exposed fasteners to match finish of hardware.
- .3 Nails and staples: to ASTM F1677, stainless steel galvanized to ASTM A 153/A 153M for exterior work, interior humid areas; stainless steel finish elsewhere.
- .4 Wood screws: to ANSI/ASME 18.6.1, countersunk flush type unless indicated otherwise, in sizes to suit application, galvanized to ASTM A 153/A 153M for exterior work, interior humid areas, stainless steel for other locations.
- .5 Splines: metal wood.
- .6 Panel adhesive: in accordance with Section 07 92 00 - Joint Sealants and as recommended by manufacturer.
 - .1 VOC limit 250 g/L maximum to GS-36.
 - .2 Use least toxic sealants, adhesives, sealers, and finishes necessary to comply with requirements of this section.

2.4 HARDWARE

- .1 Use one manufacturer's product for all similar items.
- .2 Hardware fastenings:
 - .1 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation of hardware.
 - .2 Exposed fastening devices to match finish of hardware.
 - .3 Use fasteners compatible with material through which they pass.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for wood products installation in accordance with AWS tolerances and requirements of Contract Documents.
 - .1 Visually inspect substrate.
 - .2 Proceed with installation only after unacceptable conditions have been remedied
 - ..

3.2 PREPARATION

- .1 Back prime woodwork before installation, to AWS.

3.3 INSTALLATION

- .1 Install items of finish carpentry in accordance with AWMAC AWS grade specified for respective items.
- .2 In case of conflict between Contract Documents and AWS grade requirements, Contract Documents govern.
- .3 Install items of finish carpentry at locations shown on drawings.
 - .1 Position accurately, level, plumb straight.
 - .2 Fasten and anchor securely.
- .4 Scribe and cut as required, fit to abutting walls, and surfaces, fit properly into recesses and to accommodate piping, columns, fixtures, outlets, or other projecting, intersecting or penetrating objects.
- .5 Form joints to conceal shrinkage.

3.4 CONSTRUCTION

- .1 Fastening:
 - .1 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.
 - .2 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.
 - .3 Set finishing nails to receive filler. Where screws are used to secure members, countersink screw in round smooth cut hole and plug with wood plug to match material being secured.
 - .4 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.
- .2 Panelling:
 - .1 Secure panelling and perimeter trim using adhesive recommended for purpose by manufacturer. Fill nail holes caused by temporary fixing with filler matching wood in colour.
 - .2 Secure panelling and perimeter trim using concealed fasteners.
 - .3 Secure panelling and perimeter trim using counter sunk screws plugged with matching wood plugs.
- .3 Shelving:
 - .1 Install shelving on ledgers.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .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 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

3.6 TOUCHUP AND PROTECTION

- .1 Fill and retouch all nicks, chips and scratches in factory finishes and substrate materials to AWS standards. Replace damaged items that cannot be repaired to AWS standards.
- .2 Protect installed products and components from damage during construction.
- .3 Repair damage to adjacent materials caused by finish carpentry installation.
- .4 Leave work to be site finished ready for finishing by Section 09 91 23 - Interior Painting.

END OF SECTION

Section 06 40 00 Architectural Woodwork

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI)
 - .1 ANSI/ASME 18.6.1 1981 (R2012) Wood Screws (Inch Series).
 - .2 ANSI/BHMA A156.9-2010, Cabinet Hardware.
 - .3 ANSI/BHMA A156.11-2014, Cabinet Locks.
 - .4 ANSI/BHMA A156.16-2013, Auxiliary Hardware.
 - .5 ANSI/BHMA A156.18-2012, Materials and Finishes.
 - .6 ANSI/BHMA A156.20-2006, Strap and Tee Hinges and Hasps.
 - .7 ANSI A208.1-09, Particleboard.
 - .8 ANSI A208.2-09, Medium Density Fiberboard (MDF) for Interior Applications.
 - .9 ANSI/HPVA HP-1-10, Standard for Hardwood and Decorative Plywood.
- .2 Architectural Woodwork Manufacturers Association of Canada (AWMAC)
 - .1 Architectural Woodwork Standards (AWMAC AWS), 2014.
- .3 ASTM International
 - .1 ASTM A 153/A 153M-16, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - .2 ASTM E 1333-14, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates From Wood Products Using a Large Chamber.
 - .3 ASTM F1667-13 Standard Specification for Driven Fasteners: Nails, Spikes and Staples.
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-11.3-M87, Hardboard.
 - .2 CAN/CGSB-71.20-M88, Adhesive, Contact, Brushable.
 - .3 CAN/CGSB-71.19-M88, Adhesive, Contact, Sprayable.
- .5 CSA Group (CSA)
 - .1 CSA O112-M Series 1977 (R2006) Standards for Wood Adhesives.
 - .2 CSA O121-08 (R2013), Douglas Fir Plywood.
 - .3 CSA O141-05 (R2014), Softwood Lumber.
 - .4 CSA O151-14, Canadian Softwood Plywood.
 - .5 CSA O153-M1980 (R2014), Poplar Plywood.

- .6 CAN/CSA-Z809-08 (R2013), Sustainable Forest Management.
- .6 Forest Stewardship Council (FSC)
 - .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.
- .7 Green Seal Environmental Standards (GS)
 - .1 GS-11-2015, Paints, Coatings, Stains and Sealers.
 - .2 GS-36-2013, Adhesives for Commercial Use.
- .8 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (SDS).
- .9 National Electrical Manufacturers Association (NEMA)
 - .1 ANSI/NEMA LD-3-05, High-Pressure Decorative Laminates (HPDL).
- .10 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1113-A2011, Architectural Coatings.
 - .2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.
- .11 Sustainable Forestry Initiative (SFI)
 - .1 SFI-2015-2019 Standard and Rules.

1.2 PRE-INSTALLATION MEETING

- .1 Prior to enclosing framing, convene a meeting of contractor, casework fabricator, casework installer, framing subcontractor and Consultant.
 - .1 Review locations of backing required for casework installation as shown on shop drawings and as necessary for installation.
 - .2 Review method of attachment for backing to wall system.
 - .3 Review coordination with other affected sections.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Prepare and submit material list in accordance with AWMAC AWS, cross-referenced to specifications.
 - .2 Include manufacturer's instructions, printed product literature, data sheets and catalogue pages for all materials and products to be incorporated into architectural wood casework and include product characteristics, performance criteria, dimensions and profiles, finish and limitations on use.
- .3 Hardware List:
 - .1 Include manufacturer's specification sheets indicating name, model, material, function, finish, BHMA designations and other pertinent information.
- .4 Shop Drawings:

- .1 Prepare and submit shop drawings in accordance with AWMAC AWS and as follows.
- .2 Indicate details of construction, profiles, jointing, fastening and other related details.
- .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.
- .5 Show location on casework elevations of backing required in supporting structure for attachment of casework.
- .6 Include color schedule of all casework items, including all countertop, exposed, and semi-exposed cabinet finishes, finish material manufacturer, pattern, and color.

.5 Samples:

- .1 Apply sample finishes to specified substrate or core material minimum 300 x 300 mm . For veneers with transparent finish submit three samples to illustrate range and colour of grain expected.
- .2 Shop applied coatings:
 - .1 For transparent finish, submit duplicate samples of each species and cut of wood to be used, finished as specified.
 - .2 For opaque finish, submit duplicate samples for each colour selection, finished as specified.
- .3 Submit duplicate samples of laminated plastic for each specified colour selection.
- .4 Certifications: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.4 QUALITY ASSURANCE

- .1 Perform Work of this Section by single architectural wood casework fabricator with minimum 5 years of current architectural casework production experience and having completed minimum one project in the past 5 years with value within 20% of the cost of the work of this Section.
- .2 Mock-ups:
 - .1 Construct mock-ups in accordance with Section 01 45 00 - Quality Control.
 - .2 When accepted, mock-up will demonstrate minimum standard for Work.
 - .3 Do not proceed with work prior to receipt of written acceptance of mock-up by Consultant.
 - .4 Accepted mock-up may not remain as part of finished work.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

- .2 Deliver wood casework only when area of work is enclosed, plaster and concrete work is dry, and area is broom clean and site environmental conditions are acceptable for installation.
- .3 Protect millwork against dampness and damage during and after delivery.
- .4 Store millwork in ventilated areas, protected from extreme changes of temperature and humidity, and within range recommended by AWMAC AWS for location of project.
- .5 Store materials indoors in clean, dry, well-ventilated area.
- .6 Protect architectural woodwork and hardware from nicks, scratches, and blemishes.
- .7 Replace defective or damaged materials with new.

Part 2 Products

2.1 QUALITY GRADE

- .1 Provide all materials and perform all fabrication in accordance with AWMAC AWS Premium Grade

2.2 FINISHES

- .1 Casework Finish - Wood (WD) and Wood Veneer (WV)
 - .1 Species: White birch.
- .2 Metal (MTL) and Stainless steel (SS)
 - .1 Refer to 05 50 00 Metal Fabrications

2.3 LUMBER

- .1 Softwood and Hardwood Lumber: Sound lumber to specified AWMAC AWS quality grade requirements, kiln-dried to moisture content recommended by AWMAC AWS for location of the Work.
- .2 Machine stress-rated lumber is acceptable for all purposes.

2.4 PANEL MATERIALS

- .1 MDF (medium density fibreboard) core: to ANSI A208.2, density 769 kg/m³, Grade premium, 19 mm thick unless indicated otherwise
 - .1 Medium density fibreboard performance requirements to: ANSI A208.2.
 - .2 MDF resin to contain no added urea-formaldehyde.
 - .3 Fire Retardant MDF: 19mm thick typical unless otherwise indicated. Acceptable product: Purekor FSC Pyroblock MDF Plus. Contact Glen Lowe (Panel Source) 1-780-458-1007. email: lowe.glen@panelsource.net
- .2 Canadian softwood plywood (CSP): to CSA O151, standard construction.
 - .1 Plywood resin to contain no added urea-formaldehyde.
 - .2 Fire Retardant Plywood: veneer core, softwood, 19mm thick typical unless otherwise indicated. Acceptable product: Purekor FCS Fire Retardant Plywood. Contact Glen Lowe (Panel Source) 1-780-458-1007, email lowe.glen@panelsource.net

.3 Hardboard: To CAN/CGSB-11.3.

2.5 FASTENERS AND ADHESIVES

- .1 Nails and staples: to CSA B111.
- .2 Screws: stainless steel, type and size to suit application.
- .3 Splines: metal.
- .4 Sealant: in accordance with Section 07 92 00 - Joint Sealants, type one part silicone: CAN /CGSB-19.22-M89.
 - .1 Sealants: VOC limit 250 g/L maximum to SCAQMD Rule 1168.
- .5 Laminated plastic adhesive:
 - .1 Adhesives: VOC limit 30 g/L maximum to GS-36.
 - .2 Use least toxic sealants, adhesives, sealers, and finishes necessary to comply with requirements of this section.
 - .3 Clear Wood Finishes: VOC limit 350 g/L maximum to GS-11
 - .4 Paints: VOC limit 50 g/L maximum to SCAQMD Rule 1113.

2.6 FABRICATION

- .1 Set nails and countersink screws apply stained wood filler to indentations, sand smooth and leave ready to receive finish.
- .2 Obtain all on-Site dimensions before fabricating items. Obtain all relevant data and incorporate provisions for items of equipment enclosed by millwork.
- .3 Verify wall alignment prior to proceeding with fabrication. Site conditions at variance with reviewed shop drawings shall be specifically noted on reviewed drawings and forwarded to Consultant. Variances, due to Site conditions necessitating revisions to shop drawings shall be accepted prior to fabrication.
- .4 Fabricate running members in maximum standard lengths obtainable for the particular species wherever possible.
- .5 Fit all joints tight. Locate joints at points which will not interfere with, affect strength or detract from appearance of materials.
- .6 Securely fasten intersecting framing members together at corners in an approved manner. Reinforce as required for rigid assembly designed for applicable loads.
- .7 Incorporate adequate provisions for scribing and fitting to adjoining surfaces in a manner acceptable to Consultant.
- .8 Provide for and incorporate provisions to recognize inherent shrinkage characteristics of materials specified.
- .9 Casework core material: 19 mm veneer core plywood unless otherwise noted.
- .10 Casework edge trim: Plastic laminate with plastic laminate millwork
- .11 Shelving to cabinetwork to be adjustable unless otherwise noted.
- .12 Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes and other fixtures.

- .13 Shop assemble work for delivery to site in size easily handled and to ensure passage through building openings.
- .14 Obtain governing dimensions before fabricating items which are to accommodate or abut appliances, equipment and other materials.
- .15 Ensure adjacent parts of continuous laminate work match in colour and pattern.
- .16 Veneer laminated plastic to core material in accordance with adhesive manufacturer's instructions. Ensure core and laminate profiles coincide to provide continuous support and bond over entire surface. Use continuous lengths up to 3000mm. Keep joints 600 mm from sink cutouts.
- .17 Form shaped profiles and bends as indicated, using postforming grade laminate to laminate manufacturer's instructions.
- .18 Use straight self-edging laminate strip for flatwork to cover exposed edge of core material. Chamfer exposed edges uniformly at approximately 20 degrees. Do not mitre laminate edge
- .19 Apply laminate backing sheet to reverse side of core of plastic laminate work.
- .20 Apply laminated plastic liner sheet to interior of cabinetry.

2.7 CABINET HARDWARE

- .1 Hinges: Concealed Blum 110 degree or approved alternate
- .2 Drawer Glides: Accuride #2037 Steel Roller Glides, Full Extension or approved alternate
- .3 Millwork Cabinet Locks: Corbin 02067 x 7/8 x125 C15 or approved alternate.
- .4 Millwork Cabinet and drawer D Pulls: Richelieu 0141 - functional Stainless steel pull
- .5 Adjustable Shelf Pins/Ferrules: Richelieu no. 2291180 & 2292180 nickel finish at 2" centres or approved alternate
- .6 Bumpers: Richelieu 3M - Peel & Stick (2 per door) or approved alternate

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 instructions.
 - .1 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied

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3.2 INSTALLATION

- .1 Install architectural wood casework in accordance with AWMAC AWS grade for respective items.
- .2 Install prefinished millwork at locations shown on drawings.
 - .1 Position accurately, level, plumb straight.

- .3 Fasten and anchor millwork securely.
 - .1 Supply and install heavy duty fixture attachments for wall mounted cabinets.
- .4 Countersink mechanical fasteners at exposed and semi-exposed surfaces, excluding installation attachment screws and screws securing cabinets end to end.
- .5 Use draw bolts in countertop joints.
- .6 Scribe and cut as required to fit abutting walls and to fit properly into recesses and to accommodate piping, columns, fixtures, outlets or other projecting, intersecting or penetrating objects.
- .7 At junction of counter and adjacent wall finish, apply small bead of sealant in accordance with Section 07 92 00 - Joint Sealants.
- .8 Apply moisture barrier between wood framing members and masonry or cementitious construction.
- .9 Fit hardware accurately and securely in accordance with manufacturer's written instructions.
- .10 Make cutouts for inset equipment and fixtures using templates provided.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .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 00 - Cleaning.
 - .1 Clean millwork.
 - .2 Remove excess glue, pencil and ink marks from surfaces.
- .3 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

3.4 PROTECTION

- .1 Protect millwork from damage until final inspection.
- .2 Protect installed products and components from damage during construction.
- .3 Repair damage to adjacent materials caused by architectural woodwork installation.

3.5 SCHEDULES

- .1 M1 - Classroom Control Panel (CP): plastic laminate finish: colour to be selected from standard solid colours - Pionite, Formica or Wilsonart.
- .2 M2 - Open shelving: White birch wood veneer on plywood complete with 3mm solid wood edging.

END OF SECTION

Section 07 21 16 Blanket Insulation

Part 1 General

1.1 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM C553-13, Standard Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.
 - .2 ASTM C665-12, Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - .3 ASTM C1320-10, Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.
- .2 CSA Group
 - .1 CSA B111-1974 (R2003), Wire Nails, Spikes and Staples.
 - .2 CSA B149 PACKAGE-10, Consists of B149.1, Natural Gas and Propane Installation Code and B149.2, Propane Storage and Handling Code.
- .3 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S604-2012, Standard for Factory-Built Type A Chimneys.
 - .2 CAN/ULC-S702-2012, Standard for Mineral Fibre Insulation for Buildings.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for blanket insulation and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Certificates:
 - .1 Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .4 Test Reports:
 - .1 Submit certified test reports showing compliance with specified performance characteristics and physical properties.
- .5 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 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 specified materials from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .2 Packaging Waste Management: remove for reuse and return of packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 INSULATION

- .1 Batt and blanket mineral fibre: to CAN/ULC-S702.
 - .1 Type: 1.
 - .2 Thickness: as indicated on drawings.

2.2 ACCESSORIES

- .1 Insulation clips:
 - .1 Impale type, perforated 50 x 50 mm cold rolled carbon steel 0.8 mm thick, adhesive back, spindle of 2.5 mm diameter annealed steel, length to suit insulation, 25 mm diameter washers of self locking type.
- .2 Nails: galvanized steel, length to suit insulation plus 25 mm, to CSA B111.
- .3 Staples: 12 mm minimum leg.
- .4 Tape: as recommended by 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 blanket insulation application in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant.
 - .2 Inform Consultant 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 Consultant.

3.2 INSULATION INSTALLATION

- .1 Install insulation to maintain continuity of thermal protection to building elements and spaces and to ASTM C1320.
- .2 Install insulation with factory applied vapour barrier facing warm side of building spaces and vapour permeable membrane facing cold side. Lap ends and side flanges of membrane over framing members. Retain in position with insulation clips installed as

recommended by manufacturer. Tape seal butt ends and lapped side flanges. Do not tear or cut vapour barrier.

- .3 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
- .4 Do not compress insulation to fit into spaces.
- .5 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls of CAN/ULC-S604 Type A chimneys.
- .6 Do not enclose insulation until it has been inspected and approved by Consultant.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .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 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Section 07 81 00 Applied Fire Protection

Part 1 General

1.1 REFERENCE STANDARDS

- .1 ASTM International (ASTM):
 - .1 ASTM E605/E605M-19, Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members
 - .2 ASTM E736/E736M-17, Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members
 - .3 ASTM E859/E859M-93, Standard Test Method for Air Erosion of Sprayed Fire-Resistive Materials (SFRMs) Applied to Structural Members
 - .4 ASTM G21-15, Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS):
 - .1 Safety Data Sheets (SDS)
- .3 ULC Standards (ULC):
 - .1 CAN/ULC-S101-14, Standard Methods of Fire Endurance Tests of Building Construction and Materials
 - .2 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies
 - .3 ULC List of Equipment and Materials

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Meetings: Hold meeting one week before beginning Work of this Section with the Contractor, Subcontractor and Consultant in accordance with Section 01 31 19 – Project Meetings to
 - .1 verify Project requirements,
 - .2 review site conditions and substrate conditions,
 - .3 coordinate with other Subcontractors, and
 - .4 review manufacturer's application instructions and warranty requirements.
- .2 Before start of work, arrange a site visit with the Consultant to examine the existing site conditions adjacent to demolition work.
- .3 Coordination:
 - .1 Coordinate with Subcontractor's responsible for steel and concrete surfaces to ensure accordance with manufacturer's minimum surface preparation requirements for bond surface being free from wax, grease, incompatible primer, or other deleterious materials that could affect bond of materials specified in this Section.

- .2 Coordinate installation of hangers, inserts, clips and similar items to surfaces needing protection before applying sprayed fire-resistive materials.
- .3 Prohibit all roof traffic until application of fireproofing is completed and dry.
- .4 Sequencing:
 - .1 Ducts, piping and other items that would interfere with the application of fireproofing shall not be installed, until application is completed.
 - .2 Install steel decks and associated concrete work on decks before applying fireproofing to steel decks.
 - .3 Install complete roofing, rooftop mechanical units, and related work on the roof before applying fireproofing to roof decks.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's product data and include product characteristics, performance criteria, dimensions, finishes, and limitations.
 - .2 Submit one electronic copy of WHMIS SDS - Safety Data Sheets.
- .3 Samples:
 - .1 Submit duplicate 300 x 300-mm samples of exposed fireproofing for approval of texture and colour.
- .4 Quality Assurance Submittals: Submit the following in accordance with Section 01 43 00 - Quality Assurance.
 - .1 Test Reports:
 - .1 Submit product data including certified copies of test reports that verify fireproofing applied to substrate as constructed on the project will meet or exceed the requirements of this Section.
 - .2 Submit test results in accordance with CAN/ULC-S101 for fire endurance and CAN/ULC-S102 for surface burning characteristics.
 - .3 For assemblies not tested and rated, submit proposals based on related designs using accepted fireproofing design criteria.
 - .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 application instructions, special handling criteria, minimum substrate preparation, application sequence, and cleaning warnings.
 - .4 Manufacturer's Site Reports: Submit manufacturer's written reports within 3 days of review, verifying compliance of this Section, as described in SITE QUALITY CONTROL in Part 3 of this Section.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: Submit maintenance data for applied fireproofing and incorporate into manual.

1.5 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer: Company specializing in spray-applied fireproofing approved by manufacturer and with five years minimum of documented experience.

.2 Mock-ups: Construct mock-up in accordance with Section 01 43 00 - Quality Assurance.

.1 Apply fireproofing to approximately 1 m² area of surface to be treated.

.2 Mock-up will be used to judge workmanship, substrate preparation, and material application.

.3 Consultant will require a minimum of 24 hours to review the mock-up.

.4 Approved mock-up may not remain as part of finished work.

.3 Site Meetings: As part of Manufacturer's Services described under SITE QUALITY CONTROL in Part 3 of this Section, schedule site visits to review the work at the following stages:

.1 After delivery and storage of products when preparatory work is complete, but before application begins.

.2 Upon completion of work, after cleaning is completed.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Perform in accordance with Section 01 61 00 - Common Product Requirements.

.2 Packing, Delivery, and Handling:

.1 Packaging to indicate shelf-life of materials.

.2 Deliver packaged materials in original unopened containers labeled with manufacturer, product name, and ULC markings.

.3 Damaged or opened containers will be rejected.

.3 Storage and Protection:

.1 Store materials off ground in a dry, well-ventilated indoor location, and in accordance with manufacturer's recommendations.

.2 Provide temporary enclosures to prevent spray from contaminating air beyond application area.

1.7 SITE CONDITIONS

.1 When ambient temperatures are less than 5°C, maintain 5°C air and substrate temperature during and for 24 hours after application.

.2 Provide natural ventilation to properly dry the fireproofing during and after its application. In enclosed areas lacking openings for natural ventilation, circulate and exhaust interior air to the outside using forced air circulation providing a minimum of four air exchanges per hour.

.3 Maintain relative humidity within limits recommended by fireproofing manufacturer.

Part 2 Products

2.1 PERFORMANCE CRITERIA

- .1 Adhesion: Provide materials that meet or exceed adhesion requirements in accordance with ASTM E736/E736M.
- .2 Thickness and Weight: Determine application thickness and weight of applied fireproofing based on tests of assemblies in accordance with CAN/ULC-S101. Apply same thickness of fireproofing material to all structural components forming a part of the assembly including; but not limited to, cross bracing, support angles and hangers.
- .3 Only assemblies that have been tested in accordance with Limit States Design method are acceptable. Assemblies that require use of a Load Restricted factor in accordance with Working Stress Design methods are not acceptable.
- .4 Engineered Judgements: Provide engineered judgement acceptable to authority having jurisdiction (AHJ) where the protected assembly differs from the tested assembly used to determine thickness.
- .5 Spray-applied fireproofing must not crack, spall or delaminate under downward deflection conditions over a 3 m clear span.
- .6 Fungal Resistance: To ASTM G21, 28 days no growth.
- .7 Air Erosion: To ASTM E859/E859M, maximum 0.25 gram loss per square metre in 24 hours.
- .8 Provide materials containing no asbestos.
- .9 Spray-applied fireproofing must not contribute to corrosion of test panels.

2.2 MATERIALS

- .1 Sprayed Cementitious Fireproofing: ULC-certified, qualified for use in a ULC Design with fire-resistance rating times as indicated on Drawings for structure and floors at locations as indicated on Drawings, , designed for high contact potential.
- .2 Sprayed Mineral Fibre Fireproofing: ULC-certified, asbestos-free, qualified for use in a ULC Design with fire-resistance rating times as indicated on Drawings for structure and floors at locations as indicated on Drawings.
- .3 Fireproofing: Minimum dry density and cohesion/adhesion properties as follows:
 - .1 Fireproofing for structural components concealed above ceiling, within walls, chases, or furred spaces: Minimum applied dry density of 240 kg/m³ and cohesion/adhesion strength of 9.57 kPa.
 - .2 Fireproofing for exposed structural components, except where otherwise specified or indicated: Minimum applied dry density of 350 kg/m³ and cohesion/adhesion strength of 20.83 kPa.
 - .3 Fireproofing for structural components located in mechanical rooms and storage areas: Minimum applied dry density of 640 kg/m³ and cohesion/adhesion strength of 350 kPa.
 - .4 Minimum compressive strength: 48 kPa.
- .4 Water: Clean, fresh, suitable for domestic consumption, and free from such amounts of mineral or organic substances that would affect setting of fireproofing materials.

- .5 Curing Compound: Type recommended by fireproofing manufacturer, qualified for use in the ULC Design submittal.
- .6 Sealer: Type recommended by fireproofing manufacturer, qualified for use in the ULC Design submittal, designed to prevent surface dusting.

2.3 ACCESSORIES

- .1 Reinforcement mesh, wire lath, mould inhibitors and other components necessary for a complete and functioning fireproof coating.

Part 3 Execution

3.1 EXAMINATION

- .1 Check environmental conditions and examine surfaces to receive fire resistant material - report any conditions that would be detrimental to the application of material.
- .2 Verification of Conditions: Verify that conditions of substrate previously installed are acceptable to begin fireproofing application in accordance with manufacturer's instructions:
 - .1 Visually inspect substrates.
 - .2 Proceed with installation only after unacceptable conditions have been remedied.

3.2 PREPARATION

- .1 Where adjacent floors, walls and similar surfaces will be exposed, provide and maintain masking, drop cloths and polyethylene coverings for such surfaces to protect them during spraying operations.
 - .1 Protect adjacent surfaces and equipment from overspray, fall-out, and dusting of fireproofing materials.
- .2 Provide complete enclosures and human protective devices when spraying hazardous materials.
- .3 All surfaces to receive applied fire protection materials shall be free of oil, grease, dirt, loose paint, mill scale or any other matter that would impair bond, including paint unless test application of applied fire protection materials has been done to determine that paint formulation will not impair adhesion.
- .4 Prime surfaces as required by ULC Design.

3.3 APPLICATION

- .1 Apply bonding adhesive or primer to substrate if recommended by manufacturer.
- .2 Apply fireproofing over substrate, building up to required thickness to cover substrate with monolithic blanket of uniform density and texture.
- .3 Apply fireproofing directly to open web joists without use of expanded lath.
- .4 Surface Finishing: Where indicated [on Drawings][on schedules], apply fireproofing to produce the following finishes:
 - .1 Manufacturer's standard finishes: Finish according to manufacturer's instruction for each finish specified.
 - .2 Spray-Textured Finish: Finish left as spray-applied with no further finishing.

- .3 Rolled, Spray-Textured Finish: Even finish produced by rolling spray-applied finish with a damp paint roller to remove drippings and excessive roughness.
- .4 Skip-Troweled Finish: Even leveled surface produced by troweling spray-applied finish to smooth the texture and neaten edges.
- .5 Skip-Troweled Finish with Corner Beads: Even, leveled surface produced by troweling spray-applied finish to a smooth texture, without surface markings, and with square edges.
- .5 Apply curing compound to surface of cementitious fireproofing as required by manufacturer.
- .6 Apply sealer to surface of mineral fibre fireproofing as required by manufacturer where indicated on Drawings.

3.4 REPAIR

- .1 Cut, patch, and repair materials which fail to meet requirements of this Section or which fail to attain properties stipulated in reports of tests used to determine fire-resistance rating of assembly.
- .2 Repair damage to fireproofing caused by installation of subsequent work.
- .3 Patch damage to fireproofing caused by testing or by other Subcontractors before fireproofing is concealed, or if exposed, before final review.

3.5 SITE QUALITY CONTROL

- .1 Manufacturer's Services:
 - .1 Obtain report from manufacturer of applied fire protection materials verifying compliance of Work in applying, and protecting of Products. Submit manufacturer's site reports as described in SUBMITTALS in Part 1 of this Section in an acceptable format to verify compliance of this Work with Contract within three days of promptly after inspection.
 - .2 Provide manufacturer's site services consisting of periodic site visits for inspection of product application in accordance with manufacturer's instructions.
 - .3 Schedule site visits to review Work, as directed under QUALITY ASSURANCE in Part 1 of this Section.
- .2 Inspection and Site Tests:
 - .1 Inspection and testing of applied fire protection will be carried out by a testing laboratory designated by Consultant to ASTM E605/E605M.

3.6 CLEANING

- .1 Clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Clean surfaces not indicated to receive fireproofing of sprayed material within 24 hours after application.
- .2 Waste Management: Perform in accordance with Section 01 74 19 - Waste Management and Disposal.

3.7 PROTECTION

- .1 Protect applied products from damage during construction.

END OF SECTION

Section 07 84 00 Fire stopping

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (SDS).
- .2 National Research Council Canada (NRC)
 - .1 National Building Code of Canada 2015 (NBC).
- .3 Underwriter's Laboratories of Canada (ULC)
 - .1 ULC-S115-1995, Fire Tests of Fire stop Systems.

1.2 DEFINITIONS

- .1 Fire Stop Material: device intended to close off opening or penetration during fire or materials that fill openings in wall or floor assembly where penetration is by cables, cable trays, conduits, ducts and pipes and poke-through termination devices, including electrical outlet boxes along with their means of support through wall or floor openings.
- .2 Single Component Fire Stop System: fire stop material that has Listed Systems Design and is used individually without use of high temperature insulation or other materials to create fire stop system.
- .3 Multiple Component Fire Stop System: exact group of fire stop materials that are identified within Listed Systems Design to create on site fire stop system.
- .4 Tightly Fitted; (ref: NBC Part 3.1.9.1(1) and 9.10.9.6(1)): penetrating items that are cast in place in buildings of noncombustible construction or have "0" annular space in buildings of combustible construction.
 - .1 Words "tightly fitted" should ensure that integrity of fire separation is such that it prevents passage of smoke and hot gases to unexposed side of fire separation.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .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 two copies of WHMIS SDS - Material Safety Data Sheets in accordance with Section 02 81 01 - Hazardous Materials.
- .3 Shop Drawings:
 - .1 Submit shop drawings to show location, proposed material, reinforcement, anchorage, fastenings and method of installation.
 - .2 Construction details should accurately reflect actual job conditions.

.4 Samples:

.1 Submit duplicate 300 x 300 mm samples showing actual fire stop material proposed for project.

.5 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.

.1 Test reports: in accordance with CAN-ULC-S101 for fire endurance and CAN-ULC-S102 for surface burning characteristics.

.1 Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with specifications for specified performance characteristics and physical properties.

.2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures and maintenance guide.

.4 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.

1.4 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer Qualifications: Perform Work of this Section by a company that has a minimum of five years proven experience in the installation of firestopping and smoke seal Work of a similar size and nature and that is approved by manufacturer. Submit to Consultant, applicator's current certificate of approval by the material manufacturer as proof of compliance.

.2 Manufacturer's direct representative and/or fire protection specialist shall be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures conforming to manufacturer's written recommendations published in their literature and drawing details.

.2 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section, with contractor's representative in accordance with Section 01 31 19 - Project Meetings 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.

.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.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .3 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, ULC markings.
- .2 Storage and Protection:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.
- .3 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 Fire stopping and smoke seal systems: in accordance with CAN-ULC-S115.
 - .1 Asbestos-free materials and systems capable of maintaining effective barrier against flame, smoke and gases in compliance with requirements of CAN-ULC-S115 and not to exceed opening sizes for which they are intended and conforming to specified special requirements described in PART 3.
 - .2 Fire stop system rating: 1 Hr or as indicated on drawings.
- .2 Service penetration assemblies: systems tested to CAN-ULC-S115.
- .3 Service penetration fire stop components: certified by test laboratory to CAN-ULC-S115.
- .4 Fire-resistance rating of installed fire stopping assembly in accordance with NBC.
- .5 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.
- .6 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.
- .7 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
- .8 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.
- .9 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.

- .10 Sealants for vertical joints: non-sagging.

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 PREPARATION

- .1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.
 - .1 Ensure that substrates and surfaces are clean, dry and frost free.
- .2 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.
- .3 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier.
- .4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.3 INSTALLATION

- .1 Install fire stopping and smoke seal material and components in accordance with manufacturer's certified tested system listing.
- .2 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.
- .3 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.
- .4 Tool or trowel exposed surfaces to neat finish.
- .5 Remove excess compound promptly as work progresses and upon completion.

3.4 SEQUENCES OF OPERATION

- .1 Proceed with installation only when submittals have been reviewed by Consultant.
- .2 Install floor fire stopping before interior partition erections.
- .3 Metal deck bonding: fire stopping to precede spray applied fireproofing to ensure required bonding.
- .4 Mechanical pipe insulation: certified fire stop system component.
 - .1 Ensure pipe insulation installation precedes fire stopping.

3.5 FIELD QUALITY CONTROL

- .1 Inspections: notify Consultant when ready for inspection and prior to concealing or enclosing fire stopping materials and service penetration assemblies.
- .2 Manufacturer's Field Services:

- .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
- .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
- .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.6 CLEANING

- .1 Proceed in accordance with Section 01 74 00 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .3 Remove temporary dams after initial set of fire stopping and smoke seal materials.

3.7 SCHEDULE

- .1 Fire stop and smoke seal at:
 - .1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.
 - .2 Edge of floor slabs at curtain wall and precast concrete panels.
 - .3 Top of fire-resistance rated masonry and gypsum board partitions.
 - .4 Intersection of fire-resistance rated masonry and gypsum board partitions.
 - .5 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.
 - .6 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.
 - .7 Openings and sleeves installed for future use through fire separations.
 - .8 Around mechanical and electrical assemblies penetrating fire separations.
 - .9 Rigid ducts: greater than 129 cm²: fire stopping to consist of bead of fire stopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

END OF SECTION

Section 07 92 00 Joint Sealants

Part 1 General

1.1 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM C919-18, Standard Practice for Use of Sealants in Acoustical Applications.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 19-GP-5M-1984, Sealing Compound, One Component, Acrylic Base, Solvent Curing (Issue of 1976 reaffirmed, incorporating Amendment No. 1).
 - .2 CAN/CGSB-19.13-M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.
 - .3 CGSB 19-GP-14M-1984, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing (Reaffirmation of April 1976).
 - .4 CAN/CGSB-19.17-M90, One-Component Acrylic Emulsion Base Sealing Compound.
 - .5 CAN/CGSB-19.24-M90, Multi-component, Chemical Curing Sealing Compound.
- .3 General Services Administration (GSA) - Federal Specifications (FS)
 - .1 FS-SS-S-200-E(2)1993, Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold Applied, for Portland Cement Concrete Pavement.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Safety Data Sheets (SDS).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for joint sealants and include product characteristics, performance criteria, physical size, finish and limitations.
 - .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 Samples:
 - .1 Submit 2 samples of each type of material and colour.

- .2 Cured samples of exposed sealants for each colour where required to match adjacent material.
- .4 Manufacturer's Instructions:
 - .1 Submit instructions to include installation instructions for each product used.
- .5 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect joint sealants from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return of packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

1.5 SITE CONDITIONS

- .1 Ambient Conditions:
 - .1 Proceed with installation of joint sealants only when:
 - .1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer or are above 4.4 degrees C.
 - .2 Joint substrates are dry.
 - .3 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
- .2 Joint-Width Conditions:
 - .1 Proceed with installation of joint sealants only where joint widths are more than those allowed by joint sealant manufacturer for applications indicated.
- .3 Joint-Substrate Conditions:

.1 Proceed with installation of joint sealants only after contaminants capable of interfering with adhesion are removed from joint substrates.

1.6 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 Safety Data Sheets (SDS) acceptable to Health Canada.

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 caulk are not possible, confine usage to areas which off gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off gas time.

.3 Where sealants are qualified with primers use only these primers.

2.2 SEALANT MATERIAL DESIGNATIONS

.1 Polysulfide two part:

.2 Silicones one part: to CAN/CGSB-19.13.

.1 ASTM C920, Type S, Grade NS, Class 25; non-sag type, standard colours

.3 Acrylic latex one part: to CAN/CGSB-19.17.

.1 ASTM C834, paintable standard white colour.

.4 Acoustical sealant: to ASTM C919.

.5 Preformed compressible and non-compressible back-up materials:

.1 Polyethylene, urethane, neoprene or vinyl foam:

.1 Extruded closed cell foam backer rod.

.2 Size: oversize 30 to 50 %.

.2 Neoprene or butyl rubber:

.1 Round solid rod, Shore A hardness 70.

.3 High density foam:

.1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m³ density, or neoprene foam backer, size as recommended by manufacturer.

.4 Bond breaker tape:

.1 Polyethylene bond breaker tape which will not bond to sealant.

2.3 JOINT CLEANER

- .1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant in accordance with sealant manufacturer's written recommendations.
- .2 Primer: in accordance with sealant manufacturer's written recommendations.

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 joint sealants installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant.
 - .2 Inform Consultant 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 Consultant.

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.

3.7 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Clean adjacent surfaces immediately.
 - .3 Remove excess and droppings, using recommended cleaners as work progresses.
 - .4 Remove masking tape after initial set of sealant.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

3.8 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by joint sealants installation.

END OF SECTION

Section 08 11 00

Metal doors and frames

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A653/A653M-06a, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM B29-03, Standard Specification for Refined Lead.
 - .3 ASTM B749-03, Standard Specification for Lead and Lead Alloy Strip, Sheet and Plate Products.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
 - .2 CGSB 41-GP-19Ma-84, Rigid Vinyl Extrusions for Windows and Doors.
- .3 CSA Group (CSA)
 - .1 CSA-G40.20-04 /G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CSA W59-03, Welded Steel Construction (Metal Arc Welding).
- .4 Canadian Steel Door Manufacturers' Association (CSDMA)
 - .1 CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, 2000.
 - .2 CSDMA, Selection and Usage Guide for Commercial Steel Doors, 1990.
- .5 National Fire Protection Association (NFPA)
 - .1 NFPA 80-99, Standard for Fire Doors and Fire Windows.
 - .2 NFPA 252-03, Standard Methods of Fire Tests of Door Assemblies.
- .6 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-01, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .2 CAN/ULC-S702-97, Standard for Thermal Insulation, Mineral Fibre, for Buildings.
 - .3 CAN/ULC-S704-03, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
 - .4 CAN4-S104-M80, Standard Method for Fire Tests of Door Assemblies.
 - .5 CAN4-S105-M85, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN4-S104.

1.2 SYSTEM DESCRIPTION

- .1 Design Requirements:

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- .1 Maximum deflection for exterior steel entrance screens under wind load of 1.2 kPa not to exceed 1/175th of span.
- .2 Steel fire rated doors and frames: labelled and listed by an organization accredited by Standards Council of Canada in conformance with CAN4-S104 NFPA 80, NFPA 252 for ratings specified or indicated.
- .3 Provide fire labelled frames for openings requiring fire protection ratings. Test products in conformance with CAN4-S104, NFPA 80, NFPA 252 and listed by nationally recognized agency having factory inspection services.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide product data: in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.
 - .2 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, glazed, louvred, arrangement of hardware fire rating and finishes.
 - .3 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings, reinforcing, fire rating and finishes.
 - .4 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.
 - .5 Submit test and engineering data, and installation instructions.
- .4 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 Hot dipped galvanized steel sheet: to ASTM A653M, ZF75, minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts.
 - .1 Minimum base steel thickness:
 - .1 Frames: 1.6mm
 - .2 Typical doors: 1.2mm
 - .3 Lock/strike reinforcements: 1.6mm
 - .4 Hinge reinforcements: 2.7mm

- .5 All other reinforcements: 1.6mm
- .6 Top and bottom channels: 1.2mm
- .7 Glazing stops: 0.9mm
- .8 Guard boxes: 0.9mm
- .9 Jamb spreaders: 0.9mm
- .2 Reinforcement channel: to CSA G40.20/G40.21, Type 44W, coating designation to ASTM A653M, ZF75.
- .3 Composites: balance of core materials used in conjunction with lead: in accordance with manufacturers' proprietary design.

2.2 DOOR CORE MATERIALS

- .1 Stiffened: face sheets welded, insulated core.
 - .1 Interior Doors: Mineral fibre insulation with min. face density 24 kg/m³.
 - .2 Fire Rated Doors: Mineral fibre insulation to CAN/ULC S702, Type 1A with min. face density 24 kg/m³.
- .2 Temperature rise rated (TRR): core composition to limit temperature rise on unexposed side of door to 250 degrees C at 60 minutes. Core to be tested as part of a complete door assembly, in accordance with CAN4-S104, NFPA 80, NFPA 252, covering Standard Method of Tests of Door Assemblies and listed by nationally recognized testing agency having factory inspection service.

2.3 ADHESIVES

- .1 Honeycomb cores and steel components: heat resistant, spray grade, resin reinforced neoprene/rubber (polychloroprene) based, low viscosity, contact cement.
- .2 Polystyrene and polyurethane cores: heat resistant, epoxy resin based, low viscosity, contact cement.
- .3 Lock-seam doors: fire resistant, resin reinforced polychloroprene, high viscosity, sealant/adhesive.

2.4 PRIMER

- .1 Touch-up prime CAN/CGSB-1.181.
 - .1 Maximum VOC limit 50 g/L to GC-03.

2.5 PAINT

- .1 Field paint steel doors and frames in accordance with Section 09 91 23 - Interior Painting. Protect weatherstrips, door silencers, labels and hardware from paint. Provide final finish free of scratches or other blemishes.
 - .1 Maximum VOC emission level 50 g/L to GS-11.

2.6 ACCESSORIES

- .1 Door silencers: single stud rubber/neoprene type.
- .2 Interior and Exterior bottom and top caps: steel.

- .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 Door bottom seal: In accordance with Door Hardware Schedule.
- .5 Metallic paste filler: to manufacturer's standard.
- .6 Fire labels: Brass plate, riveted to door and door frame, in accordance with ULC requirements..
- .7 Sealant: In accordance with Section 07 92 00 .
 - .1 Maximum VOC limit 250 g/L to SCAQMD Rule 1168.
- .8 Glazing: In accordance with Section 08 80 00.
- .9 Make provisions for glazing as indicated and provide necessary glazing stops.
 - .1 Provide removable stainless steel glazing beads for use with glazing tapes and compounds and secured with countersunk stainless steel screws.
 - .2 Design exterior glazing stops to be tamperproof.

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 thermally broken and welded type construction.
- .4 Interior frames: 1.6 mm welded type construction.
- .5 Blank, reinforce, drill and tap frames for mortised, templated hardware, electronic hardware using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.
- .6 Protect mortised cutouts with steel guard boxes.
- .7 Prepare frame for door silencers, 3 for single door, 2 at head for double door.
- .8 Manufacturer's nameplates on frames and screens are not permitted.
- .9 Conceal fastenings except where exposed fastenings are indicated.
- .10 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.
- .11 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.
 - .1 Finished product to have no visible seams or joints, square, true and free of distortion.
 - .2 Welding to be continuous meeting requirements of CSA W47.1, unless specified otherwise.
- .2 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.
- .3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.
- .4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.
- .5 Securely attach floor anchors to inside of each jamb profile.
- .6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.
- .7 Securely attach lead to inside of frame profile from return to jamb soffit (inclusive) on door side of frame only.

2.10 DOOR FABRICATION GENERAL

- .1 Doors: swing type, flush, with provision for glass and/or louvre openings as indicated.
- .2 Exterior doors: slab insulated hollow steel construction. Interior doors: insulated 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, templated hardware electronic 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. Provide inverted, recessed, spot welded channels to top and bottom of interior doors.
- .7 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.
- .8 Provide fire labelled doors for those openings requiring fire protection ratings, as scheduled. Test such products in conformance with NFPA 80, NFPA 252, CAN4-S104, ASTM E152 and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.
- .9 Manufacturer's nameplates on doors are not permitted.

2.11 HOLLOW STEEL CONSTRUCTION

- .1 Form face sheets for exterior doors from 1.6 1.2 mm sheet steel.

- .2 Form face sheets for interior doors from 1.2mm sheet steel.
- .3 Reinforce doors with vertical stiffeners, securely welded to face sheets at 150 mm on centre maximum.
- .4 Fill voids between stiffeners of exterior doors with rigid poly/isocyanurate core.
- .5 Fill voids between stiffeners of interior doors with fibreglass core.

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 labelled steel fire rated doors and frames to NFPA 80 except where specified otherwise.
- .2 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 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 - Doors Hardware.
- .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, 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.

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.2 Fill exposed frame anchors surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

3.6 GLAZING

.1 Install glazing for doors frames in accordance with Section 08 80 50 - Glazing.

END OF SECTION

Section 08 71 00

Door Hardware

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI)/Builders Hardware Manufacturers Association (BHMA)
 - .1 ANSI/BHMA A156.1-2000, American National Standard for Butts and Hinges.
 - .2 ANSI/BHMA A156.2-2003, Bored and Preassembled Locks and Latches.
 - .3 ANSI/BHMA A156.3-2001, Exit Devices.
 - .4 ANSI/BHMA A156.4-2000, Door Controls - Closers.
 - .5 ANSI/BHMA A156.5-2001, Auxiliary Locks and Associated Products.
 - .6 ANSI/BHMA A156.6-2005, Architectural Door Trim.
 - .7 ANSI/BHMA A156.8-2005, Door Controls - Overhead Stops and Holders.
 - .8 ANSI/BHMA A156.10-1999, Power Operated Pedestrian Doors.
 - .9 ANSI/BHMA A156.12-2005, Interconnected Locks and Latches.
 - .10 ANSI/BHMA A156.13-2002, Mortise Locks and Latches Series 1000.
 - .11 ANSI/BHMA A156.14-2002, Sliding and Folding Door Hardware.
 - .12 ANSI/BHMA A156.15-2006, Release Devices - Closer Holder, Electromagnetic and Electromechanical.
 - .13 ANSI/BHMA A156.16-2002, Auxiliary Hardware.
 - .14 ANSI/BHMA A156.17-2004, Self-closing Hinges and Pivots.
 - .15 ANSI/BHMA A156.18-2006, Materials and Finishes.
 - .16 ANSI/BHMA A156.19-2002, Power Assist and Low Energy Power - Operated Doors.
 - .17 ANSI/BHMA A156.20-2006, Strap and Tee Hinges and Hasps.
- .2 Canadian Steel Door and Frame Manufacturers' Association (CSDMA)
 - .1 CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames - 2009.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .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 Hardware List:

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- .1 Submit contract hardware list.
- .2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.
- .4 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for door hardware for incorporation into manual.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra Stock Materials:
 - .1 Supply maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Tools:
 - .1 Supply 2 sets of wrenches for locksets.

1.5 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.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .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.

Part 2 Products

2.1 HARDWARE ITEMS

- .1 Refer to schedule attached in appendix.

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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 CSDFMA 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 Install key control cabinet.
- .7 Use only manufacturer's supplied fasteners.
 - .1 Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.
- .8 Remove construction cores when directed by Owner.
 - .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 00 - Cleaning.
 - .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 00 - Cleaning.
- .2 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 DEMONSTRATION

- .1 Keying System Setup and Cabinet:

- .1 Set up key control system with file key tags, duplicate key tags, numerical index, alphabetical index and key change index, label shields, control book and key receipt cards.
- .2 Place file keys and duplicate keys in key cabinet on their respective hooks.
- .3 Lock key cabinet and turn over key to Owner.
- .2 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 locksets.
 - .3 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 hardware schedule (Addendum to be issued).

END OF SECTION

Section 08 80 00

Glazing

Part 1 General

1.1 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM C542-05, Standard Specification for Lock-Strip Gaskets.
 - .2 ASTM D790-07e1, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 - .3 ASTM D1003-07e1, Standard Test Method for Haze and Luminous Transmittance of Plastics.
 - .4 ASTM D1929-96 (R2001)e1, Standard Test Method for Determining Ignition Temperature of Plastics.
 - .5 ASTM D2240-05, Standard Test Method for Rubber Property - Durometer Hardness.
 - .6 ASTM E84-10, Standard Test Method for Surface Burning Characteristics of Building Materials.
 - .7 ASTM E330-02, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
 - .8 ASTM F1233-08, Standard Test Method for Security Glazing Materials and Systems.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.
 - .2 CAN/CGSB-12.2-M91, Flat, Clear Sheet Glass.
 - .3 CAN/CGSB-12.3-M91, Flat, Clear Float Glass.
 - .4 CAN/CGSB-12.4-M91, Heat Absorbing Glass.
 - .5 CAN/CGSB-12.6-M91, Transparent (One-Way) Mirrors.
 - .6 CAN/CGSB-12.8-97, Insulating Glass Units.
 - .7 CAN/CGSB-12.8-97 (Amendment), Insulating Glass Units.
 - .8 CAN/CGSB-12.9-M91, Spandrel Glass.
 - .9 CAN/CGSB-12.10-M76, Glass, Light and Heat Reflecting.
 - .10 CAN/CGSB-12.11-M90, Wired Safety Glass.
 - .11 CAN/CGSB-12.12-M90, Plastic Safety Glazing Sheets.
 - .12 CAN/CGSB-12.13-M91, Patterned Glass.
- .3 Environmental Choice Program (ECP)

- .1 CCD-045-95 (R2005), Sealants and Caulking Compounds.
- .4 Glass Association of North American (GANA)
 - .1 GANA Glazing Manual - 2008.
 - .2 GANA Laminated Glazing Reference Manual - 2009.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .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:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.
- .4 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Samples will be returned for inclusion into work.
 - .3 Submit duplicate 300x300 mm size samples of and sealant material.
- .5 Certificates: submit 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.
 - .1 Submit testing and analysis of glass under provisions of Section 01 45 00 - Quality Control.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for glazing for incorporation into manual.

1.4 QUALITY ASSURANCE

- .1 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 with manufacturer's written instructions 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 glazing and frames from nicks, scratches, and blemishes.
- .3 Protect prefinished aluminum surfaces with wrapping.
- .4 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return of packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

1.6 AMBIENT CONDITIONS

- .1 Ambient Requirements:
 - .1 Install glazing when ambient temperature is 10 degrees 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 DESIGN REQUIREMENTS

- .1 Glass Design:
 - .1 Design glass using a probability of breakage of 8 litres per 1000 at the first application of design load.
 - .2 Design glass to CAN/CGSB-12.20-M. 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 Structural Glazing:
 - .1 Carry out design of structural silicone joints by rational analysis including all movements specified herein. Maximum stress shall not exceed 138 kPa (20 psi) in tension or shear for short term loading. Maximum stress in shear for long term loading due to the dead load of glass shall not exceed 7 kPa (1 psi) or the limit imposed by sealant manufacturer, whichever is less.
 - .2 The joint shall be essentially rectangular in shape and shall include no internal corners which could precipitate tearing or create high local stresses.
 - .3 Single Source Responsibility for Sealants, Gaskets and Other Glazing Accessories: In order to ensure consistent quality of performance, provide all glazing sealants and seals from a single manufacturer.

- .4 Preconstruction Compatibility and Adhesion Testing: Submit to sealant manufacturer, samples of each glass, gasket, glazing accessory and glass-framing member that will contact or affect glazing sealants for compatibility and adhesion testing. Schedule submission of test samples to provide sufficient time for testing and analysis of results to prevent delay in the progress of work.
- .3 Limit glass deflection to flexural limit of glass with full recovery of glazing materials.
- .4 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.
- .5 Design window glazing with the following properties:
 - .1 U-Value: R3.
 - .2 Solar heat gain: 0.38.
 - .3 Shading Coefficient: 0.44.

Part 2 Products

2.1 MATERIALS

- .1 Flat Glass:
 - .1 (GL1) Glass in doors, side lights screens to be fire-rated, impact-rated, transparent
 - .1 Fire resistance rating : as indicated on Door Schedule
 - .2 Acceptable Product: 8mm FireLite Plus by TGP or 9mm Pyran Platinum L by Schott AG or approved equivalent
 - .2 Plastic Film: in accordance with Section 08 87 53 - Security Films.
 - .3 Sealant: in accordance with Section 07 92 00 - Joint Sealants.
 - .1 VOC limit 250 g/L maximum to SCAQMD Rule 1168.
 - .1 VOC limit: 5 % maximum by weight to CCD-045.
 - .2 Ensure sealant does not contain chemical restrictions to CCD-045.

2.2 ACCESSORIES

- .1 Setting blocks (regular): EPDM, 80- 90 Shore A durometer hardness to ASTM D2240, to suit glazing method, glass light weight and area.
- .2 Setting blocks (structural): Silicone setting blocks with Shore, Type A durometer hardness of 85, plus or minus 5 to ASTM D2240, sized to suit glazing method, glass unit weight and area.
- .3 Edge blocks: EPDM, 60-70 Shore A Durometer hardness, sized with 3 mm clearance from glass edge and spanning glass thickness(es). Capable of withstanding weight of glass unit, self adhesive on face.
- .4 Spacer shims: EPDM, 50-60 Shore A durometer hardness to ASTM D2240, 75 mm long x one half height of glazing stop x thickness to suit application. Self adhesive on one face.
- .5 Glazing and rebate primers, sealants, sealers, and cleaners: Compatible with each other. Type as recommended by glass manufacturer.

- .6 Glazing Sealant (regular): Silicone sealant as recommended by glazing manufacturer. Verify compatibility with insulating glass unit secondary sealant.
- .7 Glazing Sealant (structural):
 - .1 Silicone, One Part in accordance with ASTM C920, Type S or M, Grade NS, Class 25.
 - .2 Structural glazing tensile bead: 'Spectrem 2 Sealant' by Tremco or 'Dow 795' by Dow Corning.
 - .3 Structural glazing weather bead: 'Spectrem 2 Sealant' by Tremco or 'Dow 795' by Dow Corning.
 - .4 Structural glazing (factory glazed): Two-part, neutral cure silicone sealant, 'Proglaze II' by Tremco or 'Dow 983' by Dow Corning.
 - .5 Colour to be selected by Consultant.
- .8 Glazing gasket: 'Visionstrip' by Tremco Ltd., extruded composite glazing seal, size as recommended by manufacturer.
- .9 Heel & toe bead: Silicone sealant as recommended by glazing manufacturer.
- .10 Glazing tape:
 - .1 'Polyshim II' glazing tape EPDM shim.
- .11 Glazing splines: resilient EPDM or neoprene, extruded shape to suit glazing channel retaining slot, black colour as selected by consultant.
- .12 Glazing clips: manufacturer's standard type.
- .13 Lock-strip gaskets: to ASTM C542.
- .14 Glass presence markers: Easily removable, non-residue depositing.
- .15 Screws, bolts and fasteners: Type 304 stainless steel.

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 Verify that openings for glazing are correctly sized and within tolerance.
 - .2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.
 - .3 Visually inspect substrate in presence of Consultant.
 - .4 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .5 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

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: INTERIOR - DRY METHOD (TAPE AND TAPE)

- .1 Perform work in accordance with GANA Glazing Manual for glazing installation methods.
- .2 Cut glazing tape to length and set against permanent stops, projecting 1.6 mm above sight line.
- .3 Place setting blocks at 1/4 points, with edge block maximum 150 mm from corners.
- .4 Rest glazing on setting blocks and push against tape for full contact at perimeter of light or unit.
- .5 Place glazing tape on free perimeter of glazing in same manner described.
- .6 Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
- .7 Knife trim protruding tape.

3.4 INSTALLATION: MIRRORS

- .1 Set mirrors with adhesive, applied in accordance with adhesive manufacturer's instructions.
- .2 Set mirrors with clips. Anchor rigidly to wall construction.
- .3 Set in frame.
- .4 Place plumb and level.

3.5 INSTALLATION: PLASTIC FILM

- .1 Install plastic film with adhesive, applied in accordance with film manufacturer's instructions.
- .2 Place without air bubbles, creases or visible distortion.
- .3 Fit tight to glass perimeter with razor cut edge.

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .1 Remove traces of primer, caulking.
 - .2 Remove glazing materials from finish surfaces.
 - .3 Remove labels.
 - .4 Clean glass and mirrors using approved non-abrasive cleaner in accordance with manufacturer's instructions.
 - .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .2 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 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.
 - .1 Do not mark heat absorbing or reflective glass units.
- .3 Repair damage to adjacent materials caused by glazing installation.

END OF SECTION

Section 08 87 23

Surface films

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Glazing film for interior screens
 - .2 Graphic wallpaper applied to Drywall surface

1.2 REFERENCE STANDARDS

- .1 International Window Film Association (IWFA)
 - .1 IWFA Visual Quality Standard for Applied Window Film 1999.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings
 - .1 Indicate dimension, seams, colours and film type
- .3 Samples
 - .1 For non-custom films, provide 300mm x300mm sample for each film type.
 - .2 For custom printed films, Provide test print of a representative area of the graphic for each film type/unique graphic.

1.4 QUALITY ASSURANCE

- .1 Perform work in accordance with manufacturer's instructions.
- .2 Film to be installed by a Certified Applicator in order for a full manufacturer's warranty to apply.

1.5 WARRANTY

- .1 Contractor hereby warrants that Films will stay in place without delaminating, peeling or blistering in accordance with CCDC 2 GC24, but for 10 years.
- .2 Ensure warranty includes items as follows:
 - .1 Maintaining adhesion properties without blistering, bubbling or delaminating from glass surface.
 - .2 Maintaining appearance without discolouration.
 - .3 Removing, replace and reapply defective materials.
 - .4 In event of product failure under warranty terms, remove and re-apply film without glass replacement at no cost to Owner.

Part 2 Products

2.1 MATERIALS

- .1 Frosted film for interior Glazing (FLM1)
 - .1 3M Fasara, frosted Matte
 - .2 See drawings for location of glazing film. Account for 100% coverage on glazing surfaces indicated
- .2 Transparent Coloured Film (FLM2)
 - .1 Manufacturer: Solar Graphics
 - .2 Colour: Sky Blue
- .3 Transparent Coloured Film (FLM3)
 - .1 Manufacturer: Solar Graphics
 - .2 Colour: Steel Blue
- .4 Transparent Coloured Film (FLM4)
 - .1 Manufacturer: Solar Graphics
 - .2 Colour: Amber
- .5 Custom Vinyl Graphic wall paper (FLM6)
 - .1 Colour: White
- .6 Custom Vinyl Graphic wall paper (FLM5)
 - .1 Colour: Dark Blue

Part 3 Execution

3.1 PREPARATION

- .1 Examine glass and wall surfaces to receive a new film and verify that they are free from defects and imperfections.
- .2 The window and window framing will be cleaned thoroughly with a neutral cleaning solution. The surface of the window glass where the film is to be applied shall be bladed with industrial razors to ensure safe removal of any foreign contaminants.
- .3 Toweling or other absorbent material shall be placed in the window will or sash to absorb moisture generated by the installation of the film

3.2 INSTALLATION

- .1 The film must be applied as to the specifications of the Manufacturer by a Certified Dealer/Applicator.
- .2 Materials will be delivered to the job site with the manufacturer's labels intact and legible.
- .3 To minimize waste, the film will be cut to specification. Film edges shall be cut neatly and squarely at a uniform distance of 1/8" to 1/16" from the window sealing device.
- .4 Clear, clean water with a small amount of slip solution will be used to activate the pressure sensitive adhesive and facilitate the proper positioning of the film on the glass.

- .5 To ensure efficient removal of excess water from the underside of the film and to maximize the bonding of the pressure sensitive adhesive, polyplastic bladed squeegees will be utilized.
- .6 Upon completion, the film may have a dimpled appearance from residual moisture. Said moisture, shall dry flat with no moisture dimples within a period of 30 days under reasonable weather conditions.
- .7 After application, any leftover material will be removed and work area will be returned to at least the original condition. All necessary means will be used to protect the film before, during and after installation.

3.3 FINAL CLEANING

- .1 The film can be washed using common window cleaning solutions, including ammonia based cleaners. Abrasive type cleaning agents and bristle brushes that could scratch the film must not be used. Synthetic sponges or soft cloths are recommended.

END OF SECTION

Section 09 21 16

Gypsum Board Assemblies

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Aluminum Association (AA)
 - .1 AA DAF 45-03 (R2009), Designation System for Aluminum Finishes.
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM C475-02 (2015), Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - .2 ASTM C514-04 (2014), Standard Specification for Nails for the Application of Gypsum Board.
 - .3 ASTM C557-03 (2009)e1, Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
 - .4 ASTM C840-16, Standard Specification for Application and Finishing of Gypsum Board.
 - .5 ASTM C954-15, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
 - .6 ASTM C1002-14, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - .7 ASTM C1047-14a, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
 - .8 ASTM C1177/C1177M-13, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 - .9 ASTM C1178/C1178M-13, Standard Specification for Glass Mat Water-Resistant Gypsum Backing Board.
 - .10 ASTM C1280-13a, Standard Specification for Application of Gypsum Sheathing.
 - .11 ASTM C1396/C1396M-14a, Standard Specification for Gypsum board.
- .3 Association of the Wall and Ceilings Industries International (AWCI)
 - .1 AWCI Levels of Gypsum Board Finish-GA-214-2015.
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.34-M86 (R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
 - .2 CAN/CGSB-71.25-M88, Adhesive, for Bonding Drywall to Wood Framing and Metal Studs.
- .5 Green Seal Environmental Standards (GS)

- .1 GS-11-2008, 2nd Edition, Paints and Coatings.
- .6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI.
Source Specific Standards
 - .1 SCAQMD Rule 1113-A2007, Architectural Coatings.
 - .2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.
- .7 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-10, Standard Method of Test of Surface Burning Characteristics of Building Materials and Assemblies.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for gypsum board assemblies 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 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address and applicable standard designation.
- .3 Exercise care in unloading gypsum board materials shipment to prevent damage.
- .4 Storage and Handling Requirements in accordance with ASTM C 840-16:
 - .1 Store gypsum board assemblies materials level flat indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect gypsum board assemblies from nicks, scratches, and blemishes.
 - .3 Protect gypsum board from direct exposure to rain, snow, sunlight, or other excessive weather conditions.
 - .4 Protect ready mix joint compounds from freezing, exposure to extreme heat and direct sunlight.
 - .5 Protect from weather, elements and damage from construction operations.
 - .6 Handle gypsum boards to prevent damage to edges, ends or surfaces.
 - .7 Protect prefinished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.
 - .8 Replace defective or damaged materials with new.

1.4 AMBIENT CONDITIONS

- .1 Maintain temperature 10 °C minimum, 21 °C maximum for 48 hours prior to and during application of gypsum boards and joint treatment, and for 48 hours minimum after completion of joint treatment.

- .2 Apply board and joint treatment to dry, clean, frost free surfaces.
- .3 Ventilation: ventilate building spaces as required to remove excess moisture that would prevent drying of joint treatment material immediately after its application.

Part 2 Products

2.1 MATERIALS

- .1 Standard board: to ASTM C1396/C1396M-14 Type X, 15.9mm thick, 1200 mm wide x maximum practical length, ends square cut, edges squared.
- .2 Impact Resistant Gypsum Board; Heavy duty glass mat facers with dense water resistant treated gypsum core and embedded fiberglass mesh enforcement, to ASTM C1658 and ASTM C1629, Type X 15.9mm thick, 1200mm wide x maximum practical length. Score of 10 (no mould growth) as per ASTM D3273)
- .3 Glass mat water-resistant gypsum backing board: to ASTM C1178/C1178M-13, 16 mm thick, 1200 mm wide x maximum practical length.
- .4 Metal furring runners, hangers, tie wires, inserts, and anchors: to ASTM C840.
- .5 Drywall furring channels: 0.5 mm core thickness galvanized steel channels for screw attachment of gypsum board.
- .6 Resilient drywall furring: 0.5 mm base steel thickness galvanized steel for resilient attachment of gypsum board.
- .7 Nails: to ASTM C514-14.
- .8 Steel drill screws: to ASTM C1002-14.
- .9 Stud adhesive: to CAN/CGSB-71.25.
- .10 Laminating compound: as recommended by manufacturer, asbestos-free.
- .11 Casing beads, corner beads, control joints and edge trim: to ASTM C1047, ABS, 0.5 mm base thickness, perforated flanges, one piece length per location.
- .12 Shadow gap: Bailey D300 Metal trim, CGC Dur-a-bead or Nicolson Rollforming No 114, fillable edge trim, 0.55mm (0.022") base thickness commercial grade sheet steel with zinc wiped coating to ASTM A 525-93; perforated flanges; one piece length per location. To be used at the junction of all dissimilar materials.
- .13 Sealants: in accordance with Section 07 92 00 - Joint Sealants.
 - .1 VOC limit 250 g/L maximum to SCAQMD Rule 1168.
 - .2 Acoustic sealant: in accordance with Section 07 92 00 - Joint Sealants.
- .14 Polyethylene: to CAN/CGSB-51.34, Type 2.
- .15 Insulating strip: rubberized, moisture resistant, 3 mm thick cork strip, 12 mm wide, with self-sticking permanent adhesive on one face, lengths as required.
- .16 Joint compound: to ASTM C475, asbestos-free.
- .17 Tapable Access Panels for GWB ceilings: Manufacturer: T.A.P. Thickness: 16mm, sizes 610x610, 305x305
- .18 Access doors (non-fire rated walls and ceilings) Allow for 10 access doors in project area

- .1 Seamless access panel for gypsum board with concealed aluminum frame with continuous factory installed perimeter EPDM gasket, galvanized steel hardware, pivoting hinge and steel safety cable with clip for ceiling operation
- .2 Provide concealed mechanical touch-latch for ceiling access doors and screwdriver operated cam latch locks for wall applications
- .3 Door size as approved by the Consultant for intended applications
- .4 Access doors, 'Bauco Plus II' by Access Panel Solutions Inc. or approved alternative
- .19 Access doors (tiled insert-walls)
 - .1 Recessed, zinc coated 0.06" (16ga) thick access door and press bent frame to accept tile and grout, capable of blending in with surrounding wall finish, complete with continuous concealed heavy duty hinge and screwdriver operated cam latch lock. Metal components to consist of manufacturer's standard powder coat finish.
 - .2 Coordinate with Section 06 20 00 as required for MDF or plywood infill and adhesive for door
 - .3 Door size as approved by the Consultant for intended applications
 - .4 Access doors, 'Model TD-5025' by Acudor Access Doors or approved alternative

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for gypsum board assemblies installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant.
 - .2 Inform Consultant 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 consultant.

3.2 ERECTION

- .1 Do application and finishing of gypsum board to ASTM C840-16 except where specified otherwise.
- .2 Do application of gypsum sheathing to ASTM C1280-13a.
- .3 Erect hangers and runner channels for suspended gypsum board ceilings to ASTM C840-16 except where specified otherwise.
- .4 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
- .5 Install work level to tolerance of 1:1200.
- .6 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles, etc.
- .7 Install 19 x 64 mm furring channels parallel to, and at exact locations of steel stud partition header track.

- .8 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.
- .9 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.
- .10 Install wall furring for gypsum board wall finishes to ASTM C840-16, except where specified otherwise.
- .11 Furr openings and around built-in equipment, cabinets, access panels, etc, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.
- .12 Furr duct shafts, beams, columns, pipes and exposed services where indicated.
- .13 Erect drywall resilient furring transversely across studs, spaced maximum 600 mm on centre and not more than 150 mm from ceiling/wall juncture. Secure to each support with 25mm drywall screw.
- .14 Install 150 mm continuous strip of 12.7 mm gypsum board along base of partitions where resilient furring installed.

3.3 APPLICATION

- .1 Apply gypsum board after bucks, anchors, blocking, sound attenuation, electrical and mechanical work have been approved.
- .2 Apply double layer gypsum board to metal furring or framing using stud adhesive screw fasteners for the first layer, and laminating adhesive for second layer. Maximum spacing of screws 300 mm on centre.
 - .1 Single-Layer Application:
 - .1 Apply gypsum board on ceilings prior to application of walls to ASTM C840-16.
 - .2 Apply gypsum board on walls vertically or horizontally, providing sheet lengths that will minimize number of board edges or end joints.
 - .2 Double-Layer Application:
 - .1 Install gypsum board for base layer and exposed gypsum board for face layer.
 - .2 Apply base layer to ceilings prior to base layer application on walls; apply face layers in same sequence. Offset joints between layers at least 250 mm.
 - .3 Apply base layers at right angles to supports unless otherwise indicated.
 - .4 Apply base layer on walls and face layers vertically with joints of base layer over supports and face layer joints offset at least 250 mm with base layer joints.
 - .3 Apply single layer gypsum board to concrete concrete block surfaces, where indicated, using laminating adhesive.
 - .1 Comply with gypsum board manufacturer's recommendations.
 - .2 Brace or fasten gypsum board until fastening adhesive has set.
 - .3 Mechanically fasten gypsum board at top and bottom of each sheet.

- .4 Exterior Soffits and Ceilings: install exterior gypsum board perpendicular to supports; stagger end joints over supports. Install with 6 mm gap where boards abut other work.
- .5 Apply water-resistant gypsum board where wall tiles to be applied. Apply water-resistant sealant to edges, ends, cut-outs which expose gypsum core and to fastener heads. Do not apply joint treatment on areas to receive tile finish.
- .6 Apply 12 mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, ducts, and, in partitions where perimeter sealed with acoustic sealant.
- .7 Install ceiling boards in direction that will minimize number of end-butt joints. Stagger end joints at least 250 mm.
- .8 Install gypsum board on walls vertically to avoid end-butt joints. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs, except where local codes or fire-rated assemblies require vertical application.
- .9 Install gypsum board with face side out.
- .10 Do not install damaged or damp boards.
- .11 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

3.4 INSTALLATION

- .1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure using contact adhesive for full length.
- .2 Install casing beads around perimeter of suspended ceilings.
- .3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.
- .4 Install insulating strips continuously at edges of gypsum board and casing beads abutting metal window and exterior door frames, to provide thermal break.
- .5 Install shadow mould at gypsum board/ceiling juncture as indicated. Minimize joints; use corner pieces and splicers.
- .6 Construct control joints of two back-to-back casing beads set in gypsum board facing and supported independently on both sides of joint.
- .7 Provide continuous polyethylene dust barrier behind and across control joints.
- .8 Locate control joints at changes in substrate construction.
- .9 Install control joints straight and true.
- .10 Ensure that screws or nails are properly applied in process of attaching gypsum board to framing without damaging of gypsum board edges and ends.
- .11 Construct expansion joints as detailed, at building expansion and construction joints. Provide continuous dust barrier.
- .12 Install expansion joint straight and true.
- .13 Install cornice cap where gypsum board partitions do not extend to ceiling.

- .14 Fit cornice cap over partition, secure to partition track with two rows of sheet metal screws staggered at 300 mm on centre.
- .15 Splice corners and intersections together and secure to each member with 3 screws.
- .16 Install access doors to electrical and mechanical fixtures specified in respective sections.
 - .1 Rigidly secure frames to furring or framing systems.
- .17 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.
- .18 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with AWCI Levels of Gypsum Board Finish:
 - .1 Levels of finish:
 - .1 Level 3: embed tape for joints and interior angles in joint compound and apply two separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges.
 - .2 Level 5: embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; apply a thin skim coat of joint compound to entire surface; surfaces smooth and free of tool marks and ridges.
- .19 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.
- .20 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board, invisible after surface finish is completed.
- .21 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.
- .22 Completed installation smooth, level or plumb, free from waves and other defects and ready for surface finish.
- .23 Apply one coat of white primer sealer over surface to be textured. When dry apply textured finish in accordance with manufacturer's instructions.
- .24 Mix joint compound slightly thinner than for joint taping.
- .25 Apply thin coat to entire surface using trowel or drywall broad knife to fill surface texture differences, variations or tool marks.
- .26 Allow skim coat to dry completely.
- .27 Remove ridges by light sanding or wiping with damp cloth.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .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 00 - Cleaning.

.2 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

.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 gypsum board assemblies installation.

3.7 SCHEDULES

.1 Construct fire rated assemblies where indicated.

END OF SECTION

Section 09 22 16

Non-Structural Metal Framing

Part 1 General

1.1 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM C645-14e1, Standard Specification for Nonstructural Steel Framing Members.
 - .2 ASTM A653/A653M-07, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process.
 - .3 ASTM C754-15, Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- .2 Underwriter's Laboratories (UL) Environmental Standards
 - .1 UL-2768-2011, Architectural Surface Coatings.
 - .2 , Surface Coatings - Recycled Water-Borne. UL-2760-2011
- .3 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual - current edition.
 - .1 MPI #26, Primer, Galvanized Metal, Cementitious.
- .4 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for metal framing and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 QUALITY ASSURANCE

- .1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: 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 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 metal framing from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 Non-load bearing channel stud framing: to ASTM C645, 92 mm stud size, roll formed from 0.91 mm thickness hot dipped zinc-coated (galvanized) steel sheet in accordance with ASTM A653, Z180, for screw attachment of gypsum board.
 - .1 Knock-out service holes at 460 mm centres.
- .2 Floor and ceiling tracks: to ASTM C645, in widths to suit stud sizes, and as follows:
 - .1 Slotted Deflection Track for Fire Separations: Premanufactured slotted top runner with 63 mm down standing legs and having 6 mm wide x 38 mm high slots spaced at 25 mm on centre along length of runner; tested and certified for use in fire rated wall construction.
 - .2 Double Runner Deflection Track: Outside runner using 50 mm flanges; inner runner 33 mm; maintaining 25 mm minimum deflection space.
 - .3 Deep Leg Deflection Track: Top runner having 50 mm down standing legs; maintaining 13 mm minimum deflection space.
 - .4 Base Runner: Bottom track with 33 mm upstanding legs.
- .3 Non-load bearing truss stud framing system: to consist of:
 - .1 Studs: 92 mm size; truss-type bent rod web with double rod chords ; welded together at contact points.
 - .1 Make rod of minimum 4.5 mm diameter cold drawn steel wire having tensile strength of 620 MPa.
 - .2 Design studs for clip attachment of gypsum lath or wire tying of metal lath.
 - .2 Floor track: snap-in type formed to hold studs securely in place at 50 mm intervals; fabricated from 0.5 mm thick steel sheet; size to suit studs.
 - .3 Ceiling track: channel shaped track for use with stud shoes and 1.2 mm diameter double wire ties; size to suit studs.
 - .4 After fabrication apply one shop coat of MPI #26 primer to steel surfaces.
 - .1 Descale and clean surfaces before painting.
- .4 Furring Channels: Commercial steel sheet in accordance with ASTM A653, Z180, hot dipped zinc-coated (galvanized), as follows:

- .1 Hat Shaped, Rigid Furring Channels: ASTM C645, 0.75 mm thickness x 22 mm deep.
- .2 Resilient Furring Channels: 0.46 mm thickness x 13 mm deep members designed to reduce sound transmission having asymmetrical face attached to single flange by a slotted leg (web).
- .5 Acoustical sealant: in accordance with Section 07 92 00 - Joint Sealants.
- .6 Sealants: VOC limit 30 g/L maximum to SCAQMD Rule 1168.
- .7 Insulating strip: rubberized, moisture resistant 3 mm thick cork foam strip, 12 mm wide, with self sticking adhesive on one face, lengths as required.
- .8 Shaft Wall Framing: 102mm CH studs

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 non-structural metal framing application in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 ERECTION

- .1 Erect partitions in accordance with framing requirements of ASTM C754.
- .2 Align partition tracks at floor and ceiling and secure at 600 mm on centre maximum.
- .3 Install damp proof course under stud shoe tracks of partitions on slabs on grade.
- .4 Place studs vertically at 400 mm on centre and not more than 50 mm from abutting walls, and at each side of openings and corners.
 - .1 Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.
- .5 Erect metal studding to tolerance of 1:1000.
- .6 Attach studs to ceiling track using pop rivets.
- .7 Co-ordinate simultaneous erection of studs with installation of service lines. Align web openings when erecting studs.
- .8 Co-ordinate erection of studs with installation of door/window frames and special supports or anchorage for work specified in other Sections.
- .9 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified.
 - .1 Secure studs together, 50 mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.
- .10 Install heavy gauge single jamb studs at openings.

- .11 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs.
 - .1 Secure track to studs at each end, in accordance with manufacturer's instructions.
 - .2 Install intermediate studs above and below openings in same manner and spacing as wall studs.
- .12 Frame openings and around built-in equipment, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.
- .13 Provide 40 mm stud or furring channel secured between studs for attachment of fixtures behind lavatory basins, toilet and bathroom accessories, and other fixtures including grab bars and towel rails, attached to steel stud partitions.
- .14 Install steel studs or furring channel between studs for attaching electrical and other boxes.
- .15 Extend partitions to ceiling height except where noted otherwise on drawings.
- .16 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs.
 - .1 Use 50 mm leg ceiling tracks. Use double track slip joint as indicated.
- .17 Install continuous insulating strips to isolate studs from uninsulated surfaces.
- .18 Install two continuous beads of acoustical sealant under studs and tracks around perimeter of sound control partitions.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .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 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .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 non-structural metal framing application.

END OF SECTION

Section 09 30 13

Ceramic Tiling

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 09 21 16 Gypsum Board Assemblies.

1.2 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI)/Ceramic Tile Institute (CTI)
 - .1 ANSI A108.1-99, Specification for the Installation of Ceramic Tile (Includes ANSI A108.1A-C, 108.4-13, A118.1-10, ANSI A136.1).
 - .2 CTI A118.3-92, Specification for Chemical Resistant, Water Cleanable Tile Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive (included in ANSI A108.1).
 - .3 CTI A118.4-92, Specification for Latex Cement Mortar (included in ANSI A108.1).
 - .4 CTI A118.5-92, Specification for Chemical Resistant Furan Resin Mortars and Grouts for Tile Installation (included in ANSI A108.1).
 - .5 CTI A118.6-92, Specification for Ceramic Tile Grouts (included in ANSI A108.1).
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C144-04, Specification for Aggregate for Masonry Mortar.
 - .2 ASTM C207-06, Specification for Hydrated Lime for Masonry Purposes.
 - .3 ASTM C847-06, Specification for Metal Lath.
 - .4 ASTM C979-05, Specification for Pigments for Integrally Coloured Concrete.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.34-M86 (R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
 - .2 CGSB 71-GP-22M-78 (AMEND.), Adhesive, Organic, for Installation of Ceramic Wall Tile.
 - .3 CAN/CGSB-75.1-M88, Tile, Ceramic.
 - .4 CAN/CGSB-25.20-95, Surface Sealer for Floors.
- .4 CSA Group (CSA)
 - .1 CSA A123.3-05, Asphalt Saturated Organic Roofing Felt.
 - .2 CAN/CSA-A3000-03 (R2006), Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .5 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Include manufacturer's information on:
 - .1 Ceramic tile, marked to show each type, size, and shape required.
 - .2 Chemical resistant mortar and grout (Epoxy and Furan).
 - .3 Cementitious backer unit.
 - .4 Dry-set cement mortar and grout.
 - .5 Divider strip.
 - .6 Elastomeric membrane and bond coat.
 - .7 Reinforcing tape.
 - .8 Levelling compound.
 - .9 Latex cement mortar and grout.
 - .10 Commercial cement grout.
 - .11 Organic adhesive.
 - .12 Slip resistant tile.
 - .13 Waterproofing isolation membrane.
 - .14 Fasteners.
- .3 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Wall tile: submit duplicate, full size tile of each colour, texture, size, and pattern of tile.
 - .2 Trim shapes, each type, colour, and size.

1.4 QUALITY ASSURANCE

- .1 Quality Assurance Submittals:
 - .1 Manufacturer's Instructions: manufacturer's installation instructions.
 - .2 Manufacturer's Field Reports: manufacturer's field reports specified.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

1.6 AMBIENT CONDITIONS

- .1 Maintain air temperature and structural base temperature at ceramic tile installation area above 12 degrees C for 48 hours before, during, and 48 hours after, installation.
- .2 Do not install tiles at temperatures less than 12 degrees C or above 38 degrees C.

.3 Do not apply epoxy mortar and grouts at temperatures below 15 degrees C or above 25 degrees C.

1.7 MAINTENANCE

.1 Extra Materials:

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Provide minimum 2% of each type and colour of tile required for project for maintenance use. Store where directed.

.3 Maintenance material same production run as installed material.

Part 2 Products

2.1 FLOOR TILE

.1 POR1
Supplier: Stone Tile
Collection/Colour: Medley/White Classic, or approved equivalent.
Size: 12"x24"
Installation: as per drawings

.2 POR2
Supplier: Stone Tile
Collection/Colour: Medley/Grey Classic, or approved equivalent.
Size: 12"x24"
Installation: as per drawings

2.2 WALL TILE

.1 CER1A
Supplier: Daltile
Collection/Colour: ColorStory/Restore 0058, or approved equivalent.
Size: 4"x16"
Finish: glossy.

.2 CER1B
Supplier: Daltile
Collection/Colour: ColorStory/Ice White 0025, or approved equivalent.
Size: 2"x8"
Finish: glossy.

2.3 MORTAR AND ADHESIVE MATERIALS

.1 Cement: to CSA-A5, type 10.

.2 Sand: to ASTM C144, passing 16 mesh.

.3 Hydrated lime: to ASTM C207, Type SA.

.4 Latex additive: formulated for use in cement mortar and thin set bond coat.

.5 Water: potable and free of minerals and chemicals which are detrimental to mortar and grout mixes.

2.4 BOND COAT

- .1 Dry set cement mortar: to ANSI A108.1.
- .2 Organic adhesive: to ANSI A136.1.
 - .1 Maximum VOC limit 65 g/L to SCAQMD Rule 1168.
- .3 Latex Cement mortar: to ANSI A108.1, two-component universal dry-set mortar.
- .4 Epoxy bond coat: non-toxic, non-flammable, non-hazardous during storage, mixing, application, and when cured. To produce shock and chemical resistant mortars having the following physical characteristics:
 - .1 Compressive Strength: 246 kg/cm².
 - .2 Bond Strength: 53 kg/cm².
 - .3 Water Absorption: 4.0% Max.
 - .4 Ozone Resistance, 200 hours @ 200 ppm: no loss of strength.
 - .5 Smoke Contribution Factor: 0.
 - .6 Flame Contribution Factor: 0.
 - .7 Finished mortar and grout to be resistant to urine, dilute acid, dilute alkali, sugar, brine and food waste products, petroleum distillates, oil and aromatic solvents.
 - .8 Bond Coat: maximum VOC limit 65 g/L to SCAQMD Rule 1168.
- .5 Chemical-Resistant Bond Coat:
 - .1 Epoxy Resin Type: CTI A118.3.
 - .2 Furan Resin Type: CTI A118.5.
 - .3 Bond Coat: maximum VOC limit 65 g/L to SCAQMD Rule 1168.

2.5 GROUT

- .1 Colouring Pigments:
 - .1 Pure mineral pigments, limeproof and nonfading, complying with ASTM C979.
 - .2 Colouring pigments to be added to grout by manufacturer.
 - .3 Job coloured grout are not acceptable.
 - .4 Use in Commercial Cement Grout, Dry-Set Grout, and Latex Cement Grout.
- .2 Cement Grout: to ANSI A108.1.
 - .1 Use one part white cement to one part white sand passing a number 30 screen.
- .3 Commercial Cement Grout: to CTI A118.6.
- .4 Dry-Set Grout: to CTI A118.6.
- .5 Latex Cement Grout: to ANSI A108.1, fast curing, high early strength, polymer-modified, stain resistant, sanded mix for floors, unsanded mix for walls and floors with polished tiles commercial tile grout.
- .6 Chemical-Resistant Grout:

- .1 Epoxy grout: to ANSI A108.1, having quality, colour and characteristics to match epoxy bond coat. Adhesive and grout by same manufacturer.
- .2 Furan grout: to CTI A118.5.

2.6 ACCESSORIES

- .1 Reinforcing mesh: 50 x 50 x 1.6 x 1.6 mm galvanized steel wire mesh, welded fabric design, in flat sheets.
- .2 Divider strips:
 - .1 For transitions between materials and at corners/edges on all wall applications always use a flush anodized aluminum metal edging similar to Schluter Schiene. Exact model number to be determined by the contractor based on site conditions and height differential and to be approved by architect prior to installation.
 - .2 Wall to Floor strip: cove-shaped profile for inside wall corners. Schluter DILEX-AHK. Satin anodized aluminum. Typical in all washrooms.
- .3 Cleavage plane: polyethylene film to CGSB 51-34.
- .4 Metal lath: to ASTM C847 galvanized finish, 10 mm rib at 2.17 kg/m².
- .5 Transition Strips: purpose made metal extrusion; anodized aluminum type.
- .6 Reducer Strips: purpose made metal extrusion; anodized aluminum type; maximum slope of 1:2.
- .7 Prefabricated Movement Joints: purpose made, having a Shore A Hardness not less than 60 and elasticity of plus or minus 40 percent when used in accordance to TTMAC Detail 301EJ.
- .8 Sealant: in accordance with Section 07 92 00 - Joint Sealants.
 - .1 Sealants: maximum VOC limit 250 g/L to SCAQMD Rule 1168.

2.7 MIXES

- .1 Cement:
 - .1 Scratch coat: 1 part cement, 1/5 to 1/2 parts hydrated lime to suit job conditions, 4 parts sand, 1 part water, and latex additive where required. Adjust water volume depending on water content of sand.
 - .2 Slurry bond coat: cement and water mixed to creamy paste. Latex additive may be included.
 - .3 Mortar bed for walls and ceilings: 1 part cement, 1/5 to 1/2 parts hydrated lime to suit job conditions, 4 parts sand and 1 part water. Adjust water volume depending on water content of sand. Latex additive may be included.
 - .4 Levelling coat: 1 part cement, 4 parts sand, minimum 1/10 part latex additive, 1 part water including latex additive.
 - .5 Bond or setting coat: 1 part cement, 1/3 part hydrated lime, 1 part water.
 - .6 Measure mortar ingredients by volume.
- .2 Dry set mortar: mix to manufacturer's instructions.

- .3 Organic adhesive: pre-mixed.
 - .1 Adhesives: maximum VOC limit 65 g/L to SCAQMD Rule 1168.
- .4 Mix bond and levelling coats, and grout to manufacturer's instructions.
- .5 Adjust water volumes to suit water content of sand.

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 WORKMANSHIP

- .1 Do tile work in accordance with TTMAC Tile Installation Manual 2006/2007, "Ceramic Tile", except where specified otherwise.
- .2 Apply tile or backing coats to clean and sound surfaces.
- .3 Fit tile around corners, fitments, fixtures, drains and other built-in objects. Maintain uniform joint appearance. Cut edges smooth and even. Do not split tiles.
- .4 Maximum surface tolerance 1:800.
- .5 Make joints between tile uniform and approximately 1.5 mm wide, plumb, straight, true, even and flush with adjacent tile. Ensure sheet layout not visible after installation. Align patterns.
- .6 Lay out tiles so perimeter tiles are minimum 1/2 size.
- .7 Sound tiles after setting and replace hollow-sounding units to obtain full bond.
- .8 Install divider strips at junction of tile flooring and dissimilar materials.
- .9 Allow minimum 24 hours after installation of tiles, before grouting.
- .10 Clean installed tile surfaces after installation and grouting cured.
- .11 Make control joints where indicated. Make joint width same as tile joints. Fill control joints with sealant in accordance with Section 07 92 00 - Joint Sealants. Keep building expansion joints free of mortar and grout.

3.3 WATERPROOFING

- .1 Apply in accordance with manufacturer's instructions.
- .2 Apply Schluter-Kerdi waterproofing membrane system along floors and full height of shower walls. In all corridor areas, the waterproofing membrane is to be applied along the floor and on the walls up to 900mm AFF. Apply system as per manufacturer's instructions complete with the following:
 - .1
 - Thin-set mortar
 - Kerdi-Kereck-F and Kerdi-Band preformed corners
 - Kerdi-Seal-PS and Kerdi-Seal-MV at all pipe and valve penetrations

- Kerdi-Fix bonding and sealing compound

.3 All existing drains are to remain. Tie new waterproofing membrane to existing drains.

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 00 - Cleaning.

.2 Waste Management: Separate waste material for reuse or recycling in accordance with section 01 74 19 - Waste Management and Disposal.

END OF SECTION

Section 09 51 13

Acoustical Panel Ceilings

Part 1 General

1.1 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM C423-09, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
 - .2 ASTM E580/E580M-14 Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.
 - .3 ASTM C635/C635M-13a, Standard Specifications for the Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
 - .4 ASTM C636/C636M-08, Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
 - .5 ASTM E1264-14, Standard Classification for Acoustical Ceiling Products.
 - .6 ASTM E1414/E1414M 11ae1 Standard Test Method for Sound Attenuation between Rooms Sharing a Common Ceiling Plenum.
 - .7 ASTM E1477-98a(2013), Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.
 - .8 ASTM F1667-15 Standard Specification for Driven Fasteners: Nails, Spikes and Staples.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction and Amendment No. 1 1988.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (SDS).
- .4 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-2003, Surface Burning Characteristics of Building Materials and Assemblies.

1.2 COORDINATION

- .1 Do not begin erection of ceiling suspension system until work above ceiling has been inspected by Consultant.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:

- .1 Submit manufacturer's instructions, printed product literature and data sheets for acoustical suspension, acoustic panels, acoustic tiles, and system accessories. Include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit reflected ceiling plans for special grid patterns in the Active Classrooms.
 - .2 Indicate lay-out, insert and hanger spacing and fastening details, splicing method for main and cross runners, change in level details.
- .4 Samples:
 - .1 Submit duplicate 150 mm x 100 mm samples of each type of acoustical unit.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Submit operation and maintenance data for acoustical suspension for incorporation into manual.

1.5 MAINTENANCE MATERIALS

- .1 Provide extra acoustical units in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Provide acoustical units amounting to 2 % of gross ceiling area for each pattern and type of acoustical panel or tile, suspension system and trim required for project, minimum 1 complete factory-sealed package of each.
- .3 Ensure extra materials are from same production run as installed materials.
- .4 Deliver extra materials for each type of acoustical unit in original unopened packages clearly identified, including colour and texture.
- .5 Deliver to Owner, upon completion of the work of this section.

1.6 CERTIFICATIONS

- .1 Fire-resistance rated suspension system: certified by a Canadian Certification Organization accredited by Standards Council of Canada.

1.7 MOCK-UPS

- .1 Construct mock-ups in accordance with Section 01 45 00 - Quality Control.
- .2 Construct mock-up where directed.
- .3 Allow 24 hours for inspection of mock-up by Consultant before proceeding with ceiling work.
- .4 When accepted, mock-up will demonstrate minimum standard for this work. Mock-up may remain as part of the finished work.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver, store and handle materials in accordance with manufacturers recommendations.

- .3 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .4 Storage and Handling Requirements:
 - .1 Store materials flat, indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect acoustical ceiling tiles suspension grid components from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
 - .4 Store extra materials required for maintenance, where directed by Owner.

1.9 ENVIRONMENTAL REQUIREMENTS

- .1 Permit wet work to dry before beginning to install.
- .2 Maintain uniform minimum temperature of 15 degrees C and humidity of 20 % before and during installation.⁴⁰
- .3 Store materials in work area 48 hours prior to installation.

Part 2 Products

2.1 MATERIALS

- .1 ACT1: Acoustic ceiling tile in Kitchen
Manufacturer: Armstrong
Tile: Calla Health Health Zone
Size: 24"x48"
Colour: White
Edge Profile: Square Lay-in
Suspension Grid: Prelude XL 15/16
Grid Colour: White
- .2 ACT2: Acoustic ceiling tile
Manufacturer: Armstrong
Tile: Optima lay-in
Size: 24"x48"
Colour: White
Edge Profile: Square Lay-in
Suspension Grid: Prelude XL 15/16
Grid colour: White

Part 3 Execution

3.1 EXAMINATION

- .1 Verify conditions of substrates previously installed under other Sections or Contracts are acceptable for acoustical ceiling tile and track installation in accordance with manufacturer's written instructions.
 - .1 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from consultant.

3.2 INTERFACE WITH OTHER WORK

- .1 Co-ordinate ceiling work to accommodate components of other sections, such as light fixtures, diffusers, speakers, sprinkler heads, to be built into acoustical ceiling components.

3.3 SUSPENSION SYSTEM INSTALLATION

- .1 Comply with manufacturer's written installation instructions and recommendations, including product technical bulletins, product carton installation instructions, and data sheets.
- .2 Install suspension system in accordance with accepted shop drawings, Certification Organizations tested design requirements and ASTM C636/C636M except where specified otherwise.
- .3 Lay out system according to reflected ceiling plan.
- .4 Finished ceiling system to be square with adjoining walls and level within 1:1000.
- .5 Secure hangers to overhead structure as per manufacturer's directions
- .6 Install hangers spaced at maximum 1200 mm centres and within 150 mm from ends of main tees.
- .7 Ensure suspension system is coordinated with location of related components. Provide carrying channels as necessary to bridge at unavoidable interference between suspension system and other work above ceiling.
- .8 Install wall moulding to provide correct ceiling height.
- .9 Completed suspension system to support super-imposed loads, such as lighting fixtures, grilles, diffusers and speakers.
- .10 Support at diffusers and light fixtures with additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
- .11 Attach cross member to main runner to provide rigid assembly.
- .12 Frame at openings for light fixtures, air diffusers, speakers and at changes in ceiling heights.
- .13 Install perimeter trim at floating installations securely anchored to suspension system, in accurate alignment with adjacent assemblies. Install curved trim members in smooth curves to radius indicated.

3.4 ACOUSTICAL CEILING PANEL INSTALLATION

- .1 Install lay-in acoustical panels in ceiling suspension system in accordance with manufacturer's instructions and as indicated.
- .2 Install fibrous acoustical media and spacers over entire area above suspended metal panels.

3.5 SITE QUALITY CONTROL

- .1 Arrange for periodic site visits by design professional responsible for delegated ceiling design work to review installed work for conformity to design.
- .2 Arrange for periodic site visits by manufacturer's representative to review installed work for conformity to manufacturer's installation instructions and recommendations.

.3 Submit written site reports by designer to Consultant within 3 days of visit.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
.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 00 - Cleaning.
.1 Touch up scratches, abrasions, voids and other defects in painted surfaces.

.3 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

3.7 PROTECTION

.1 Protect installed products and components from damage during construction.
.2 Repair damage to adjacent materials caused by acoustical suspension installation.

END OF SECTION

Section 09 65 19 Resilient Tile Flooring

Part 1 General

1.1 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM F1066-04 (2010)e1, Standard Specification for Vinyl Composition Floor Tile.
 - .2 ASTM F1344-12e1, Standard Specification for Rubber Floor Tile.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-25.20-95, Surface Sealer for Floors.
 - .2 CAN/CGSB-25.21-95, Detergent-Resistant Floor Polish.
- .3 South Coast Air Quality Management District (SCAQMD)
 - .1 SCAQMD Rule 1168-A2011, Adhesive and Sealant Applications.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for resilient tile flooring and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Submit duplicate tile in size specified, .

1.3 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra Materials:
 - .1 Provide maintenance materials of resilient tile flooring, base and adhesive in accordance with Section 01 78 00 - Closeout Submittals.
 - .2 Provide 10 m² of each colour, pattern and type flooring material required for this project for maintenance use.
 - .3 Extra materials from same production run as installed materials.
 - .4 Identify each container of floor tile and each container of adhesive.
 - .5 Deliver to Owner, upon completion of the work of this section.
 - .6 Store where directed by Owner.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect specified materials from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

1.5 SITE CONDITIONS

- .1 Ambient Conditions:
 - .1 Maintain air temperature and structural base temperature at flooring installation area above 20 degrees C for 48 hours before, during and for 48 hours after installation.

Part 2 Products

2.1 MATERIALS

- .1 Vinyl Composition Tile.
 - .1 **VCT1**
Manufacturer: Standard Excelon by Armstrong, or approved equivalent.
Colour: full range of manufacturer's standard.
 - .2 **VCT2**
Manufacturer: Standard Excelon by Armstrong, or approved equivalent.
Colour: full range of manufacturer's standard.
 - .3 **VCT3**
Manufacturer: Standard Excelon by Armstrong, or approved equivalent.
Colour: 51885 Granny Smith.
- .2 **VCT2A Stair Tread and Riser**
 - .1 Manufacturer: Johnsonite
 - .2 Product: Tread/Riser Visually Impaired VIHNTR
 - .3 Grit Tape Colour: Black
 - .4 Colour: TBD
 - .5 Finish: Hammered
- .3 **VCT2B Tactile Warning Surface**
 - .1 Manufacturer: Johnsonite
 - .2 Product: Vinyl Tactile Warning surface
 - .3 Colour: TBD
- .4 **VCT2C Rubber Landing Tile**
 - .1 Manufacturer: Johnsonite
 - .2 Product: Rubber Landing tile for use with Vinyl Stair treads

- .3 Colour: TBD
- .4 Finish: Hammered
- .5 **Nosing at Cafetorium 1139 Stage Stair**
 - .1 Manufacturer: KINESIK Engineered Products
 - .2 Product: RF7136 Flat Stair Nosing
 - .3 Contrasting Colour: Grey
 - .4 Aluminum Finish: Black
- .6 Primers and adhesives: waterproof, recommended by flooring manufacturer for specific material on applicable substrate, above, at or below grade.
 - .1 Flooring adhesives:
 - .1 Adhesive: maximum VOC limit 50 g/L to SCAQMD Rule 1168.
 - .2 Cove base adhesives:
 - .1 Adhesive: maximum VOC limit 50 g/L to SCAQMD Rule 1168.
- .7 Sub-floor filler and leveller: white premix latex requiring water only to produce cementitious paste as recommended by flooring manufacturer for use with their product.
- .8 Metal edge strips: aluminum extruded, smooth, mill finish with lip to extend under floor finish, shoulder flush with top of adjacent floor finish.

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 resilient tile flooring installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant.
 - .2 Inform Consultant 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 Consultant.

3.2 INSPECTION

- .1 Ensure concrete floors are dry, by using test methods recommended by tile manufacturer.

3.3 SUB-FLOOR TREATMENT

- .1 Remove or treat old adhesives to prevent residual, old flooring adhesives from bleeding through to new flooring and/or interfering with the bonding of new adhesives.
- .2 Clean floor and apply filler; trowel and float to leave smooth, flat hard surface. Prohibit traffic until filler cured and dry.
- .3 Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.
- .4 Prime to flooring manufacturer's printed instructions.

3.4 TILE APPLICATION

- .1 Provide high ventilation rate, with maximum outside air, during installation, and for 48 to 72 hours after installation. If possible, vent directly to outside. Do not let contaminated air recirculate through district or whole building air distribution system. Maintain extra ventilation for at least one month following building occupation.
- .2 Apply adhesive uniformly using recommended trowel in accordance with flooring manufacturer's instructions. Do not spread more adhesive than can be covered by flooring before initial set takes place.
- .3 Lay flooring with joints parallel to building lines to produce symmetrical tile pattern. Border tiles minimum half tile width.
- .4 Install flooring to ashlar/staggered pattern with continuous joints flowing with direction of mottle.
- .5 As installation progresses, and after installation, roll flooring in 2 directions resilient tile with 45 kg minimum roller to ensure full adhesion.
- .6 Cut tile and fit neatly around fixed objects.
- .7 Install feature strips and floor markings where indicated. Fit joints tightly.
- .8 Install flooring in pan type floor access covers. Maintain floor pattern.
- .9 Continue flooring through areas to receive movable type partitions without interrupting floor pattern.
- .10 Terminate flooring at centerline of door in openings where adjacent floor finish or colour is dissimilar.
- .11 Install metal edge strips at unprotected or exposed edges where flooring terminates.

3.5 BASE APPLICATION

- .1 Lay out base to keep number of joints at minimum. Base joints at maximum length available or at internal or premoulded corners.
- .2 Clean substrate and prime with one coat of adhesive.
- .3 Apply adhesive to back of base.
- .4 Set base against wall and floor surfaces tightly by using 3 kg hand roller.
- .5 Install straight and level to variation of 1:1000.
- .6 Scribe and fit to door frames and other obstructions. Use premoulded end pieces at flush door frames.
- .7 Cope internal corners. Use premoulded corner units for right angle external corners. Use formed straight base material for external corners of other angles, minimum 300 mm each leg. Wrap around toeless base at external corners.
- .8 Install toeless type base before installation of carpet on floors.

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .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 00 - Cleaning.
 - .1 Clean flooring base surfaces to flooring manufacturer's printed instructions.
- .3 Remove excess adhesive from floor, base and wall surfaces without damage.
- .4 Clean, seal and wax floor and base surface to flooring manufacturer's instructions. In carpeted areas clean, seal and wax base surface before carpet installation.
- .5 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 PROTECTION

- .1 Protect new floors from time of final set of adhesive until final inspection.
- .2 Prohibit traffic on floor for 48 hours after installation.

END OF SECTION

Section 09 91 23 Interior Painting

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Environmental Protection Agency (EPA)
 - .1 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, EPA Method 24 - Surface Coatings.
 - .2 SW-846, Test Methods for Evaluating Solid Waste: Physical/Chemical Methods.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (SDS).
- .3 Master Painters Institute (MPI)
 - .1 The Master Painters Institute (MPI)/Architectural Painting Specification Manual (ASM) - current edition.
 - .2 Standard GPS-1-12, MPI Green Performance Standard.
 - .3 Standard GPS-2-12, MPI Green Performance Standard.
- .4 National Research Council Canada (NRC)
 - .1 National Fire Code of Canada 2015 (NFC).
- .5 Society for Protective Coatings (SSPC)
 - .1 SSPC Painting Manual, Volume Two, 8th Edition, Systems and Specifications Manual.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's instructions, printed product literature and data sheets for paint and paint products and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Submit full range colour sample chips to indicate where colour availability is restricted.
 - .2 Submit 200x300 mm sample panels of each coating with specified paint or coating in colours, gloss/sheen and textures required to MPI Architectural Painting Specification Manual standards submitted on a drawdown card.
 - .3 Retain reviewed samples on-site to demonstrate acceptable standard of quality for appropriate on-site surface.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: Provide operation and maintenance data for painting materials for incorporation into manual.
- .3 Include:
 - .1 Product name, type and use.
 - .2 Manufacturer's product number.
 - .3 Colour numbers.
 - .4 MPI Environmentally Friendly classification system rating.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra Stock Materials:
 - .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
 - .2 Submit one 3.78 litre can of each type and colour of finish coating. Identify colour and paint type in relation to established colour schedule and finish system.

1.5 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Contractor: to have a minimum of 5 years proven satisfactory experience. When requested, provide list of last 3 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.
 - .4 Conform to latest MPI requirements for exterior painting work including preparation and priming.
 - .5 Materials: in accordance with MPI Painting Specification Manual "Approved Product" listing and from a single manufacturer for each system used.
 - .6 Retain purchase orders, invoices and documents to prove conformance with noted MPI requirements when requested by Consultant.
 - .7 Standard of Acceptance:
 - .1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.
 - .2 Soffits: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.
 - .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
 - .1 Labels: to indicate:
 - .1 Type of paint or coating.
 - .2 Compliance with applicable standard.
 - .3 Colour number in accordance with established colour schedule.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Observe manufacturer's recommendations for storage and handling.
 - .3 Store materials and supplies away from heat generating devices.
 - .4 Store materials and equipment in well ventilated area with temperature range 7 degrees C to 30 degrees C.
 - .5 Keep areas used for storage, cleaning and preparation, clean and orderly. After completion of operations, return areas to clean condition.
 - .6 Remove paint materials from storage only in quantities required for same day use.
 - .7 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
 - .8 Fire Safety Requirements:
 - .1 Provide 9 kg 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 (NFC).

1.7 SITE CONDITIONS

- .1 Ambient Conditions:
 - .1 Heating, Ventilation and Lighting:
 - .1 Provide heating facilities to maintain ambient air and substrate temperatures above 10 degrees C for 24 hours before, during and after paint application until paint has cured sufficiently.
 - .2 Provide continuous ventilation for 7 days after completion of application of paint.

- .3 Co-ordinate use of existing ventilation system with Owner and ensure its operation during and after application of paint as required.
- .4 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.
- .5 Provide minimum lighting level of 323 Lux on surfaces to be painted.
- .6 Temperature, Humidity and Substrate Moisture Content Levels:
 - .1 Unless pre-approved written approval by Paint Inspection Agency Authority and product manufacturer, perform no painting when:
 - .1 Ambient air and substrate temperatures are below 10 degrees C.
 - .2 Substrate temperature is above 32 degrees C unless paint is specifically formulated for application at high temperatures.
 - .3 Substrate and ambient air temperatures are not expected to fall within MPI or paint manufacturer's prescribed limits.
 - .4 The relative humidity is under 85 % or when the dew point is more than 3 degrees C variance between the air/surface temperature. Paint should not be applied if the dew point is less than 3 degrees C below the ambient or surface temperature. Use sling psychrometer to establish the relative humidity before beginning paint work.
 - .5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.
 - .6 Ensure that conditions are within specified limits during drying or curing process, until newly applied coating can itself withstand 'normal' adverse environmental factors.
 - .2 Perform painting work when maximum moisture content of the substrate is below:
 - .1 12 % for concrete and masonry (clay and concrete brick/block). Allow new concrete and masonry to cure minimum of 28 days.
 - .2 15 % for hard wood.
 - .3 17 % for soft wood.
 - .4 12 % for plaster and gypsum board.
 - .3 Test for moisture using calibrated electronic Moisture Meter. Test concrete floors for moisture using "cover patch test".

- .4 Test concrete, masonry and plaster surfaces for alkalinity as required.
- .7 Surface and Environmental Conditions:
 - .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.
 - .2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits.
 - .3 Apply paint when previous coat of paint is dry or adequately cured.
- .8 Additional interior application requirements:
 - .1 Apply paint finishes when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.
 - .2 Apply paint in occupied facilities during silent hours only. Schedule operations to approval of Owner such that painted surfaces will have dried and cured sufficiently before occupants are affected.

Part 2 Products

2.1 MATERIALS

- .1 Only Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.
- .2 Provide paint materials for paint systems from single manufacturer.
- .3 Only qualified products with E2 "Environmentally Friendly" rating are acceptable for use on this project.
- .4 Conform to latest MPI requirements for interior painting work including preparation and priming.
- .5 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids to be:
 - .1 Water-clean-able.
 - .2 non-flammable.
 - .3 Be manufactured without compounds which contribute to ozone depletion in the upper atmosphere.
 - .4 Be manufactured without compounds which contribute to smog in the lower atmosphere.
 - .5 Do not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.
- .6 Ensure manufacture and process of both water-borne surface coatings and recycled water-borne surface coatings does not release:

- .1 Matter in undiluted production plant effluent generating 'Biochemical Oxygen Demand' (BOD) in excess of 15 mg/L to natural watercourse or sewage treatment facility lacking secondary treatment.
- .2 Total Suspended Solids (TSS) in undiluted production plant effluent in excess of 15 mg/L to natural watercourse or a sewage treatment facility lacking secondary treatment.
- .7 Water-borne paints and stains, recycled water-borne surface coatings and water borne varnishes to meet minimum "Environmentally Friendly" E2 rating.
- .8 Recycled water-borne surface coatings to contain 50 % post-consumer material by volume.
- .9 Recycled water-borne surface coatings must not contain:
 - .1 Lead in excess of 600.0 ppm weight/weight total solids.
 - .2 Mercury in excess of 50.0 ppm weight/weight total product.
 - .3 Cadmium in excess of 1.0 ppm weight/weight total product.
 - .4 Hexavelant chromium in excess of 3.0 ppm weight/weight total product.
 - .5 Organochlorines or polychlorinated biphenyls (PCBS) in excess of 1.0 ppm weight/weight total product.

2.2 COLOURS

- .1 Selection of colours will be from manufacturers full range of colours.
- .2 Where specific products are available in restricted range of colours, selection based on limited range.
- .3 For deep and ultra deep colours; 4 coats may be required.
- .4 Accent walls: The following colours are to be coordinated and confirmed with the project colour Schedule.
 - .1 Field colour walls and ceilings:
(PT1)- Chantilly Lace OC-65

2.3 MIXING AND TINTING

- .1 Perform colour tinting operations prior to delivery of paint to site. Obtain written approval from Consultant for tinting of painting materials.
- .2 Mix paste, powder or catalyzed paint mixes in accordance with manufacturer's written instructions.
- .3 Use and add thinner in accordance with paint manufacturer's recommendations. Do not use kerosene or similar organic solvents to thin water-based paints.
- .4 Thin paint for spraying in accordance with paint manufacturer's instructions.
- .5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity. Strain as necessary.

2.4 GLOSS/SHEEN RATINGS

- .1 Paint gloss is defined as sheen rating of applied paint, in accordance with following values:
 - .1 Level 1 - Matte(Flat) Finish
Gloss @ 60 degrees: Max. 5
Gloss@ 85 degrees: Max 10
 - .2 Level 2 - Velvet Finish
Gloss @ 60 degrees: Max. 10
Gloss@ 85 degrees: 10-35
 - .3 Level 3 - Eggshell Finish
Gloss @ 60 degrees: 10-25
Gloss@ 85 degrees: 10-35
 - .4 Level 4 - Satin (Pearl) Finish
Gloss @ 60 degrees: 20-35
Gloss@ 85 degrees: min 35
 - .5 Level 5 - Semi-gloss Finish
Gloss @ 60 degrees: 35-70
 - .6 Level 6 - Gloss Finish
Gloss @ 60 degrees: 70-85
 - .7 Level 7 - High Gloss Finish
Gloss @ 60 degrees: More than 85
- .2 Gloss level ratings of painted surfaces to be provided on colour schedule.

2.5 INTERIOR PAINTING SYSTEMS

- .1 Interior dry fall paint for mechanical equipment and open ceiling areas. Benjamin Moore Latex Dry Fall, Flat or Architect approved similar.
- .2 Concrete masonry units: smooth and split face block and brick:
 - .1 INT 4.2D - High performance architectural latex (over latex block filler) Eggshell finish.
- .3 Structural steel and metal fabrications: columns, beams, joists:
 - .1 INT 5.1Q - Latex Eggshell finish (over Q.D. alkyd primer).
- .4 Galvanized metal: doors, frames, railings, misc. steel, pipes, overhead decking, and ducts.
 - .1 INT 5.3M - High performance architectural latex semi-gloss (over W.B. galvanized primer) finish.
- .5 Dressed lumber: including doors, door and window frames, casings, mouldings:
 - .1 INT 6.3Z - Polyurethane, Clear, 2 component finish.
- .6 Wood paneling and casework: partitions, panels, shelving, millwork:
 - .1 INT 6.4J - Polyurethane varnish satin finish.
 - .2 INT 6.4Q - Fire Retardant, Clear, S.B. Eggshell coating (ULC rated).

- .7 Plaster and gypsum board: gypsum wallboard, drywall, "sheet rock type material", and textured finishes:
 - .1 INT 9.2B - High performance architectural latex Eggshell (over latex primer/sealer) finish.

2.6 SOURCE QUALITY CONTROL

- .1 Perform following tests on each batch of consolidated post-consumer material before surface coating is reformulated and canned. Testing by laboratory or facility which has been accredited by Standards Council of Canada.
 - .1 Lead, cadmium and chromium are to be determined using ICP-AES (Inductively Coupled Plasma - Atomic Emission Spectroscopy) technique no. 6010 as defined in EPA SW-846.
 - .2 Mercury is to be determined by Cold Vapour Atomic Absorption Spectroscopy using Technique no. 7471 as defined in EPA SW-846.
 - .3 Organochlorines and PCBs are to be determined by Gas Chromatography using Technique no. 8081 as defined in EPA SW-846.

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 GENERAL

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

3.3 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable to be painted in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant.
 - .2 Inform Consultant 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 Consultant.
- .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 Maximum moisture content as follows:
 - .1 Stucco, plaster and gypsum board: 12 %.

- .2 Concrete: 12 %.
- .3 Clay and Concrete Block/Brick: 12 %.
- .4 Hard Wood: 15 %.
- .5 Soft Wood: 17%.

3.4 PREPARATION

- .1 Protection (not applicable to new painting work):
 - .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 Consultant.
 - .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
 - .3 Protect factory finished products and equipment.
 - .4 Protect passing pedestrians, building occupants in and about the building.
- .2 Surface Preparation (not applicable to new painting work):
 - .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 Consultant.
- .3 Clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
 - .1 Remove dust, dirt, and other surface debris by vacuuming, wiping with dry, clean cloths or compressed air.
 - .2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.
 - .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
 - .4 Allow surfaces to drain completely and allow to dry thoroughly.
 - .5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.
 - .6 Use trigger operated spray nozzles for water hoses.
 - .7 Many water-based paints cannot be removed with water once dried. Minimize use of mineral spirits or organic solvents to clean up water-based paints.
- .4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between

applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.

- .5 Where possible, prime non-exposed surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.
 - .1 Apply sealer to MPI #36 over knots, pitch, sap and resinous areas.
 - .2 Apply wood filler to nail holes and cracks.
 - .3 Tint filler to match stains for stained woodwork.
- .6 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.
- .7 Carried out during shop priming: clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes and vacuum cleaning.
- .8 Touch up of shop primers with primer as specified.
- .9 Do not apply paint until prepared surfaces have been accepted by Consultant

3.5 EXISTING CONDITIONS

- .1 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" and report findings to Consultant. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.
- .2 Maximum moisture content as follows:
 - .1 Stucco: 12 %.
 - .2 Concrete: 12 %.
 - .3 Clay and Concrete Block/Brick: 12 %.
 - .4 Hard Wood: 15 %.
 - .5 Soft Wood: 17%.

3.6 APPLICATION

- .1 Method of application to be as approved by Consultant. Apply paint by air sprayer, brush, airless sprayer and/or roller. Conform to manufacturer's application instructions unless specified otherwise.
- .2 Brush and Roller Application:
 - .1 Apply paint in uniform layer using brush and/or roller type suitable for application.
 - .2 Work paint into cracks, crevices and corners.
 - .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
 - .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces free of roller tracking and heavy stipple.
 - .5 Remove runs, sags and brush marks from finished work and repaint.

.3 Spray application:

- .1 Provide and maintain equipment that is suitable for intended purpose, capable of atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
- .2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
- .3 Apply paint in uniform layer, with overlapping at edges of spray pattern. Back roll first coat application.
- .4 Brush out immediately all runs and sags.
- .5 Use brushes and rollers to work paint into cracks, crevices and places which are not adequately painted by spray.
- .4 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access.
- .5 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
- .6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
- .7 Sand and dust between coats to remove visible defects.
- .8 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.
- .9 Finish inside of cupboards and cabinets as specified for outside surfaces.
- .10 Finish closets and alcoves as specified for adjoining rooms.
- .11 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.
- .12 Wood, drywall, plaster, stucco, concrete, concrete masonry units and brick; if sprayed, must be back rolled.

3.7 MECHANICAL/ELECTRICAL EQUIPMENT

- .1 Paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as indicated.
- .2 Boiler room, mechanical and electrical rooms: paint exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment.
- .3 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.
- .4 Do not paint over nameplates.
- .5 Keep sprinkler heads free of paint.
- .6 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matt black paint.
- .7 Paint fire protection piping red.
- .8 Paint disconnect switches for fire alarm system and exit light systems in red enamel.

- .9 Paint natural gas piping yellow.
- .10 Paint both sides and edges of backboards for telephone and electrical equipment before installation. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.
- .11 Do not paint interior transformers and substation equipment.

3.8 SITE TOLERANCES

- .1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.
- .2 Ceilings: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.
- .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

3.9 FIELD QUALITY CONTROL

- .1 Standard of Acceptance:
 - .1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.
 - .2 Ceilings: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.
 - .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

3.10 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .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 00 - Cleaning.

3.11 RESTORATION

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

END OF SECTION

Section 14 24 00

Hydraulic Elevator

PART 1: GENERAL

1.1. PROJECT MANUAL

.1 This technical section of the Project Manual forms part of the Contract and is to be read, interpreted, and coordinated with all other parts of the Contract Documents including General Conditions, Supplementary Conditions and Division 1, General Requirements.

1.2. SUMMARY

.1 Provide holeless hydraulic elevator with single slide doors.

.2 This section is based on the design intent, performance criteria, and dimensional requirements established by the Basis-of-Design product. The Basis-of-Design product is identified to establish a standard of quality, performance, and configuration. Subject to compliance with the requirements of this Section, comparable product by acceptable manufacturers may be considered.

1.3. RELATED SECTIONS

.1	03 30 00	Cast-in-Place Concrete
.2	04 20 00	Unit Masonry
.3	05 12 00	Structural Steel for Buildings
.4	05 50 00	Metal Fabrications
.5	06 20 00	Finish Carpentry and Millwork
.6	07 16 16	Crystalline Waterproofing
.7	07 21 00	Building Insulation
.8	07 92 00	Sealants
.9	09 30 13	Ceramic Tiling
.10	09 90 00	Painting
.11	Div. 22/23	Mechanical
.12	Div. 26	Electrical

1.4. REFERENCES

- .1 ASME A17.1/CSA-B44 2022, Safety Code for Elevators.
- .2 CAN/CSA C22.1-24 Canadian Electrical Code, Part 1 Safety Standards for Electrical Installations.
- .3 CAN/ULC S104-15, Standard Method of Fire Tests of Door Assemblies
- .4 NFPA 80-2025 Standard for Fire Doors and Other Opening Protective.
- .5 Ontario Building Code (OBC) 2024 Edition.

1.5. SUBMITTALS

- .1 Provide information in accordance with 01 33 00 Submittal Procedures.
- .2 Product Data: Submit manufacturer's product literature for each proposed system.
 1. Cab design, dimension and layout.
 2. Layout, finishes, and accessories and available options.
 3. System capacity and performance.
 4. Controls, signals and operating system.
 5. Colour selection charts for cab and entrances.
- .3 Shop Drawings:
 1. Clearances and travel of car.
 2. Clear inside hoistway and pit dimensions.
 3. Location and layout of equipment and Signals.
 4. Car, guide rails, buffers and other components in hoistway.
 5. Maximum rail bracket spacing.
 6. Maximum loads imposed on building structure.
 7. Hoist beam requirements.
 8. Location and sizes of access doors.
 9. Location and details of hoistway door and frames.
 10. Equipment layout and size in controller closet.
 11. Electrical characteristics and connection requirements.
 12. Prepare signed and sealed structural design drawings to confirm non-conforming rail sizes and spacing required for seismic loading. Submit

Shop Drawings and request for variance to authorities having jurisdiction for approval.

.4 Closeout Submittals:

1. Manufacturer's operation and maintenance manuals.
2. Inspection Certificates and Permits.
3. Special Manufacturer Warranty.
4. Software: Submit one backup copy of the control system software for the Owner's exclusive use. The Owner agrees that the software shall be used for archival purposes only and will not be sold or given to any other party or individual and will not be used for any other purpose.

1.6.		REGULATORY REQUIREMENTS
	.1	Work in accordance with ASME A17.1/CSA-B44 and the requirements of the Ontario Elevator Inspection Branch Regulations, local Building codes and By-Laws, Canadian Electrical Code and the requirements of the local fire department that may govern this installation.
1.7.		FEES AND PERMITS
	.1	Give notices, obtain permits and pay fees as required for tests and inspections (except ownership and operating license) and furnish certificates as evidence that work conforms to all regulations.
	.2	Pay patent license fees and royalties necessary for the completion of the work. The Owner and the Consultants will not be held responsible for infringements of patents because of Work of this section.
1.8.		QUALITY ASSURANCE
	.1	Manufacturer: minimum ten (10) years experience in the fabrication, installation and service of elevators. Manufacturer will be ISO 9001 and 14001 certified, and have a documented quality assurance program.
	.2	Installer: Elevator installed by the manufacturer, or a manufacturer approved installer with a minimum ten (10) years experience in the installation and service of hydraulic elevators.
	.3	Inspection and Testing: In accordance with requirements of local jurisdiction, obtain required permits, inspections and tests.
	.4	Pre-installation Conference: <ol style="list-style-type: none">1. Prior to beginning Work of this section, convene a pre-installation conference. Owner, Consultant, and contractors with adjacent or related work shall attend.
1.9.		DELIVERY, STORAGE AND HANDLING
	.1	Coordinate delivery of elevator material throughout construction.
	.2	Store elevator materials in protected environment in accordance with manufacturer recommendations.
1.10.		TEMPORARY USE OF THE ELEVATOR
	.1	If use of the Elevator is required before certified date Ready for Takeover, it will be inspected by the local enforcing authorities for safety, and if passed, a written temporary arrangement will be made upon agreement with the Consultant.
	.2	Any repairs or maintenance required shall be done by sub-contractor responsible for the Work of this section.

- .3 Upon termination of temporary agreement, elevator will be returned to "as new" condition by the sub-contractor responsible for the Work of this section.
- .4 Temporary use will have no bearing on Contract guarantee or the Maintenance Contract portion of the Work.

1.11. WARRANTY

- .1 Provide Manufacturer warranty for a period of five (5) years. Warranty period to begin upon Ready for Takeover of the Contract. Warranty covers defects in materials and workmanship. Damage due to ordinary use, vandalism, improper or insufficient maintenance, misuse, or neglect does not constitute defective material or workmanship.

1.12. MAINTENANCE SERVICE

- .1 Provide maintenance service consisting of examinations and adjustments of the elevator equipment for a period of twelve (12) months after date of substantial completion/Ready for Takeover.
- .2 Maintenance service shall be provided by elevator manufacturer recommended service personnel. Manufacturer recommended parts and supplies shall be used in maintenance service as in the original manufacture and installation.
- .3 Maintenance service be performed during regular working hours of regular working days and shall include regular time call back service.
- .4 Answer trouble calls twenty-four (24) hours a day, seven days a week, without extra charge. Work other than call backs to be performed during regular working hours with maximum response time of 30 minutes from time of call to site.
- .5 Maintenance service shall not include adjustments, repairs or replacement of parts due to negligence, misuse, abuse or accidents.
- .6 Maintain locally, near place of building, an adequate stock of parts for replacement or emergency purposes and have qualified installation personnel available to ensure fulfillment of this maintenance service without unreasonable loss of time.
- .7 Requirements of this maintenance provision will in no way prejudice or cancel five (5) year warranty provision set out in General Conditions of the Contract.

PART 2: PRODUCTS

2.1. ELEVATOR BASIS-OF-DESIGN

- .1 Basis of Design elevator system is:

"Aspire" conventional, holeless hydraulic passenger elevator by Federal Elevator.

- .2 The Basis-of-Design product is identified to establish the minimum standard of quality, performance, configuration, and dimensional criteria for the Work.

2.2. ACCEPTABLE MANUFACTURERS

1.1 Basis of Design Manufacturer:

1 Federal Elevator. Contact Florence Facchini, florence@federalelevator.com.

2 Acceptable Manufacturers:

- 1.1. Otis Elevator Company.
- 1.2. TK Elevator (formerly Thyssenkrupp).
- 1.3. Schindler Elevator Corp.
- 1.4. Other manufacturers may be considered only in accordance with requirements stipulated in 4.2 Substitutions paragraph of 4.0 - Tender Compliance of Owner's "DDSB Front End Documents".
- 1.5. Manufacturers listed shall be capable of providing equipment that fits within the hoistway, pit, and headroom dimensions indicated on drawings without modification to the building design.

2.3. PERFORMANCE AND CONFIGURATION REQUIREMENTS

1. Elevator systems shall comply with the performance, dimensional, and operational requirements specified in Part 1 and indicated on the Drawings.
2. Equipment configurations that require changes to architectural, structural, mechanical, or electrical systems will not be accepted.
3. Minimum cab size: 2337mm x 1651mm.
4. Card/FOB access: Not required.
5. Provide operational testing, inspection and verification of elevator and services.
6. Provide Non- Proprietary Equipment Controls and Tools.

- .5 Travel: Refer to drawings
- .6 Landings: 2 total.
- .7 Openings: front only.
- .8 Door opening: 1076mm (42").
- .9 Cab Height: 2.4m (8'-0").
- .10 Car Enclosures: refer to drawings
- .11 Pit Depth: 1.5m (5'-0").
- .12 Seismic Requirements: shall conform to OBC 2024 and the local spectral acceleration values for the project location.
- .13 Fixture & Button Style: Signa4 Signal Fixtures with antimicrobial protection.
- .14 Provide protective blanket hooks and one set of full-height fire retardant blankets.
- .15 Non-proprietary controls and technology.

2.4. PERFORMANCE REQUIREMENTS

- .1 Car Performance
 - 1. Car Speed: $\pm 5\%$ of contract speed under any loading condition or direction of travel.
 - 2. Car Capacity: Safely lower, stop and hold (per code) up to 125% of rated load.
- .2 System Performance.
 - 1. Vertical Vibration (maximum): 25 mg.
 - 2. Horizontal Vibration (maximum): 25 mg.
 - 3. Jerk Rate (maximum): 1.4m /sec³ (1.3 ft/sec³).
 - 4. Acceleration (maximum): 1.3 ft/sec².
 - 5. In Car Noise: ≤ 55 dB(A).

6. Levelling Accuracy: $\pm 5\text{mm}$ ($\pm 0.2''$).
7. Re-levelling Distance: $\pm 10\text{mm}$ ($\pm 0.4''$)
8. Starts per hour (maximum): 120.

.3 Heat Loads - 6,000 BTU/hour.

.4 Structural Loads

1. Passenger Simplex: refer to manufacturer's information.

.5 Electrical Loads: as per elevator manufacturer, or as follows:

1. 30-40 hp/200 amp disconnect
2. 208 V 3-phase or 600 Volts 3-phase - 60 cycle

2.5. MATERIALS - GENERAL

.1 Provide materials and finishes for exposed parts of elevator car enclosures, car doors, hoistway entrance doors and frames, and signal equipment as indicated in this Section.

.2 Finish Materials:

1. Fire-Retardant Treated Particleboard Panels: Minimum 13 mm (0-1/2 in.) thick backup for plastic laminate veneered panels provided with suitable anti-warp backing; to meet ASTM E84 Class "A" rating with flame-spread rating of 25 or less.
2. Stainless Steel: ASTM A 666, Type 304, with No. 4, finish as per Finish Schedule. Braille on SS control panel.
 - .1 Brushed finish for trim, front return and car doors.
3. Prime-Painted Steel Sheet: Cold-rolled steel sheet, ASTM A 366/A 366M, or hot- rolled steel sheet, ASTM A 569/A 569M, with factory-applied rust-inhibitive primer.
4. Rolled Steel Floor Plate: ASTM A 786/A 786M.
5. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Pattern 1, alloy 6061-T6 with toe guard.

.3 Paint:

1. Concealed Steel and Iron: Clean metal of oil, grease, scale and other foreign matter and paint one shop coat of manufacturer's standard rust-resistant primer. Galvanized metal need not be painted.
2. Exposed Steel: Clean exposed metal of oil, grease, scale and other foreign matter. Eliminate any dents, scratches, or other defects that would affect the final finish. For material delivered with primer coat only, apply enamel primer. For material delivered with a finish coat, apply two coats enamel.

2.6. POWER UNIT

- .1 Power Unit (Oil Pumping and Control Mechanism): A self-contained unit consisting of Oil reservoir with tank cover, oil hydraulic pump, and electric motor.
- .2 The following items must be confirmed they have been installed during initial
 1. Extent and equipment installed with hydraulic jack and well opening.
 2. Casing for Underground Piping: PVC pipe complying with ASTM D 1785 joined with PVC fittings complying with ASTM D 2466 and solvent cement complying with ASTM D 2564.
 3. Provide dielectric couplings between power unit and cylinder units.
- .3 Install an oil hydraulic silencer (muffler device) at the power unit location containing pulsation absorbing material inserted in a blow-out proof housing arranged for inspecting interior parts without removing unit from oil line.
- .4 Pump:
 1. Positive displacement type pump specifically manufactured for oil-hydraulic elevator service. Pump designed for steady discharge with minimum pulsation to give smooth and quiet operation. Output of pump will not vary more than 10 percent between full load and no load on the elevator car.
- .5 Motor: Standard manufacture motor specifically designed for oil-hydraulic elevator service.
Duty rating selected for specified speed and load, minimum 80 starts per hour.
- .6 Control System: microprocessor based and protected from environmental extremes and excessive vibrations in a NEMA 1 enclosure.
- .7 Oil Control Unit (OCU): Welded manifolds with separate valves to accomplish each function are not acceptable. Adjustments accessible and be made without removing the assembly from the oil line. OCU comprised of the following components built into a single housing.
 1. Relief valve externally adjustable and be capable of bypassing the total oil flow without increasing back pressure more than 10 percent above that required to barely open the valve.
 2. Up start and stop valve adjustable and designed to bypass oil flow during start and stop of motor pump assembly. Valve to close slowly, gradually diverting oil to or from the jack unit, ensuring smooth up starts and up stops.
 3. Check valve designed to close quietly without permitting any perceptible reverse flow.
 4. Lowering valve and levelling valve adjustable for down start speed, lowering speed, levelling speed and stopping speed to ensure smooth "down" starts and stops. The levelling valve designed to level the car to the floor in the direction the car is traveling after slowdown is initiated.

.8 Solid State Starting: Provide an electronic starter featuring adjustable starting currents, equipped with current limiting electronic device to reduce the peak starting current to 150% of the full load running current or less.

2.7. HOISTWAY ENTRANCES

.1 Doors and Frames: Provide complete hollow metal type hoistway entrances at each hoistway opening bolted\knock down construction.

1. Manufacturer's standard entrance design consisting of hangers, doors, hanger supports, hanger covers, fascia plates, sight guards, and necessary hardware.
2. Typical door & frame finish: stainless steel #4 finish.

.2 Interlocks: Equip each hoistway entrance with an approved type interlock tested as required by code. Provide door restriction devices as required by code.

.3 Door Hanger and Tracks: Provide sheave type two point suspension hangers and tracks for each hoistway horizontal sliding door.

1. Sheaves: Polyurethane tires with ball bearings properly sealed to retain grease.
2. Hangers: Provide an adjustable device beneath the track to limit the up-thrust of the doors during operation.
3. Tracks: Drawn steel shapes, smooth surface and shaped to conform to the hanger sheaves.

.4 Hoistway Sills: Extruded metal, with groove(s) in top surface. Provide mill finish on aluminum.

2.8. EQUIPMENT – CAR COMPONENTS

.1 Car Frame: Provide car frame with adequate bracing to support platform and car enclosure.

.2 Platform: all steel construction.

.3 Car Guides: Provide guide-shoes mounted to top and bottom of both car and counterweight frame. Each guide-shoe assembly shall be arranged to maintain constant contact on the rail surfaces. Provide retainers in areas with Seismic design requirements.

.4 Load weighing device shall be strain gauge type mounted to dead-end hitch attached atop the hoistway guide-rail.

.5 Steel Cab: Refer to Interior Design Finish Schedule for complete finish selection.

.6 Car Enclosure:

1. Cab Fronts, Return, Transom, Soffit and Strike: Provide panels faced with brushed stainless steel.
2. Canopy: Cold-rolled steel with hinged exit.

3. Ceiling: Suspended, 6 pot lights, No. 4 stainless steel brushed finish.
4. Walls: stainless steel up to handrail, plastic laminate above
(Consultant to select from full range of manufacturer's standard laminate finishes)
5. Doors: Horizontal sliding car doors reinforced with steel for panel rigidity.
Hang doors on sheave type hangers with polyurethane tires that roll on a polished steel track and are guided at the bottom by non-metallic sliding guides.
 - .1 Door Finish: Stainless steel panels: No. 4 brushed finish.
 - .2 Cab Sills: Extruded aluminum, mill finish.
6. Handrail: Provide stainless steel, no. 4 brushed finish flat bar handrails on sides and rear walls on front opening cars.
7. Cab floor finish: by Section 09 30 13
8. Provide steel bumper at floor level to protect wall finish from delivery carts.
9. Ventilation: Manufacturer's standard exhaust fan, mounted on the car top.

.7 Car Top Inspection: Provide a car top inspection station with an "Auto-Inspection" switch, an "emergency stop" switch, and constant pressure "up and down" direction and safety buttons to make the normal operating devices inoperative. The station will give the inspector complete control of the elevator. The car top inspection station shall be mounted in the door operator assembly.

2.9. DOOR OPERATION

- .1 Provide a direct current motor driven heavy duty operator designed to operate the car and hoistway doors simultaneously. Door movements electrically cushioned at both limits of travel and the door operating mechanism arranged for manual operation in event of power failure.
- .2 Doors automatically open when the car arrives at the landing and automatically close after an adjustable time interval or when the car is dispatched to another landing. Closed-loop, microprocessor controlled motor-driven linear door operator, with adjustable torque limits, also acceptable. AC controlled units with oil checks or other deviations are not acceptable.
- .3 Door Protection Devices:
 1. Provide a door protection system using 150 or more microprocessor controlled infra-red light beams. The beams shall project across the car opening detecting the presence of a passenger or object. If door movement is obstructed, the doors immediately reopen.

2.10. IN CAR OPERATING STATION

- .1 Car Operating Station:
 1. The main car control in each car to contain the devices required for specific operation mounted in an integral swing return panel requiring no applied faceplate.

2. Swing return will have a brushed stainless steel finish.
3. Main car operating panel mounted in the return and comply with handicap requirements. Push buttons that illuminate using long lasting LED's included for each floor served, and emergency buttons and switches provided per OBC.
4. As the car travels, its position in hoistway to be indicated by illumination the alphanumeric character corresponding to landing which elevator is stopped or passing.
5. Provide distinct audible signals to indicate to passengers intended direction of travel (up or down); as car is passing each floor; and when car is stopping at a floor. Provide travel direction arrows if not part of car control station.
6. Provide polycarbonate pushbuttons manufactured with antimicrobial protection.
7. Provide switches for car light and accessories.

- .2 Provide Emergency Communications System: Integral hands free phone system.
- .3 Emergency Car Signals
 - 1. Emergency Siren: Siren mounted on top of cab that is activated when the alarm button in the car operating panel is engaged. Siren shall have rated sound pressure level of 80 dB(A) at a distance of three feet from device. Siren shall respond with a delay of not more than one second after activation of alarm button.
 - 2. Emergency Car Lighting: Provide emergency power unit employing a 12-volt sealed rechargeable battery and totally static circuits shall illuminate the elevator car and provide current to the alarm bell in the event of building power failure.
 - 3. Emergency Exit Contact: An electrical contact shall be provided on the car-top exit.
- .4 Ventilation: Integral (Natural) ventilation with fan.

2.11. HALL STATIONS

- .1 Hall Stations:
 - 1. Provide buttons with red-illuminating LED halos to indicate call has been registered at that floor for the indicated direction.
- .2 Provide one push button riser with faceplates having a brushed stainless steel finish.
- .3 Phase 1 firefighter's service key switch, with instructions, incorporated into the hall station at the main floor level on the entry vestibule side.

2.12. EQUIPMENT – HOISTWAY

- .1 Design to achieve the required seismic restraint in hoistway. Hoistway is concrete or concrete block, and rail brackets can be mounted at any elevation.

1. Prepare signed and sealed structural design drawings to confirm actual rail sizes and spacing. Submit Shop Drawings and request for variance to authorities having jurisdiction for approval.
- .2 Platform:
 1. Fabricated frame of formed or structural steel shapes, gusseted and rigidly welded with a wood sub floor. Underside of the platform fireproofed.
 2. The car platform designed and fabricated to support one-piece loads weighing up to 25% of the rated capacity.
 3. The car platform to have sufficient depression to receive the finished porcelain tile floor.
- .3 Sling: Steel stiles affixed to a steel crosshead and bolstered with bracing members to remove strain from the car enclosure.
- .4 Guide Rails: Steel, omega shaped, fastened to the building structure with steel brackets.
- .5 Guide Shoes: Slide guides mounted on top and bottom of the car.
- .6 Buffers: Provide substantial buffers in the elevator pit. Mount buffers on a steel template that is fastened to the pit floor or continuous channels fastened to the elevator guide rail or securely anchored to the pit floor. Provide extensions if required by project conditions.
 1. Jack units of sufficient size to lift the gross load the height specified. Confirm from preliminary inspections that the Jack meets the requirements in accordance with ASME A17.1/CSA-B44 including: Factory test jack to insure adequate strength and freedom from leakage.
 2. Brittle material, such as gray cast iron, is prohibited in the jack construction.
 3. Provide the following jack type: Dual holeless hydraulic cylinder.
 4. Single polished steel hydraulic plungers housed in a steel sealed casing with sufficient clearance space to allow for alignment during installation.
 5. The casings will have dished end caps as required by ASME A17.1/CSA-B44 code.
 6. The plungers high-pressure sealing system which will not allow for seal movement or displacement during the course of operation.
 7. The jack systems will be supplied with a minimum of 2 layers of anti-corrosion paint.
 8. The jack casings to have a bleeder valve to discharge any air trapped in the jack.
- .7 Guide Rails and Attachments: 'T'-section Steel rails with brackets and fasteners.

- .8 Steel Belts: Polyurethane coated belts with high tensile grade zinc plated steel cords.
- .9 Automatic Self-Levelling: Provide each elevator car with a self-levelling feature to automatically bring the car to the landings and correct for over travel or under travel.
Self-levelling within its zone is automatic and independent of the operating device. The car will be maintained approximately level with the landing irrespective of its load.
- .10 Wiring, Piping, and Oil: Provide all necessary hoistway wiring in accordance with the National Electrical Code. All necessary code compliant pipe and fittings shall be provided to connect the power unit to the jack unit. Provide proper grade oil as specified by the manufacturer of the power unit.

2.13. EQUIPMENT – ELEVATOR OPERATION AND CONTROLLER

- .1 Single Elevator: Provide "simple collective automatic operation" as defined in ASME A17.1/CSA-B44.
- .2 Controller: The elevator control system microprocessor based and software oriented. Control of the elevator is automatic in operation by means of push buttons in the car numbered to correspond to floors served, for registering car stops, and by "up-down" push buttons at each intermediate landing and "call" push buttons at terminal landings.
- .3 Provide elevator control systems with non-proprietary diagnostics which will permit ongoing maintenance and service by any qualified elevator contractor. Parts and technical support shall be available directly from the control system manufacturer to a third party elevator contractor and/or the Owner on a fair and expedient basis.
- .4 Automatic Light and Fan shut down: The control system shall evaluate the system activity and automatically turn off the cab lighting and ventilation fan during periods of inactivity. The settings shall be field programmable.
- .5 Provide within controller an emergency stop switch to disconnect power from the brake and prevents motor from running.
- .6 Provide the means from the controller to mechanically lift and control the elevator brake to safely bring car to nearest available landing when power is interrupted.
- .7 Provide the means from the controller to reset the governor over speed switch and also trip the governor.
- .8 Provide the means from the controller to reset the emergency brake when set because of an unintended car movement or ascending car over speed.
- .9 Provide the means for the control to reset elevator earthquake operation.
- .10 Battery-Powered Lowering:
 1. If power fails, cars that are at a floor remain at that floor, cycle their doors, and shut down with the doors closed. Cars that are between floors are lowered to a field programmable floor, cycle their doors, and shut down

with the doors closed.

2. System includes rechargeable battery and automatic recharging system.

.11 Hoistway Operating Devices:

1. Emergency stop switch in the pit.
2. Terminal stopping switches.
3. Emergency stop switch on the machine.

PART 3: EXECUTION

3.1. EXAMINATION

- .1 Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Verify critical dimensions and examine supporting structure and other conditions under which elevator work is to be installed. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. INSTALLATION

- .1 Install cylinders plumb and accurately centered for elevator car position and travel. Anchor securely in place, supported at pit floor. Seal between cylinder and pit floor with 100 mm (4 inches) of non-shrink, non-metallic grout.
- .2 Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.
- .3 Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts designed to effectively prevent transmission of vibrations to structure and thereby eliminate sources of structure-borne noise from elevator system.

- .4 Install piping above the floor, where possible. Where not possible, install underground piping in Schedule 40 PVC pipe casing assembled with solvent-cement fittings.
- .5 Install piping above the floor, where possible. Where not possible, cover underground piping with permanent protective wrapping before backfilling.
- .6 Lubricate operating parts of systems as recommended by manufacturers.
- .7 Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay installation of sills and frames until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.
- .8 Levelling Tolerance: 6 mm (1/4 inch), up or down, regardless of load and direction of travel.
- .9 Set sills flush with finished floor surface at landing. Fill space under sill solidly with non-shrink, non-metallic grout.

3.3. FIELD QUALITY CONTROL

- .1 Acceptance Testing: On completion of elevator installation and before permitting use of elevators, perform acceptance tests as required and recommended by ASME A17.1 and by governing regulations and agencies.
- .2 Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times tests are to be performed on elevators.

3.4. ADJUSTING

- .1 Make necessary adjustments of operating devices and equipment to ensure elevator operates safely, accurately, and smoothly.

3.5. DEMONSTRATION

- .1 Instruct Owner's personnel in proper use, operations, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of operational failure and other building emergencies. Train Owner's personnel in procedures to follow in identifying sources of operational failures or malfunctions. Confer with Owner on requirements for a complete elevator maintenance program.
- .2 Make a final check of each elevator operation with Owner's personnel present and before date of Substantial Completion. Determine that operation systems and devices are functioning properly.

3.6. PROTECTION

- .1 Temporary Use: Do not allow the use of elevators for construction purposes unless authorized by the School/Owner. The party who uses the cars to provide temporary enclosures, either within finished cars or in place of finished cars, to protect finishes from damage.

- .2 Upon completion, maintain protective measures throughout remainder of construction period.

3.7. CLEANING

- .1 Before final acceptance, remove protection from finished surfaces and clean and polish surfaces in accordance with manufacturer's recommendations for type of material and finish provided. Stainless stall shall be cleaned with soap and water and dried with a non-abrasive surface; shall not be cleaned with bleached-based cleansers.
- .2 At completion of elevator work, remove tools, equipment, and surplus materials from site.
Clean equipment rooms and hoistway. Remove trash and debris.
- .3 At time of Substantial Completion/Ready for Takeover of elevator Work, or portion thereof, provide suitable protective coverings, barriers, devices, signs, or other such methods or procedures to protect elevator work from damage or deterioration.

END OF SECTION

Section 31 23 33

Excavation, Trenching and Backfilling

Part 1 General

1.1 SCOPE

- .1 This Section covers the requirements for excavating, backfilling, and compacting for structures.

1.2 RELATED SECTIONS

- .1 DIVISION 1 – GENERAL REQUIREMENTS
- .2 Section 31 41 00 – Bracing and Shoring
- .3 Section 31 48 33 – Micropiles

1.3 REFERENCES

- .1 OPSS.MUNI 180 – Management of Excess Material
- .2 OPSS.MUNI 1303 – Admixtures for Concrete
- .3 OPSS.MUNI 1359 – Unshrinkable Backfill
- .4 O. Reg. 406/19: On-Site and Excess Soil Management
- .5 Rules for Soil Management and Excess Soil Quality Standards
- .6 O. Reg. 153/04: Records of Site Condition
- .7 O. Reg. 347: General – Waste Management
- .8 Local Municipal Standards

1.4 DEFINITIONS

- .1 Common Excavation

.1 Common excavation is defined as material, of whatsoever nature, excavated to complete works as specified and indicated and includes but not necessarily limited to: earth, deadheads, pipes, masonry, frost, any combination of these with normal or abnormal earth conditions, or any other obstacles encountered in the excavation, all of which must be removed.

- .2 Select Excavated Material

.1 Selected excavated material is defined as excavated material that is free from cinders, ashes, refuse, vegetable or organic matter, boulders, rocks, or stones with nominal dimensions greater than 100 mm, paving material, timbers, unbroken or frozen masses of earth, and other material which in the opinion of the Engineer is unsuitable. Selected excavated material to have properties to meet specified compaction requirements.

- .3 Borrow Material:

- .1 Material, imported from other sites, to be in accordance with Part 2 of this section.
- .4 Soil
 - .1 means unconsolidated naturally occurring mineral particles and other naturally occurring materials resulting from the natural breakdown of rock or organic matter by physical, chemical or biological processes that are smaller than 2 millimeters in size or that pass the US #10 sieve.
- .5 Rock
 - .1 means natural beds or massive fragments of the hard, stable, cemented part of the earth's crust, either igneous, metamorphic, or sedimentary in origin that may or may not be weathered, and includes boulders having a volume of 1 m³ or greater.
- .6 Topsoil
 - .1 material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
- .7 Waste
 - .1 excavated material unsuitable for use in work or surplus to requirements.
- .8 Excess Soil
 - .1 means soil, or soil mixed with rock, that has been excavated as part of a project and removed from the project area for the project.
- .9 Abbreviations
 - .1 SPMDD for Standard Proctor Maximum Dry Density.
 - .2 OHSA for Occupational Health and Safety Act.
 - .3 OPSS for Ontario Provincial Standard Specification.

1.5 SITE CONDITIONS

- .1 Existing Utilities and Services
 - .1 Known underground services and surface utility lines are indicated on Drawings. No guarantee is given of completeness or accuracy.
 - .2 Maintain existing utilities which must remain in service in or adjacent to the excavation.
 - .3 Record locations of underground utility lines.
 - .4 Repair damage to existing utility lines and services resulting from work under this Section at no cost to the Owner.
 - .5 Notify utilities prior to excavating.
- .2 Excess soils generated should be characterized and handled in accordance with the Excess Soil Management O.Reg 406/19 and other related regulatory amendments related to the management, reuse and off-site disposal of excess soil.

1.6 SUBMITTALS

- .1 Shop drawings.

- .1 Submit, for record purposes, shop drawings detailing side slopes for excavations in open cut. Specifically show details of transitions between open cut and excavation shoring systems.
- .2 Provide shop drawing showing temporary shoring system (if applicable)
- .3 Shop drawings to bear seal and signature of a professional engineer licensed to practice in Ontario.
- .2 Submit as Constructed Drawings
 - .1 Provide copies of all Utility locate forms provided by the Owners of the various buried utility plant.
 - .2 Record locations and elevations of all new utilities installed, and existing utilities encountered.
 - .3 Record contours of the final grade.

1.7 MEASUREMENT AND PAYMENT

- .1 All costs for excavating, trenching, and backfilling, except for excavating in rock and rock removal, shall be included in the total Lump Sum Tender Price.
- .2 Payment will be made for work completed during the payment period on a percentage basis of the sum entered in the breakdown of the lump sum price for 31 23 33 – Excavating, Trenching and Backfilling, as approved by the Contract Administrator.
- .3 All other unauthorized excavation made to elevation below the founding level to be remedied at Contractor's expense.

Part 2 Products

2.1 MATERIALS

- .1 Granular 'A': OPSS 1010.
- .2 Granular 'B', (Type I): OPSS 1010.
- .3 20 mm Clear Crushed Stone: OPS 1004 – Crushed Rock composed of hard, uncoated angular fragments produced from rock formations or boulders of uniform quality.
- .4 Imported Fill Material: Non-organic clean fill compactable to specified density and free from frozen lumps, rubble, debris and rocks or boulders with nominal size larger than 100 mm. Material subject to acceptance by Geotechnical Consultant. Fill material to be analyzed and classified in accordance with MECP Decommissioning Guidelines.
- .5 Select native site material:
 - .1 Excavated material approved by the Engineer.
 - .2 Material free from frozen lumps, cinders, ashes, refuse, vegetable or organic matter, rocks and boulders over 150 mm in any dimensions, or other deleterious materials.
- .6 Unshrinkable Backfill:
 - .1 Unshrinkable backfill to OPSS 1359

- .2 Admixtures shall conform to OPSS 1303 and the latest MTO designated sources list. Calcium chloride or pozzolanic mineral admixtures shall not be used. Air entraining admixtures may be added if desired by the Contractor.
- .7 Pea Gravel: Roughly spheroidal in shape, nominal diameter size 5 mm to 10 mm.
- .8 Natural Sand: CAN/CSA-A23.1.
- .9 Water: Potable water from municipal potable water source.

Part 3 Execution

3.1 GENERAL

- .1 All excavations and trenches shall be kept stable and dry.
- .2 Provide Bracing and Shoring according to Section 31 41 00 – Bracing and Shoring, as required.

3.2 PROTECTION OF EXISTING FEATURES

- .1 Existing buried utilities and structures:
 - .1 Prior to commencing any excavation work, notify the Engineer and/or applicable authorities having jurisdiction. Establish the location and state of use of buried utilities and structures on and adjacent to site. The Owner or authorities having jurisdiction are to clearly mark such locations to prevent disturbance during work.
 - .2 Confirm exact locations and depth of buried utilities by careful test excavations.
 - .3 Where utility lines or structures exist in area of excavation, obtain direction of Engineer before relocating.
 - .4 Remove obsolete or abandoned buried services within 2 m of foundations: cap cut-offs.
 - .5 Verify that existing services are not damaged by the construction procedure
 - .6 Record location of maintained, re-routed and abandoned underground lines.
- .2 Existing buildings and surface features:
 - .1 Conduct, with Engineer condition survey of existing buildings which may be affected by work.
 - .2 Protect existing buildings and surface features which may be affected by work from damage while work is in progress. In event of damage, immediately make repair to approval of Engineer.

3.3 STOCKPILING

- .1 Stockpile fill materials in areas designated. Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination.
- .3 Do not stockpile material in a manner or location that will interfere with site operation or drainage.
- .4 Apply water, sodding or other means as required to provide continuous control of dust from drifting or blowing.

- .5 Crown, shape and tarp stockpiles as required to promote runoff and minimize increase in moisture content.
- .6 All surplus materials shall be disposed in accordance with the contract requirements for impacted materials and current regulations.
- .7 The Contractor shall provide a letter from the temporary offsite disposal site property owner accepting the material, placement, grading and restoration and releasing the Client of any responsibility to the satisfaction of the Client.

3.4 CONSTRUCTION PROCEDURE

- .1 Employ construction procedures to suit conditions encountered and prevent undermining existing or installed foundations and weakening of material which supports foundations already in place.
- .2 Undertake work in a safe manner. Take full responsibility for site safety. Comply with safety requirements of the Occupational Health and Safety Act (OHSA).
- .3 Employ construction procedures so that foundation at adjacent higher levels are not disturbed or weakened.

3.5 EXCAVATING AND BACKFILLING FOR STRUCTURES

- .1 Excavating
 - .1 Locate existing buried pipes, conduits, duct banks and utilities prior to commencement of excavation operation.
 - .2 Excavate to lines, levels and dimensions required.
 - .3 Excavate to provide adequate space for structure and connections to structures, for formwork, braces and supports, for excavation shoring systems and dewatering.
 - .4 All unauthorized excavation made to elevation below the founding level to be remedied at Contractor's expense. Correct unauthorized over-excavation as follows:
 - .1 Fill under bearing surfaces and footings with unshrinkable fill or Granular A per OPSS 1010 compacted to not less than 100% of Standard Proctor maximum dry density.
 - .2 Fill under other areas with Granular B per OPSS 1010, compacted to not less than 100% of corrected Standard Proctor maximum dry density.
 - .3 Hand trim, make firm, and remove loose material and debris from excavations.
 - .4 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
 - .5 Clean out rock seams and fill with concrete mortar or grout to approval of the Engineer.
 - .6 Unless otherwise indicated on the drawings, provide concrete mud-mat to prevent destabilization of the finished subgrade.
 - .7 Obtain Engineer's approval of completed excavation.
 - .5 Prevent disturbance and destabilization of final subgrade.

- .6 Provide side slopes of excavations in open cuts suitable to the conditions encountered and in accordance with requirements of OHSA. Stability of side slopes is time dependent. Slopes generally become increasingly unstable with time. Remove all slides and cave-ins, without extra compensation, at whatever time and circumstances they may occur.
- .7 Excavate with care adjacent to existing structures around existing utilities and pipelines. Provide temporary supports as required. Prevent damage.

.2 Backfilling

- .1 Before proceeding with backfilling against concrete walls, ensure that the wall concrete has reached the specified 28-day compressive strength and slabs, struts, cross walls, and similar items which frame into the wall, and which provide the lateral stability are in place and have reached their specified compressive strength.
- .2 Before proceeding with backfilling, verify that waterproofing for underground structures where indicated, have been completed.
- .3 Backfill around structures evenly in maximum 300 mm lifts compacted to 98 per cent SPMDD at a placement moisture content within 2 per cent of optimum. Place a 600 mm minimum thick layer of free-draining granular material (Granular 'B' or approved equal) against all exterior concrete walls. Backfill the remainder with select excavated material.
- .4 Make up any shortfall of selected excavation material with imported fill material.
- .5 Do not backfill to elevation higher than the finish grades.
- .6 Use equipment for backfilling and compaction that would not impose loads greater than those indicated or will damage the surface finishes.
- .7 Puddling is not permitted.
- .8 Fill in low spots after settlement and re-grade as necessary until settlement ceases.
- .9 Repair waterproofed and damp-proofed surfaces damaged during construction.
- .10 Remove all debris and surplus materials from site on completion of work.

3.6 HAULAGE

- .1 Haul off site and dispose of at an approved site surplus excavated material not required or suitable for backfill.
- .2 The Owner has the right of first refusal for excess material that is to be removed.
- .3 Haul surplus excavated material from site in tight bodied trucks or other means. Clean truck tires prior to exiting site. Prevent hauled material from spilling on roads. Promptly clean up if such spill occurs and maintain roads free of any tracked soil. Maintain roads free of any tracked soil.

3.7 DISPOSAL SITES

- .1 Make arrangements for the off-site disposal of all excavated material. As the excavation areas are within the existing building, the Contractor shall take extra precautionary measures to minimize disturbance to the building and to prevent the spread of dirt and debris during excavation and soil removal. Any dirt, debris, or mess generated during excavation and removal operations shall be cleaned immediately after each round of soil removal and prior to moving material out of the building..
- .2 Obtain from property owner of disposal site a written agreement setting out terms, conditions, and ultimate responsibility for materials as placed.
- .3 On completion of the Works, provide the Owner with a release from the owner of disposal site.

3.8 DUST CONTROL

- .1 Throughout construction period, provide adequate dust control on the site by watering or use of other accepted dust control materials.
- .2 Apply water or other material as often as necessary to provide continuous control of dust from drifting or blowing.
- .3 Eliminate dust and dirt in areas where electrical equipment, metering instruments and similar equipment requiring interior cleanliness are being installed or assembled by providing temporary enclosures, covers for openings, or other means of protection.

3.9 FIELD QUALITY CONTROL

- .1 Inspection
 - .1 The Owner will retain an independent Geotechnical Consultant to inspect foundations for its suitability prior to placement of concrete or other materials.
 - .2 Notify the Owner sufficiently in advance of operations, to provide field inspection.
 - .3 On reaching specified excavation level, request an inspection of subgrade by the Geotechnical Consultant.
 - .4 Provide all facilities to enable proper inspection.
 - .5 Do not excavate below the specified level or place concrete or other materials on subgrade until the inspection has been undertaken and permission granted to proceed in writing by the Engineer.
 - .6 Co-operate with the Owner's Representative and testing company by scheduling the placing and compacting of fill and backfill so tests can be progressively taken. Provide assistance, as required, to facilitate compaction and material testing.
 - .7 The cost for the initial material and compaction testing shall be borne by the Owner. If the compacting Work does not meet the specified requirements, the Contractor shall perform further compacting Work until the specified requirements are met and pay the cost of further testing to establish proof of compliance with the specified compaction.
- .2 Soil Compaction Densities
 - .1 Where specified, compaction densities are percentages of SPMDD in accordance with ASTM D698.

.2 Field tests of soil compaction densities will be carried out in accordance with ASTM D6938.

END OF SECTION

Section 31 41 00 Bracing and Shoring

Part 1 GENERAL

1.1 SCOPE

- .1 This specification covers the requirements for the design, supply, placement, maintenance, and removal or abandonment of temporary support systems required to permit the excavation and backfilling of excavations for the construction and pouring of the elevator pit and any other specified subsurface work.
- .2 This specification also covers the requirements for the design, placement, maintenance, and removal or abandonment of temporary support systems required to permit the construction of below grade structures and/or foundations for elevator pit.
- .3 Shoring is mandatory where indicated and, in all areas, where excavation will potentially undermine existing structures, pipes, conduits, utilities.

1.2 RELATED SECTIONS

- .1 DIVISION 1 – GENERAL REQUIREMENTS
- .2 Section 31 23 30 – Excavating, Trenching and Backfilling

1.3 REFERENCES

- .1 Occupational Health and Safety Act, R.S.O. 1990, c.O.1, as amended.
- .2 Ontario Regulation 213/91 – Regulations for Construction Projects, as amended.
- .3 OPSS 404 – Construction Specification for Support Systems.
- .4 CSA A23.1/A32.2 - Concrete Materials and Methods of Concrete Construction / Test Methods and Standard Practices for Concrete
- .5 CSA G40.20-13/G40.21-13 - General requirements for rolled or welded structural quality steel / Structural quality steel.
- .6 CSA W59 – Welded Steel Construction

1.4 DESIGN OF SHORING SYSTEM

- .1 Design excavation shoring and/or underpinning systems based on recognized geotechnical and structural theories and principles and site conditions encountered. Undertake additional geotechnical site investigation for design of the shoring system and/or underpinning at no extra cost to the Owner.
- .2 Design shoring system for all applicable lateral pressures from soil and groundwater, including unsymmetrical surcharge loads from construction operations on retained soil.
- .3 Design shoring system such that intermediate bracing members, walers or struts will not interfere with the permanent structure. All below grade structures are to be complete with ground level slabs, and other bracing elements prior to backfill.

- .4 Design bracing to be fully effective at all stages of construction. Pre-stress bracing, if required, to control deflection.
- .5 Design underpinning and temporary supports for existing structures and/or utilities to safely resist all loads including loads which may be imposed as a result of construction operations.
- .6 Where shoring system retains materials which provide support for foundations at a higher level, design to limit deflections so that foundation materials are not disturbed or weakened. Design lateral pressures to be determined based on at-rest soil pressures. Limit total deflection to 20 mm horizontally.
- .7 Co-ordinate design of shoring system with design of dewatering system to meet performance requirements specified herein.
- .8 Locate all yard piping, services, conduit, structures, etc., in the area of the excavation. Assume all items found are live and are to be kept live unless specifically noted otherwise. Take precautions necessary to ensure that there is no damage to existing buried services, piping, conduit, structure, etc., during the shoring and excavation work.

1.5 METHOD STATEMENT

- .1 Submit method statements for the construction sequence and duration of all main activities including any ground treatment that may be required to construct without the use of active dewatering at least fifteen (15) days prior to the commencement of the Works.

1.6 SHORING PERFORMANCE REQUIREMENTS

- .1 General Requirements
 - .1 Construct substantially watertight excavation shoring systems suitable for geotechnical conditions encountered and which will meet all requirements of these performance Specifications. Prevent destabilization of subgrade, migration of soil fines, damage to any structure and/or works. Prevent disturbance, displacement or damage, to sides and bottom of excavation, to new and existing structures at any stage of construction of works. Prevent destabilization or failure of bottom of excavation from shear, heave, piping and boiling, groundwater pressure or any other cause.
 - .2 Prior to beginning work on the site, confirm location of all underground services and structures, and arrange work to prevent damage to any services or structures.
 - .3 Provide adequate space for access for installation of formwork and inspection.
- .2 Watertightness
 - .1 Shoring system to be watertight to the extent that any dewatering required inside the excavation shall not lower the water table on outer side of the shoring system.
- .3 Tolerances
 - .1 Install shoring so that, exclusive of temporary walers or bracings, no part of temporary structure to be left in place above the bottom of the excavation in its deflected position will reduce the concrete wall thicknesses to below the dimensions indicated.

- .2 If the shoring installation does not satisfy these requirements, alter it, at no extra cost to Owner, until it meets the requirements.
- .3 Allow a minimum installation tolerance of 75 mm.
- .4 Fill the void between any shoring to be left in place and the adjacent structural member with concrete.

.4 Monitoring Deflection

- .1 The contractor shall hire a monitoring contractor with at least five years' experience in precision survey monitoring that can demonstrate having performed at least 10 projects of similar scope, magnitude and complexity to develop and execute a precision survey program for monitoring movement at the top of the shoring wall. The system shall achieve an accuracy of plus/minus 2 mm at each measurement point.
- .2 The monitoring contractor is responsible for developing the system to meet 2 mm accuracy but the system at a minimum meet the following criteria:
 - .1 Monitoring points are to be spaced no more than 3 m apart and at all critical locations.
 - .2 Movement in the x, y and z direction must be measured at each point.
 - .3 The surveying instrument shall be a Leica TCA 1800 or equal. The manufacturer's published accuracy must be at least one second angular resolution with plus minus 1 mm electronic distance measurement at 100 m distance.
 - .3 Readings shall be recorded twice weekly until the excavation is no longer open.
 - .4 Reports shall show movement in both at a tabulated and graphical format. The owner's representative to approve the reporting format prior to start of the work.
 - .5 Data is to be reported weekly, but immediately if any unusual movements occur.
 - .6 Monitor and control vibration in accordance with Specification Section 01140 – Special Project Procedures.

1.7 SUBMITTALS

- .1 Submit shop drawings at least fifteen (15) days before commencement of shoring Works for temporary structures including both shoring and bracing systems. Shop drawing to bear seal and signature of a Professional Engineer, registered in the Province of Ontario, who has carried out the design and who will provide construction supervision of temporary structures.
- .2 Indicate on shop drawings the following:
 - .1 Dimensions and elevations
 - .2 Relationship to new and existing structures and utilities
 - .3 Material designations, grades, sizes, etc.
 - .4 Temporary struts and walers etc., their relationship to permanent structure and schedule for removal
 - .5 Deflections of shoring members when deflection limitations carried in the design.
 - .6 Design loads, design assumptions, surcharge loads and all loading restrictions.

- .7 Identification of Engineer of record who will be responsible for design calculations, checking of shop drawings, inspection and supervision of fabrication and installation, and filing of reports with the appropriate authorities and the Owner.
- .8 Complete field instructions required during installation and any other pertinent information.
- .9 Schedule for removal of temporary struts and walers.
- .10 Preparation method to be used on shoring prior to application of blindside waterproofing if indicated in the drawings.
- .3 Submittal of shop drawings for such temporary structures is for record purposes. The Engineer will not review or check such shop drawings for structural adequacy. Take the full responsibility for design, supplying, placing, installation and maintenance.
- .4 Prior to commencing excavation in any area protected by temporary shoring, the Engineer of Record shall provide written certification that the shoring has been constructed in accordance with the approved drawings as amended by field instruction. This submittal will not apply to trench boxes.
- .5 Submit all monitoring of deflection, vibration, settlements of shoring and adjacent structures weekly.

1.8 QUALITY CONTROL

- .1 Provide a system of quality control to ensure that the minimum standards specified herein are attained.
- .2 Bring to the attention of Engineer any defects in the work or departures from the Contract Documents which may occur during construction. The Engineer will decide upon corrective action and state recommendations in writing.
- .3 The Engineer's general review during construction and inspection and testing by Independent Inspection and Testing Companies reporting to the Engineer are both undertaken to inform the Owner of the Contractor's performance and shall in no way augment the Contractor's quality control or relieve him of contractual responsibility.

1.9 QUALITY ASSURANCE

- .1 Engage a Professional Engineer, licensed in Ontario, to design, supervise installation of, and inspect all temporary structures for the duration of construction.
- .2 Utilize only personnel with demonstrated competence and experience to install temporary structures.
- .3 Welder: CSA W47.1 certified.

Part 2 PRODUCTS

2.1 MATERIALS

- .1 Steel Liner Plates
 - .1 Corrugated proprietary steel liner plates with bolted joints and grouting nipples supplied on a sufficient number of plates to provide grouting connections at 3 m maximum around the circumference and every second ring of plates.

- .2 Structural Steel Members
 - .1 CAN/CSA G40.20/G40.21 Grade 300W for walers, bracing and soldiers piles.
- .3 Welding
 - .1 CSA W59 Welded Steel Construction
- .4 Steel Sheet Piling:
 - .1 Per CAN/CSA G40.20/G40.21 interlocking type. Selection properties to suit design.
- .5 Lumber
 - .1 Graded lumber, sound, straight, free from cracks, shakes, large or loose knots. Use planks for sheeting, tongued and grooved, or grooved and splined as required.
- .6 Drypack Concrete Fill Behind Lagging
 - .1 Concrete in accordance with Section 03300 suitable for filling all voids behind lagging with a 28-day minimum compressive strength of 20 MPa.

Concrete Mixes and materials

In accordance with CSA A23.1/A23.2

Part 3 EXECUTION

3.1 GENERAL

- .1 Before work begins, inspect conditions upon which work depends. Inform the Engineer, in writing, of conditions not identified.
- .2 Protect adjacent structures, utilities, pipelines, or other foundations on or below grade from damage and/or displacement.

3.2 RESPONSIBILITY FOR SHORING SYSTEM

- .1 Retain the services of a professional engineer, registered in the Province of Ontario, who has demonstrated competence in shoring and underpinning work, to design and supervise construction of temporary structures which are required in order to execute construction of permanent Works.
- .2 Take full responsibility for design, supply, placement, installation, maintenance, and where applicable, removal of shoring system.
- .3 Comply with all safety requirements of The Occupational Health and Safety Act and Ontario Building Code.

3.3 PLACEMENT - GENERAL

- .1 Retain Professional Engineer responsible for design and supervision of construction of temporary/permanent retaining structures to verify that Work is carried out in conformance with the design. Retained engineer to provide written acceptance of "As Constructed" shoring before excavation is occupied.
- .2 Do not place any part of shoring and bracing systems until permission by the Engineer has been given to proceed.

- .3 Have shoring systems installed by personnel with demonstrated competence and experience in this type of work.
- .4 Provide and set all excavation, shoring and bracing necessary to prevent cave-in of banks and excavations.
- .5 Install shoring so that there is no loose material or voids between shoring and sound undisturbed soil.
- .6 Set all shoring to a true vertical and to dimensions and elevations indicated on shop drawings.
- .7 Do not encase any part of temporary structure in the structural concrete of the permanent structure without written permission from the Engineer.
- .8 If bracing members, such as walers, etc., are to be removed during construction, timing and procedure for removal shall not induce stresses in permanent structures. Submit removals plan to Engineer for review.

3.4 SOLDIER PILES AND LAGGING

- .1 Install soldier piles to dimensions and elevations indicated on shop drawings. If soldier piles are installed in predrilled holes, fill void around piles with a lean concrete mix before commencing excavation.
- .2 Install walers and/or ringwalers, struts and bracing for soldier piles as excavation proceeds and follow behind as closely as possible with lagging installation. Install lagging to bottom of excavation at the end of each day's work.
- .3 Wedge lagging tightly against firm soil at all points. Prevent migration of soil particles through joints in lagging.
- .4 If soil has been loosened, remove it and fill void with drypack concrete rammed tightly between the lagging and firm soil.
- .5 Fill all voids between lagging and firm soil with drypack rammed tightly in place. Do not leave any voids ungrouted at the end of the workday.
- .6 If bracing members, such as walers, etc., are to be removed during construction, timing and procedure for removal shall not induce stresses in permanent structures or bracing members in excess of those allowed by applicable codes.

3.5 LINER PLATES

- .1 Excavate to depth of one (1) ring and place liner plates, set first ring true to circle and vertical position.
- .2 Excavate for next ring and place liner plates. Do not excavate further ahead of liner in place than the width of one ring.
- .3 Grout voids between liner plates and ground, by means of a grout pump. Frequency of grouting to suit conditions but not less frequent than after every second ring has been placed. Do not leave any ring ungrouted overnight.
- .4 Do not leave the sides of the excavation exposed below the liner plates at the end of the day's work.
- .5 Provide reinforcing at openings as required by the design.

3.6 MONITORING DEFLECTION OF EXISTING INFRASTRUCTURE

- .1 Monitor deflection of shoring systems that retain materials providing support for adjacent foundations at higher levels at least daily. Verify that measured deflections are within design tolerances.
- .2 Monitor elevations at each corner and center of existing structure daily. Report to the engineer immediately if specified settlement limits are exceeded.
- .3 Monitor and control vibration. Provide continuous monitoring of all structures within the influence zone.
- .4 Submit written records of settlement, deflection, and vibration results to the engineer weekly.

3.7 SHORING REMOVALS

- .1 When footings, walls, slabs and other foundations are in place and backfilling near completion to existing grade, cut down and remove the tops of piles, lagging, or sheet pile to a minimum of 500 mm below finished grade.

3.8 NOTIFICATION

- .1 Give the Engineer advance notice of shop fabrication, field installation and other phases of the work so as to afford the Engineer reasonable opportunity to inspect the work for compliance with contract requirements. Failure to meet this requirement may be a cause for the Engineer to classify the work as defective.

3.9 DEFECTIVE MATERIALS AND WORK

- .1 Where factual evidence exists that defective work has occurred or that work has been carried out incorporating defective materials, the Engineer may have tests, inspections or surveys performed, analytical calculations of structural strength made, and the like, in order to help determine whether the work must be replaced. Tests, inspections or surveys or calculations carried out under these circumstances will be made at the Contractor's expense, regardless of their results, which may be such that, in the Engineer's opinion, the work may be acceptable.
- .2 All testing shall be conducted in accordance with the requirements of the Ontario Building Code and in accordance with the standards given by the Engineer.
- .3 Materials or work which fail to meet specified requirements may be rejected by the Engineer whenever found at any time prior to final acceptance of the work regardless of previous inspection. If rejected, defective materials or work incorporating defective materials or work shall be promptly removed and replaced or repaired to the satisfaction of the Engineer, at no expense to the Owner.

END OF SECTION

Section 31 48 33

Micropiles

Part 1 General

1.1 DESCRIPTION

- .1 This work shall consist of constructing micropiles as shown on the contract plans and approved working drawings and as specified herein. The micropile specialty Contractor is responsible for furnishing of all design, materials, products, accessories, tools, equipment, services, transportation, labor and supervision, and manufacturing techniques required for design, installation and testing of micropiles and pile top attachments for this project.
- .2 The selected micropile Contractor shall select the micropile type, size, pile top attachment, installation means and methods, estimate the ground-grout bond value and determine the required grout bond length and final micropile diameter. The micropile Contractor shall design and install micropiles that will develop the load capacities indicated on the contract plans. The micropile load capacities shall be verified by verification and proof load testing as required and must meet the test acceptance criteria specified herein.
- .3 Where the imperative mood is used within this specification, "The Contractor shall" is implied.

1.2 MICROPILE CONTRACTOR'S EXPERIENCE REQUIREMENTS AND SUBMITTAL

- .1 The micropile Contractor shall be experienced in the construction and load testing of micropiles and have successfully constructed at least five (5) projects in the last five (5) years involving construction totaling at least 100 micropiles of similar capacity to those required in these plans and specifications.
- .2 The Contractor shall have previous micropile drilling and grouting experience in soil/rock similar to project conditions. The Contractor shall submit construction details, structural details and load test results for at least three previous successful micropile load tests from different projects of similar scope to this project.
- .3 The Contractor shall assign a Professional Engineer licensed in the Province of Ontario to supervise the work with experience on at least three (3) projects of similar scope to this project completed over the past five (5) years. The Contractor shall not use Engineer's or manufacturer representative's review to satisfy the supervising engineer requirements of this section. The on-site foremen and drill rig operators shall also have experience on at least three (3) projects over the past five (5) years installing micropiles of equal or greater capacity than required in these plans and specifications.
- .4 The micropiles shall be designed by a Registered Professional Engineer with experience in the design of at least three (3) successfully completed micropile projects over the past five (5) years, with micropiles of similar capacity to those required in these plans and specifications. The micropile designer may be either an employee of the Contractor or a separate Consultant designer meeting the stated experience requirements.

- .5 At least 45 calendar days before the planned start of micropile construction, the Contractor shall submit five (5) copies of the completed project reference list and a personnel list. The project reference list shall include a brief project description with the owner's name and current phone number and load test reports. The personnel list shall identify the micropile system designer (if applicable), supervising project Engineer, drill rig operators, and on-site foremen to be assigned to the project. The personnel list shall contain a summary of each individual's experience and be complete enough for the Engineer to determine whether each individual satisfies the required qualifications. The Engineer will approve or reject the Contractor's qualifications within 15 calendar days after receipt of a complete submission. Additional time required due to incomplete or unacceptable submittals will not be cause for time extension or impact or delay claims. All costs associated with incomplete or unacceptable submittals shall be borne by the Contractor.
- .6 Work shall not be started, nor materials ordered, until the Engineer's written approval of the Contractor's experience qualifications is given. The Engineer may suspend the Work if the Contractor uses non-approved personnel. If work is suspended, the Contractor shall be fully liable for all resulting costs and no adjustment in contract time will result from the suspension.

1.3 DEFINITIONS

- .1 **Admixture:** Substance added to the grout to control bleed and/or shrinkage, improve flowability, reduce water content, or retard setting time.
- .2 **Alignment Load (AL):** A minimum initial load (five percent DL maximum) applied to micropile during testing to keep the testing equipment correctly positioned.
- .3 **Allowable Geotechnical Bond Load:** For Service Load Design (SLD), computed as the nominal grout-to-ground bond strength (a_{bond} nominal strength) divided by the geotechnical safety factor and then multiplied by the grouted bond surface area (bond length times drillhole circumference).
- .4 **Bonded Length:** The length of the micropile that is bonded to the ground and conceptually used to transfer the applied axial loads to the surrounding soil or rock. Also known as the load transfer length.
- .5 **Bond-breaker:** A sleeve placed over the steel reinforcement to prevent load transfer.
- .6 **Casing:** Steel tube introduced during the drilling process in overburden soil to temporarily stabilize the drill hole. This is usually withdrawn as the pile is grouted, although in certain types of micropiles, some casing is permanently left in place to provide added pile reinforcement.
- .7 **Centralizer:** A device to support and position the reinforcing steel in the drill hole and/or casing so that a minimum grout cover is provided.
- .8 **Contractor:** The person/firm responsible for performing the micropile work.
- .9 **Coupler:** The means by which load capacity can be transmitted from one partial length of reinforcement to another.
- .10 **Creep Movement:** The movement that occurs during the creep test of a micropile under a constant load.
- .11 **Design Load (DL):** The maximum unfactored load expected to be applied to the micropile during its service life.

- .12 **Encapsulation:** A corrugated or deformed tube protecting the reinforcing steel against corrosion.
- .13 **Engineer:** The Owner or Owner's authorized agent.
- .14 **Free (unbonded) length:** The designed length of the micropile that is not bonded to the surrounding ground or grout.
- .15 **Geotechnical Bond Design Strength:** For Load Factor Design (LFD), computed as the nominal grout-to-ground bond strength (a_{bond} nominal strength) multiplied by a geotechnical resistance factor (ϕ_G . Use $\phi_G = 0.6$ for typical designs and non-seismic load groups; use $\phi_G = 1.0$ for seismic loads groups.
- .16 **Micropile:** A small-diameter, bored, cast-in-place composite pile, in which the applied load is resisted by steel reinforcement, cement grout and frictional grout/ground bond.
- .17 **Maximum Test Load:** The maximum load to which the micropile is subjected during testing. Recommended as $2.5 \times DL$ for verification load tests and as $1.67 \times DL$ for proof load tests.
- .18 **Nominal Grout-to-Ground Bond Strength:** The estimated ultimate geotechnical unit grout-to-ground bond strength selected for use in design. Same as (a_{bond} nominal strength) (SLD and LFD).
- .19 **Overburden:** Material, natural or placed, that may require cased drilling methods to provide an open borehole to underlying strata.
- .20 **Post-grouting:** The injection of additional grout into the load transfer length of a micropile after the primary grout has set. Also known as regrouting or secondary grouting.
- .21 **Primary Grout:** Portland-cement-based grout injected into the micropile hole prior to or after the installation of the reinforcement to direct the load transfer to the surrounding ground along the micropile.
- .22 **Proof Load Test:** Incremental loading of a production micropile, recording the total movement at each increment.
- .23 **Reinforcement:** The steel component of the micropile that accepts and/or resists applied loadings.
- .24 **Sheathing:** Smooth or corrugated piping or tubing that protects the reinforcing steel against corrosion.
- .25 **Spacer:** A device to separate elements of a multiple-element reinforcement.
- .26 **Verification Load Test:** Pile load test performed to verify the design of the pile system and the construction methods proposed, prior to installation of production piles.

1.4 REFERENCES CODES AND STANDARDS

- .1 The following publications form a part of this specification to the extent indicated by the references. The latest publication as of the issue date of this specification shall govern, unless indicated otherwise.
- .2 American Society for Testing and Materials (ASTM)
 - .1 American Association of State Highway and Transportation Officials (AASHTO)

ASTM	AASHTO	SPECIFICATION / TEST
A36, A572	M183, M223	Structural Steel

ASTM	AASHTO	SPECIFICATION / TEST
A1064	M55	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
A252-10	-	Standard Specification for Welded and Seamless Steel Pipe Piles
A615	M31	Deformed and Plain Billet Steel Bars for Concrete Reinforcement
A722		Standard Specification for High-Strength Steel Bars for Prestressed Concrete
A775	-	Standard Specification for Epoxy-Coated Steel Reinforcing Bars
A934	-	Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
C 33	M80	Concrete Aggregates
C 109		Standard Test Method for Compressive Strength of Hydraulic Cement Mortars
C 188	T133	Density of Hydraulic Cement
C 144		Standard Specification for Aggregate for Masonry Mortar
C 150	M85	Portland Cement
C 494-17	M194	Chemical Admixtures for Concrete
D 1143	-	Standard Test Methods for Deep Foundation Elements Under Static Axial Compressive Load
D 1784	-	Standard Classification System and Basis for Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
D 3350	M252	Polyethylene Corrugated Tubing
D 3689	-	Standard Test Methods for Deep Foundation Elements Under Static Axial Tensile Load
D 3966		Standard Test Methods for Deep Foundation Elements Under Static Lateral Load
-	T26	Quality of Water to be Used in Concrete

.3 Canadian Code

- .1 CSA W59, Welded Steel Construction
- .2 CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction
- .3 G40.20-13/G40.21 , General Requirements for Rolled or Welded Structural Quality Steel / Structural Quality Steel.
- .4 CSA S16 Design of Steel Structures.
- .5 CSA W48, Filler Metals and Allied Materials for Metal Arc Welding.
- .6 CAN/CSA W47.1, Certification of Companies for Fusion Welding of Steel.

Notwithstanding the version of the standard mentioned above, it remains the responsibility of the Contractor to consult the most recent version.

.4 American Society of Civil Engineers (ASCE):

- .1 ASCE 20-96 Standard Guidelines for the Design and Installation of Pile Foundations.

- .5 Deep Foundations Institute (DFI)
 - .1 Guide to Drafting a Specification for High Capacity Drilled and Grouted Micropiles for Structural Support, 1st Edition, Copyright 2001 by the Deep Foundation Institute (DFI).

1.5 AVAILABLE INFORMATION

- .1 Available information developed by the Owner, or by the Owner's duly authorized representative include the following items:
 - .1 The plans include the plan view, profile and typical cross sections for the proposed micropile approximate locations.
 - .2 Geotechnical Report: There is no geotechnical report available at this time. The Contractor shall design the micropiles in accordance with minimum requirements, standard industry practice, and applicable code requirements. The Contractor shall include in the bid price all assumptions, investigations, site soil sampling and testing, engineering design, and any other work necessary to establish soil parameters and complete the micropile design. No additional cost or claim to the Owner shall be permitted for these items.

A comprehensive geotechnical report is currently under investigation and preparation by a geotechnical engineer retained by the Owner. Upon receipt of the report, the micropile design parameters shall be reviewed, reassessed, and optimized as necessary based on the actual soil properties.

1.6 CONSTRUCTION SITE SURVEY

- .1 Before bidding the Work, the Contractor shall review the available subsurface information and visit the site to assess the site geometry, equipment access conditions, and location of existing structures and above ground facilities.
- .2 The Contractor is responsible for field locating and verifying the location of all utilities shown on the plans prior to starting the Work. Maintain uninterrupted service for those utilities designated to remain in service throughout the Work. Notify the Engineer of any utility locations different from shown on the plans that may require micropile relocations or structure design modification.
- .3 Prior to start of any micropile construction activity, the Contractor and Engineer shall jointly inspect the site to observe and document the pre-construction condition of the site, existing structures and facilities.
- .4 The Contractor shall verify all site constraints, particularly the height restriction (existing height of 3 m), and select a drilling rig suitable for the project. The Contractor shall also consider all requirements for reinforcement splicing and any other measures necessary to complete the work within the height constraints.

1.7 MICROPILE DESIGN REQUIREMENTS

- .1 The micropiles shall be designed to meet the specified loading conditions, as shown on the contract plans and approved working drawings. Design the micropiles and pile top to footing connections using the Service Load Design (SLD) procedures contained in the FHWA "Micropile Design and Construction Guidelines Manual", Report No. FHWA-SA-97-070.
- .2 The required geotechnical safety factors/strength factors (for SLD Design) or load and resistance factors (for LFD Design) shall be in accord with the FHWA manual, unless specified otherwise. Estimated soil/rock design shear strength parameters, unit weights, applied foundation loadings, slope and external surcharge loads, corrosion protection requirements, known utility locations, and other applicable design criteria will be as shown on the plans or specified herein. Structural design of any individual micropile structure elements not covered in the FHWA manual shall be by the service load design method in conformance with appropriate articles of the most current Edition of the AASHTO Standard Specifications for Highway Bridges, including current interim specifications.
- .3 Steel pipe used for micropile permanent casing shall incorporate an additional 1.6 mm thickness of sacrificial steel for corrosion protection.
- .4 Where required as shown on the contract plans, corrosion protection of the internal steel reinforcing bars, consisting of either encapsulation, epoxy coating, or grout, shall be provided. Where permanent casing is used for a portion of the micropile, encapsulation shall extend at least 1.5 m into the casing.

1.8 MICROPILE DESIGN SUBMITTALS

- .1 Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures.
- .2 At least 21 calendar days before the planned start of micropile structure construction, submit complete design calculations and working drawings to the Engineer for review and approval.
- .3 The drawings and calculations shall be signed and sealed by the contractor's Professional Engineer, previously approved by the owner's Engineer. If the micropile contractor uses a subconsultant designer to prepare the design, the micropile contractor shall still have overall contract responsibility for both the design and the construction.

1.9 DESIGN CALCULATIONS

- .1 Design calculations shall include, but not be limited to, the following items:
 - .1 A written summary report which describes the overall micropile design.
 - .2 Applicable code requirements and design references.
 - .3 Design calculation sheets with the project number, micropile structure location, designation, date of preparation, initials of designer and checker, and page number at the top of each page. Provide an index page with the design calculations.
 - .4 Micropile structure critical design cross-section(s) geometry including soil/rock strata and water levels and location, magnitude and direction of design applied loadings, including slope or external surcharge loads.

- .5 Design criteria including, soil/rock shear strengths (friction angle and cohesion), unit weights, and ground-grout bond values and micropile drillhole diameter assumptions for each soil/rock strata.
- .6 Safety factors/strength factors (for Service Load Design) or load and resistance factors (for Load Factor Design) used in the design on the ground-grout bond values, surcharges, soil/rock and material unit weights, steel, grout, and concrete materials.
- .7 Seismic design earthquake acceleration coefficient.
- .8 Design notes including an explanation of any symbols and computer programs used in the design.
- .9 Pile to footing connection calculations.

1.10 WORKING DRAWINGS

- .1 The working drawings shall include all information required for the construction and quality control of the piling. Working drawings shall include, but not be limited to, the following items unless provided in the contract plans:
 - .1 A plan view of the micropile structure(s) identifying:
 - .1 A reference baseline and elevation datum.
 - .2 The offset from the construction centerline or baseline to the face of the micropile structure at all changes in horizontal alignment.
 - .3 Beginning and end of micropile structure stations.
 - .4 Right-of-way and permanent or temporary construction easement limits, location of all known active and abandoned existing utilities, adjacent structures or other potential interferences. The centerline of any drainage structure or drainage pipe behind, passing through, or passing under the micropile structure.
 - .5 Subsurface exploration locations shown on a plan view of the proposed micropile structure alignment with appropriate reference base lines to fix the locations of the explorations relative to the micropile structure.
 - .2 An elevation view of the micropile structure(s) identifying:
 - .1 Elevation view showing micropile locations and elevations; vertical and horizontal spacing; batter and alignment and the location of drainage elements (if applicable).
 - .2 Existing and finish grade profiles both behind and in front of the micropile structure.
 - .3 Design parameters and applicable codes.
 - .4 General notes for constructing the micropile structure including construction sequencing or other special construction requirements.
 - .5 Horizontal and vertical curve data affecting the micropile structure and micropile structure control points. Match lines or other details to relate micropile structure stationing to centerline stationing.
 - .6 A listing of the summary of quantities on the elevation drawing of each micropile structure showing pay item estimated quantities (if applicable).

- .7 Micropile typical sections including micropile spacing and inclination; minimum drillhole diameter; pipe casing and reinforcing bar sizes and details; splice types and locations; centralizers and spacers; grout bond zone and casing plunge lengths (if used); corrosion protection details; and connection details to the substructure footing, anchorage, plates, etc.
- .8 A typical detail of verification and production proof test micropiles defining the micropile length, minimum drillhole diameter, inclination, and load test bonded and unbonded test lengths.
- .9 Details, dimensions, and schedules for all micropiles, casing and reinforcing steel, including reinforcing bar bending details.
- .10 Revise the drawings when plan dimensions are changed due to field conditions or for other reasons. Within 30 days after completion of the work, submit as-built drawings to the Engineer. Provide revised design calculations signed by the approved Registered Professional Engineer for all design changes made during the construction of the micropile structure.

1.11 CONSTRUCTION SUBMITTALS

- .1 Work other than test pile installation shall not begin until the construction submittals have been received, reviewed, and accepted in writing by the Engineer. Provide work plan, schedule, welding procedure, headroom requirements and surface water control plan at least 21 calendar days prior to initiating micropile construction.
- .2 Provide mill reports as the work progresses for each delivery.
- .3 Provide grout plan and load test plan at least seven days prior to start of micropile load testing or incorporation of the respective materials into the work.
- .4 The Contractor shall allow the Engineer seven (7) calendar days to review the construction submittals after a complete set has been received. Additional time required due to incomplete or unacceptable submittals shall not be cause for delay or impact claims. All costs associated with incomplete or unacceptable Contractor submittals shall be the responsibility of the Contractor.
- .5 Work Plan: Detailed step-by-step description of the proposed micropile construction procedure, including personnel, testing and equipment to assure quality control. This step-by-step procedure shall be shown on the working drawings in sufficient detail to allow the Engineer to monitor the construction and quality of the micropiles.
- .6 Schedule: Proposed start date and time schedule and micropile installation schedule providing the following:
 - .1 Micropile number
 - .2 Micropile design load
 - .3 Type and size of reinforcing steel
 - .4 Minimum total bond length
 - .5 Total micropile length
 - .6 Micropile top footing attachment
- .7 Welding procedure; If welding of casing is proposed, submit the proposed welding procedure, certified by a qualified welding specialist.

- .8 Information on headroom and space requirements for installation equipment that verify the proposed equipment can perform at the site.
- .9 Surface Water Control Plan describing how surface water, drill flush, and excess waste grout will be controlled and disposed.
- .10 Certified mill test reports for the reinforcing steel or coupon test results for permanent casing without mill certification. The ultimate strength, yield strength, elongation, and material properties composition shall be included. For API N-80 pipe casing, coupon test results may be submitted in lieu of mill certification.
- .11 Proposed Grouting Plan. The grouting plan shall include complete descriptions, details, and supporting calculations for the following:
 - .1 Grout mix design and type of materials to be used in the grout including certified test data and trial batch reports.
 - .2 Methods and equipment for accurately monitoring and recording the grout depth, grout volume and grout pressure as the grout is being placed.
 - .3 Grouting rate calculations, when requested by the Engineer. The calculations shall be based on the initial pump pressures or static head on the grout and losses throughout the placing system, including anticipated head of drilling fluid (if applicable) to be displaced.
 - .4 Estimated curing time for grout to achieve specified strength. Previous test results for the proposed grout mix completed within one year of the start of grouting may be submitted for initial verification and acceptance and start of production work. During production, grout shall be tested in accord with Section 3.10.
 - .5 Procedure and equipment for Contractor monitoring of grout quality.
- .12 Load Testing Plan: Detailed plans for the proposed micropile load testing method. This shall include all drawings, details, and structural design calculations necessary to clearly describe the proposed test method, reaction load system capacity and equipment setup, types and accuracy of apparatus to be used for applying and measuring the test loads and pile top movements in accordance with Section 3.12, Pile Load Tests.
- .13 Calibration reports and data for each test jack, pressure gauge and master pressure gauge and electronic load cell to be used. The calibration tests shall have been performed by an independent testing laboratory, and tests shall have been performed within 90 calendar days of the date submitted. Testing shall not commence until the Engineer has reviewed and accepted the jack, pressure gauge, master pressure gauge and electronic load cell calibration data.

1.12 PRE-CONSTRUCTION MEETING.

- .1 A pre-construction meeting will be scheduled by the Contractor and held prior to the start of micropile construction. The Engineer, prime Contractor, micropile specialty Contractor, micropile design engineer, excavation Contractor and geotechnical instrumentation specialist (if applicable) shall attend the meeting. Attendance is mandatory. The pre-construction meeting will be conducted to clarify the construction requirements for the work, to coordinate the construction schedule and activities, and to identify contractual relationships and delineation of responsibilities amongst the prime Contractor and the various Subcontractors – specifically those pertaining to excavation for micropile structures, anticipated subsurface conditions, micropile installation and testing, micropile structure survey control and site drainage control.

Part 2 Materials

- .1 Furnish materials new and without defects. Remove defective materials from the jobsite at no additional cost. Materials for micropiles shall consist of the following:
 - .1 **Admixtures for Grout:** Admixtures shall conform to the requirements of ASTM C494/AASHTO M194. Admixtures that control bleed, improve flowability, reduce water content, and retard set may be used in the grout, subject to the review and acceptance of the Engineer. Admixtures shall be compatible with the grout and mixed in accordance with the manufacturer's recommendations. Expansive admixtures shall only be added to the grout used for filling sealed encapsulations and anchorage covers. Accelerators are not permitted. Admixtures containing chlorides are not permitted.
 - .2 **Cement:** All cement shall be Portland cement conforming to ASTM C150 ISO/AASHTO M85, Types II, III or V.
 - .3 **Centralizers and Spacers:** Centralizers and spacers shall be fabricated from schedule 40 PVC pipe or tube, steel, or material non-detrimental to the reinforcing steel. Wood shall not be used. Centralizers and spacers shall be securely attached to the reinforcement; sized to position the reinforcement within 10 mm of plan location from center of pile; sized to allow grout tremie pipe insertion to the bottom of the drillhole; and sized to allow grout to freely flow up the drillhole and casing and between adjacent reinforcing bars.
 - .4 **Encapsulation:** Encapsulation (double corrosion protection) shall be shop fabricated using high-density, corrugated polyethylene tubing conforming to the requirements of ASTM D3350/AASHTO M252 with a nominal wall thickness of 0.8 mm. The inside annulus between the reinforcing bars and the encapsulating tube shall be a minimum of 5mm and be fully grouted with non-shrink grout conforming to Materials Section 2.0.
 - .5 **Epoxy Coating:** The minimum thickness of coating applied electrostatically to the reinforcing steel shall be 0.3 mm. Epoxy coating shall be in accordance with ASTM A775 or ASTM A934. Bend test requirements are waived. Bearing plates and nuts encased in the pile concrete footing need not be epoxy coated.
 - .6 **Fine Aggregate:** If sand - cement grout is used, sand shall conform to ASTM C 144/AASHTO M45.
 - .7 **Grout:** Neat cement or sand/cement mixture with a minimum three (3)-day compressive strength of 14 MPa and a 28day compressive strength of 28 MPa per AASHTO T106/ASTM C109.
 - .8 **Grout Protection:** Provide a minimum 25 mm grout cover over bare or epoxy coated bars (excluding bar couplers) or minimum 12 mm grout cover over the encapsulation of encapsulated bars.
 - .9 **Permanent Casing Pipe:** Permanent steel casing/pipe shall have the diameter and at least minimum wall thickness shown on the approved Working Drawings. The permanent steel casing/pipe:

- .1 Shall meet the Tensile Requirements of ASTM A252, Grade 3, except the yield strength shall be a minimum of 345 MPa to 552 MPa as used in the design submittal.
- .2 May be new "Structural Grade" (a.k.a. "Mill Secondary") steel pipe meeting above but without Mill Certification, free from defects (dents, cracks, tears) and with two (2) coupon tests per truckload delivered to the fabricator.
- .10 For permanent casing/pipe that will be welded, the following material conditions apply:
 - .1 The carbon equivalency (CE) as defined in AWS D1.1, Section X15.1, shall not exceed 0.45, as demonstrated by mill certifications
 - .2 The sulfur content shall not exceed 0.05%, as demonstrated by mill certifications
- .11 For permanent casing/pipe that will be shop or field welded, the following fabrication or construction conditions apply:
 - .1 The steel pipe shall not be joined by welded lap splicing
 - .2 Welded seams and splices shall be complete penetration welds
 - .3 Partial penetration welds may be restored in conformance with AWS D1.1
 - .4 The proposed welding procedure certified by a welding specialist shall be submitted for approval
- .12 Threaded casing joints shall develop at least the required nominal resistance used in the design of the micropile.
- .13 **Plates and Shapes:** Structural steel plates and shapes for pile top attachments shall conform to ASTM A 36/AASHTO M183, or ASTM A 572/AASHTO M223, Grade 350.
- .14 **Reinforcing Bars:** Reinforcing steel shall be deformed bars in accordance with ASTM A 615/AASHTO M31, Grade 420 or Grade 520 or ASTM A 722/AASHTO M275, Grade 1035. When a bearing plate and nut are required to be threaded onto the top end of reinforcing bars for the pile top to footing anchorage, the threading may be continuous spiral deformed ribbing provided by the bar deformations (e.g., Dywidag or Williams continuous threadbars) or may be cut into a reinforcing bar. If threads are cut into a reinforcing bar, the next larger bar number designation from that shown on the Plans shall be provided, at no additional cost. All bars to be double corrosion protected.
- .15 Bar tendon couplers, if required, shall develop the ultimate tensile strength of the bars without evidence of any failure.
- .16 **Sheathing:** Smooth or corrugated plastic sheathing, including joints, shall be watertight. Polyvinyl chloride (PVC) sheathing shall conform to ASTM D 1784, Class 13464-B.
- .17 **Water:** Water used in the grout mix shall conform to AASHTO T 26 and shall be potable, clean, and free from substances that may be injurious to cement and steel.

Part 3 Construction Requirements

3.1 SITE DRAINAGE CONTROL

- .1 The Contractor shall control and properly dispose of drill flush and construction related waste, including excess grout, in accord with the standard specifications and all applicable local codes and regulations. Provide positive control and discharge of all surface water that will affect construction of the micropile installation. Maintain all pipes or conduits used to control surface water during construction. Repair damage caused by surface water at no additional cost. Upon substantial completion of the Work, remove surface water control pipes or conduits from the site. Alternatively, with the approval of the Engineer, pipes or conduits that are left in place may be fully grouted and abandoned or left in a way that protects the structure and all adjacent facilities from migration of fines through the pipe or conduit and potential ground loss.
- .2 Immediately contact the Engineer if unanticipated existing subsurface structures are discovered during excavation or drilling. Suspend work in these areas until remedial measures meeting the Engineer's approval are implemented.
- .3 Excavation
 - .1 Coordinate the work and the excavation so the micropile structures are safely constructed. Perform the micropile construction and related excavation in accordance with the Plans and approved submittals. No excavations steeper than those specified herein or shown on the Plans will be made above or below the micropile structure locations without written approval of the Engineer.
- .4 Micropile Allowable Construction Tolerances
 - .1 Centerline of piling shall not be more than 75 mm from indicated plan location.
 - .2 Pile shall be plumb within 2% of total-length plan alignment.
 - .3 Top elevation of pile shall be plus 25 mm or minus 50 mm maximum from vertical elevation indicated.
 - .4 Centerline of reinforcing steel shall not be more than 15 mm from indicated location.
- .5 Micropile Installation
 - .1 The micropile Contractor shall select the drilling method, the grouting procedure, and the grouting pressure used for the installation of the micropiles. The micropile Contractor shall also determine the micropile casing size, final drillhole diameter and bond length, and central tendon reinforcement steel sizing necessary to develop the specified load capacities and load testing requirements. The micropile Contractor is also responsible for estimating the grout take. There will be no extra payment for grout overruns.
- .6 Drilling
 - .1 The drilling equipment and methods shall be suitable for drilling through the conditions to be encountered, without causing damage to any overlying or adjacent structures or services. The drillhole must be open along its full length to at least the design minimum drillhole diameter prior to placing grout and reinforcement.

.2 Temporary casing or other approved method of anchor drillhole support will be required in caving or unstable ground to permit the anchor shaft to be formed to the minimum design drillhole diameter. The Contractor's proposed method(s) to provide drillhole support and to prevent detrimental ground movements shall be reviewed by the Engineer. Detrimental ground movement is defined as movement which requires remedial repair measures. Use of drilling fluid containing bentonite is not allowed.

.7 Ground Heave or Subsidence

.1 During construction, the Contractor shall observe the conditions vicinity of the micropile construction site on a daily basis for signs of ground heave or subsidence. Immediately notify the Engineer if signs of movements are observed. Contractor shall immediately suspend or modify drilling or grouting operations if ground heave or subsidence is observed, if the micropile structure is adversely affected, or if adjacent structures are damaged from the drilling or grouting. If the Engineer determines that the movements require corrective action, the Contractor shall take corrective actions necessary to stop the movement or perform repairs. When due to the Contractor's methods or operations or failure to follow the specified/approved construction sequence, as determined by the Engineer, the costs of providing corrective actions will be borne by the Contractor. When due to differing site conditions, as determined by the Engineer, the costs of providing corrective actions will be paid as Extra Work.

.8 Pipe Casing and Reinforcing Bars Placement and Splicing

.1 Reinforcement may be placed either prior to grouting or placed into the grout - filled drillhole before temporary casing (if used) is withdrawn. Reinforcement surface shall be free of deleterious substances such as soil, mud, grease or oil that might contaminate the grout or coat the reinforcement and impair bond. Pile cages and reinforcement groups, if used, shall be sufficiently robust to withstand the installation and grouting process and the withdrawal of the drill casings without damage or disturbance.

.2 The Contractor shall check pile top elevations and adjust all installed micropiles to the planned elevations.

.3 Centralizers and spacers (if used) shall be provided at 3 m centers maximum spacing. The upper and lower most centralizer shall be located a maximum of 1.5 m from the top and bottom of the micropile. Centralizers and spacers shall permit the free flow of grout without misalignment of the reinforcing bar(s) and permanent casing. The central reinforcement bars with centralizers shall be lowered into the stabilized drill hole and set. The reinforcing steel shall be inserted into the drill hole to the desired depth without difficulty. Partially inserted reinforcing bars shall not be driven or forced into the hole. Contractor shall redrill and reinsert reinforcing steel when necessary to facilitate insertion.

.4 Lengths of casing and reinforcing bars to be spliced shall be secured in proper alignment and in a manner to avoid eccentricity or angle between the axes of the two lengths to be spliced. Splices and threaded joints shall meet the requirements of Materials Section 2.0. Threaded pipe casing joints shall be located at least two casing diameters (OD) from a splice in any reinforcing bar. When multiple bars are used, bar splices shall be staggered at least 0.3 meters.

.9 Grouting

.1 Micropiles shall be primary grouted the same day the load transfer bond length is drilled. The Contractor shall use a stable neat cement grout or a sand cement grout with a minimum 28-day unconfined compressive strength of 28 MPa. Admixtures, if used, shall be mixed in accordance with manufacturer's recommendations. The grouting equipment used shall produce a grout free of lumps and undispersed cement. The Contractor shall have means and methods of measuring the grout quantity and pumping pressure during the grouting operations. The grout pump shall be equipped with a pressure gauge to monitor grout pressures. A second pressure gauge shall be placed at the point of injection into the pile top. The pressure gauges shall be capable of measuring pressures of at least 1 MPa or twice the actual grout pressures used, whichever is greater. The grout shall be kept in agitation prior to mixing. Grout shall be placed within one hour of mixing. The grouting equipment shall be sized to enable each pile to be grouted in one continuous operation. The grout shall be injected from the lowest point of the drill hole and injection shall continue until uncontaminated grout flows from the top of the pile. The grout may be pumped through grout tubes, casing, hollow-stem augers, or drill rods. Temporary casing, if used, shall be extracted in stages ensuring that, after each length of casing is removed the grout level is brought back up to the ground level before the next length is removed. The tremie pipe or casing shall always extend below the level of the existing grout in the drillhole. The grout pressures and grout takes shall be controlled to prevent excessive heave or fracturing of rock or soil formations. Upon completion of grouting, the grout tube may remain in the hole, but must be filled with grout.

.2 If the Contractor elects to use a postgrouting system, Working Drawings and details shall be submitted to the Engineer for review in accordance with Section 1.8, Pre-installation Submittals.

.10 Grout Testing

.1 Grout within the micropile verification and proof test piles shall attain the minimum required three (3)-day compressive strength of 14 MPa prior to load testing. Previous test results for the proposed grout mix completed within one year of the start of work may be submitted for initial verification of the required compressive strengths for installation of pre-production verification test piles and initial production piles. During production, micropile grout shall be tested by the Contractor for compressive strength in accordance with AASHTO T106/ASTM C109 at a frequency of no less than one set of three 50-mm grout cubes from each grout plant each day of operation or per every 10 piles, whichever occurs more frequently. The compressive strength shall be the average of the 3 cubes tested.

.2 Grout consistency as measured by grout density shall be determined by the Contractor per ASTM C 188/AASHTO T 133 or API RP-13B-1 at a frequency of at least one test per pile, conducted just prior to start of pile grouting. The Baroid Mud Balance used in accordance with API RP-13B-1 is an approved device for determining the grout density of neat cement grout. The measured grout density shall be as indicated on working drawings provided by the Contractor.

.3 Grout samples shall be taken directly from the grout plant. Provide grout cube compressive strength and grout density test results to the Engineer within 24 hours of testing.

.11 Micropile Installation Records

- .1 Contractor shall prepare and submit to the Engineer full-length installation records for each micropile installed. The records shall be submitted within one work shift after that pile installation is completed. The data shall be recorded on the micropile installation log included at the end of this specification. A separate log shall be provided for each micropile.
- .12 Pile Load Tests
 - .1 Perform verification and proof testing of piles. Verification test location to be within 10m of the pile cap. Perform compression load testing in accord with ASTM D1143 and tension load testing in accord with ASTM D3689, except as modified herein.
- .13 Verification Load Tests
 - .1 Perform pre-production verification pile load testing to verify the design of the pile system and the construction methods proposed prior to installing any production piles.
 - .2 One sacrificial verification test piles shall be constructed in conformance with the approved Working Drawings. Verification test pile(s) shall be installed at the locations proposed by the Contractor and approved by the Engineer.
 - .3 Verification load tests shall be performed to verify that the Contractor installed micropiles will meet the required compression and tension load capacities and load test acceptance criteria and to verify that the length of the micropile load transfer bond zone is adequate. The micropile verification load test results must verify the Contractor's design and installation methods, and be reviewed and accepted by the Engineer prior to beginning installation of production micropiles.
 - .4 The drilling-and-grouting method, casing length and outside diameter, reinforcing bar lengths, and depth of embedment for the verification test pile(s) shall be identical to those specified for the production piles at the given locations. The verification test micropile structural steel sections shall be sized to safely resist the maximum test load.
 - .5 The maximum verification and proof test loads applied to the micropile shall not exceed 80% of the structural capacity of the micropile structural elements, to include steel yield in tension, steel yield or buckling in compression, or grout crushing in compression. Any required increase in strength of the verification test pile elements above the strength required for the production piles shall be provided for in the contractor's bid price.
 - .6 The jack shall be positioned at the beginning of the test such that unloading and repositioning during the test will not be required. When both compression and tension load testing is to be performed on the same pile, the pile shall be tested under compression loads prior to testing under tension loads.
- .14 Testing Equipment and Data Recording
 - .1 Testing equipment shall include dial gauges, dial gauge support, jack and pressure gauge, electronic load cell, and a reaction frame. The load cell is required only for the creep test portion of the verification test. The contractor shall provide a description of test setup and jack, pressure gauge and load cell calibration curves in accordance with the Submittals Section.

.2 Design the testing reaction frame to be sufficiently rigid and of adequate dimensions such that excessive deformation of the testing equipment does not occur. Align the jack, bearing plates, and stressing anchorage such that unloading and repositioning of the equipment will not be required during the test.

.3 Apply and measure the test load with a hydraulic jack and pressure gauge. The pressure gauge shall be graduated in 500 kPa increments or less. The jack and pressure gauge shall have a pressure range not exceeding twice the anticipated maximum test pressure. Jack ram travel shall be sufficient to allow the test to be done without resetting the equipment. Monitor the creep test load hold during verification tests with both the pressure gauge and the electronic load cell. Use the load cell to accurately maintain a constant load hold during the creep test load hold increment of the verification test.

.4 Measure the pile top movement with a dial gauge capable of measuring to 0.025 mm. The dial gauge shall have a travel sufficient to allow the test to be done without having to reset the gauge. Visually align the gauge to be parallel with the axis of the micropile and support the gauge independently from the jack, pile or reaction frame. Use a minimum of two dial gauges when the test setup requires reaction against the ground or single reaction piles on each side of the test pile.

.5 The required load test data shall be recorded by the Engineer.

.15 Verification Test Loading Schedule

.1 Test verification piles designated tension load testing to a maximum test load of 2.5 times the micropile Design Load shown on the Plans or Working Drawings. The verification pile load tests shall be made by incrementally loading the micropile in accordance with the following cyclic load schedule for both compression and tension loading:

	AL = Alignment Load	DL = Design Load
	LOAD	HOLD TIME
1	A: (0.05 DL)	1 minute
2	0.25 DL	1 minute
3	0.50 DL	1 minute
4	AL	1 minute
5	0.25 DL	1 minute
6	0.50 DL	1 minute
7	0.75 DL	1 minute
8	AL	1 minute
9	0.25 DL	1 minute
10	0.50 DL	1 minute
11	0.75 DL	1 minute
12	1.00 DL	1 minute
13	AL	1 minute
14	0.25 DL	1 minute
15	0.50 DL	1 minute
16	0.75 DL	1 minute
17	1.00 DL	1 minute
18	1.33 DL	60 minutes (Creep Test Load Hold)
19	1.75 DL	1 minute
20	2.00 DL	1 minute

	AL = Alignment Load	DL = Design Load
	LOAD	HOLD TIME
21	2.25 DL	1 minute
22	2.50 DL (Maximum Test Load)	10 minutes
23	AL	1 minute

.2 The test load shall be applied in increments of 25 percent of the DL load. Each load increment shall be held for a minimum of 1 minute. Pile top movement shall be measured at each load increment. The load-hold period shall start as soon as each test load increment is applied. The verification test pile shall be monitored for creep at the 1.33 Design Load (DL). Pile movement during the creep test shall be measured and recorded at 1, 2, 3, 4, 6, 10, 20, 30, 50, and 60 minutes. The alignment load shall not exceed 5% of the DL load. Dial gauges shall be reset to zero after the initial AL is applied.

.3 The acceptance criteria for micropile verification load tests are:

- .1 The pile shall sustain the first compression or tension 1.0 DL test load with no more than 12 mm total vertical movement at the top of the pile, relative to the position of the top of the pile prior to testing.
- .2 At the end of the 1.33 DL creep test load increment, test piles shall have a creep rate not exceeding 1 mm/log cycle time (1 to 10 minutes) or 2 mm/log cycle time (6 to 60 minutes or the last log cycle if held longer). The creep rate shall be linear or decreasing throughout the creep load hold period.
- .3 Failure does not occur at the 2.5 DL maximum test load. Failure is defined as load at which attempts to further increase the test load simply result in continued pile movement.

.4 The Engineer will provide the Contractor written confirmation of the micropile design and construction within three (3) working days of the completion of the verification load tests. This written confirmation will either confirm the capacities and bond lengths specified in the Working Drawings for micropiles or reject the piles based upon the verification test results.

.16 Verification Test Pile Rejection

- .1 If a verification tested micropile fails to meet the acceptance criteria, the Contractor shall modify the design, the construction procedure, or both. These modifications may include modifying the installation methods, increasing the bond length, or changing the micropile type. Any modification that necessitates changes to the structure shall require the Engineer's prior review and acceptance. Any modifications of design or construction procedures or cost of additional verification test piles and load testing shall be at the Contractor's expense. At the completion of verification testing, test piles shall be removed down to the elevation specified by the Engineer.

.17 Proof Load Tests

- .1 Perform proof load tests on the 1 production pile installed, prior to the installation of the remaining production piles.

.18 Proof Test Loading Schedule

.1 Test piles designated for tension proof load testing to a maximum test load of 1.67 times the micropile Design Load shown on the Plans or Working Drawings. Proof tests shall be made by incrementally loading the micropile in accordance with the following schedule, to be used for both compression and tension loading:

	AL = Alignment Load	DL = Design Load
	LOAD	HOLD TIME
1	AL	1 minute
2	0.25 DL	1 minute
3	0.50 DL	1 minute
4	0.75 DL	1 minute
5	1.00 DL	1 minute
6	1.33 DL	10 or 60 minute Creep Test
7	1.67 DL (Maximum Test Load)	1 minute
8	AL	1 minute

.2 Depending on performance, either a 10 minute or 60 minute creep test shall be performed at the 1.33 DL Test Load. Where the pile top movement between one (1) and 10 minutes exceeds 1 mm, the Maximum Test Load shall be maintained an additional 50 minutes. Movements shall be recorded at 1, 2, 3, 5, 6, 10, 20, 30, 50 and 60 minutes. The alignment load shall not exceed 5 percent of DL. Dial gauges shall be reset to zero after the initial AL is applied.

.3 The acceptance criteria for micropile proof load tests are:

.1 The pile shall sustain the tension 1.0 DL test load with no more than 12 mm total vertical movement at the top of the pile, relative to the position of the top of the pile prior to testing.

.2 At the end of the 1.33 DL creep test load increment, test piles shall have a creep rate not exceeding 1 mm/log cycle time (1 to 10 minutes) or 2 mm/log cycle time (6 to 60 minutes). The creep rate shall be linear or decreasing throughout the creep load hold period.

.3 Failure does not occur at the 1.67 DL maximum test load. Failure is defined as the load at which attempts to further increase the test load simply result in continued pile movement.

.19 Proof Test Pile Rejection

.1 If a proof-tested micropile fails to meet the acceptance criteria, the Contractor shall immediately proof test another micropile within that footing. For failed piles and further construction of other piles, the Contractor shall modify the design, the construction procedure, or both. These modifications may include installing replacement micropiles, incorporating piles at not more than 50% of the maximum load attained, postgrouting, modifying installation methods, increasing the bond length, or changing the micropile type. Any modification that necessitates changes to the structure design shall require the Engineer's prior review and acceptance. Any modifications of design or construction procedures, or cost of additional verification test piles and verification and/or proof load testing, or replacement production micropiles, shall be at the Contractor's expense.

.20 Pre-Tensioning Production Anchors

.1 All anchors are to be pre-tensioned to 100% of the specified load, and permanently locked off.

END OF SECTION