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Butler's Barracks Re-stabilization Project

Niagara National Historic Sites

Project #: 000803

Specifications





Prepared For;
Southwestern Ontario Field Unit
Niagara National Historic Sites
Butler's Barracks National Historic Site

Prepared by;

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END OF SECTION

1 GENERAL

1.01 SECTION INCLUDES

- .1 Title and description of Work.
- .2 Contract Method.
- .3 Work by others.
- .4 Future work.
- .5 Work sequence.
- .6 Contractor use of premises.
- .7 Owner occupancy.
- .8 Partial Owner occupancy.
- .9 Owner furnished items.
- .10 Alterations to existing Building.

1.02 PRECEDENCE

- .1 For Federal Government projects, Division 01 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.03 RELATED SECTIONS

- .1 All Sections included in the package or listed in the table of contents

1.04 WORK COVERED BY CONTRACT DOCUMENTS

- .1 Work of this Contract comprises renovation of the Butler Building Two Storey Barracks, located in Niagara on the Lake, Ontario, including all interior and exterior renovations to bring the entire building into good condition for its intended use.

1.05 COST BREAKDOWN

- .1 Within 10 days of notification of acceptance of bid furnish a cost breakdown by Section aggregating to the contract Lump Sum price.
- .2 Show separately cost of equipment purchased exempt from Ontario Retail Sales Tax under your Ontario Sales Tax licence number.
- .3 Within 48 hours of acceptance of bid submit a list of subcontractors.

1.06 CONTRACTOR IS THE CONSTRUCTOR

- .1 The Contractor shall for the purpose of the Ontario Occupational Health and Safety Act and Regulations for Construction Projects, and for the duration

of the Work of the Contract:

- .1 Assume the role of Constructor in accordance with the Authority Having Jurisdictions.
- .2 Agree, in the event of two or more Contractors working at the same time and space at the work site, without limiting the General Conditions GC3.7, to the Departmental Representative's order to:
 - .1 Assume, as the Constructor, the responsibility for the Departmental Representative's other Contractors; [or]
 - .2 Accept the Departmental Representative's other Contractor's role as Constructor and conform to that Contractor's Site Specific Health and Safety Plan.

1.07 CONTRACTOR USE OF PREMISES

- .1 Contractor has unrestricted use of site until Substantial Performance.
- .2 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.

1.08 ALTERATIONS TO EXISTING BUILDING

- .1 Remove and recycle, compost, anaerobically digest, sell material for reuse or dispose of:
 - .1 Existing windows, siding and roofing;
 - .2 Built-in cabinets;
 - .3 Insulation;
 - .4 Second floor plaster ceiling
 - .5 All existing Mechanical and electrical systems.
- .2 Remove, temporarily store, clean, alter to suit and reinstall:
 - .1 Floorboards, as indicated on the drawings or as required to complete the work.
- .3 Provide new openings as required in existing construction.
- .4 Block in openings [where items removed] with material and finish to match existing adjoining construction.

1.09 DEPARTMENTAL REPRESENTATIVE

- .1 Parks Canada will appoint or designate a Departmental Representative for this contract. The contractor will be informed in writing of the designated individual or individuals. Should it be required to change the Departmental Representative, the contractor will be informed in writing.
- .2 Only the Departmental Representative will have the authority to make changes that affect the price of the contract or the price of items of the contract. No designate shall have authority to authorize work that changes the final price of the contract.
- .3 The departmental representative may designate a portion of the inspection or reviewing duties to such individuals representing the architect or consultants on the project. These duties will be specifically defined and do not constitute final inspection and acceptance nor can they be given the power to make changes that affect the final contract price.

2 PRODUCTS

2.01 NOT USED

.1 Not used.

3 EXECUTION

3.01 NOT USED

.1 Not used.

END OF SECTION

1 GENERAL

1.01 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.

1.02 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative 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 Provide sanitary facilities for use by Contractor's personnel. Keep facilities clean.
- .5 Closures: protect work temporarily until permanent enclosures are completed.

1.03 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

- .1 Execute work with least possible interference or disturbance to heritage building fabric. Arrange with Departmental Representative to facilitate execution of work.

1.04 EXISTING SERVICES

- .1 Notify, Departmental Representative utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions to a minimum.
- .3 Provide for personnel and vehicular traffic.
- .4 Construct barriers in accordance with Section 01 56 00.

1.05 SPECIAL REQUIREMENTS

- .1 Complete work in accordance with local by-laws regarding noise.
- .2 Submit schedule in accordance with Section 01 32 16.07 - Construction Progress Schedule - Bar (GANTT) Chart.
- .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 Ingress and egress of Contractor vehicles at site is limited to access off of King Street and along the path until in the immediate vicinity of the building. Access to the site is to be outside the canopy of trees adjacent to route. Discuss Route with departmental representative. Restore all damage.
- .6 Prior to cutting or drilling horizontal or vertical surfaces including concrete, concrete block or other structural substrate, determine location of reinforcing, service lines, pipes, conduits or other items by x-ray, ground penetrating radar or other appropriate method. Submit findings to Departmental Representative prior to cutting or drilling.

1.07 BUILDING SMOKING ENVIRONMENT

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

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 NOT USED

- .1 Not Used.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittals.
- .2 Particular requirements for inspection and testing to be carried out by testing laboratory designated by Departmental Representative are specified under sections as follows:
 - .1 07 31 29 - Wood Shingles and Siding.
 - .2 03 30 00.01 - Cast in Place Concrete
 - .3 05 12 23 - Structural Steel

1.02 APPOINTMENT AND PAYMENT

- .1 Departmental Representative will appoint and pay for services of testing laboratory except as follows:
 - .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
 - .2 Inspection and testing performed exclusively for Contractor's convenience.
 - .3 Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems.
 - .4 Mill tests and certificates of compliance.
 - .5 Tests specified to be carried out by Contractor under supervision of Departmental Representative.
- .2 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, pay costs for additional tests or inspections as required by Departmental Representative to verify acceptability of corrected work.

1.03 CONTRACTOR'S RESPONSIBILITIES

- .1 Provide labour, equipment and facilities to:
 - .1 Provide access to Work for inspection and testing.
 - .2 Facilitate inspections and tests.
 - .3 Make good Work disturbed by inspection and test.
 - .4 Provide storage on site for laboratory's exclusive use to store equipment and cure test samples.
- .2 Notify Departmental Representative 48 hours minimum sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.
- .3 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.
- .4 Pay costs for uncovering and making good Work that is covered before required inspection or testing is completed and approved by Departmental Representative.

2 PRODUCTS

2.01 NOT USED

.1 Not Used.

3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 ADMINISTRATIVE

- .1 Schedule and administer project meetings throughout the progress of the work at the call of Departmental Representative.
- .2 Prepare agenda for meetings.
- .3 Distribute written notice of each meeting 4 days in advance of meeting date to Departmental Representative.
- .4 Provide physical space and make arrangements for meetings.
- .5 Preside at meetings.
- .6 Unless directed otherwise by Departmental Representative, record minutes of meetings. Minutes shall be circulated to attending parties and affected parties not in attendance within 5 days after meeting.
- .7 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.02 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 Departmental Representative, Contractor, major Subcontractors, field inspectors and 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 16.07.
 - .3 Schedule of submission of shop drawings, samples, mock-ups, colour chips. Submit submittals in accordance with Section 01 33 00.
 - .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00.
 - .5 Site security in accordance with Section 01 56 00.
 - .6 Health and safety in accordance with Section 01 35 29.
 - .7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
 - .8 Record drawings and specifications in accordance with Sections 01 33 00 and 01 78 00.
 - .9 Maintenance manuals in accordance with Section 01 78 00.
 - .10 Take-over procedures, acceptance, warranties in accordance with

- Section 01 78 00.
- .11 Monthly progress claims, administrative procedures, photographs, hold backs.
 - .12 Appointment of inspection and testing agencies or firms.

1.03 PROGRESS MEETINGS

- .1 During course of Work, schedule progress meetings bi-weekly.
- .2 Contractor, major Subcontractors involved in Work and Departmental Representative are to be in attendance.
- .3 Meetings shall follow a regular schedule and designated time.
- .4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within 5 days after meeting. Seeking confirmation that minutes reflect events of the meeting. Make changes noted by parties in attendance to minutes and recirculate.
- .5 Agenda to include the following:
 - .1 Review of minutes of previous meeting.
 - .2 Review of Work progress since previous meeting.
 - .3 Field observations, problems, conflicts and report on safety.
 - .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.

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 NOT USED

- .1 Not Used.

END OF SECTION

1 GENERAL

1.01 RELATED SECTIONS

- .1 Section 01 33 00 - Submittals.
- .2 Section 01 77 00 - Closeout Procedures.

1.03 ELECTRONIC COPY

- .1 Submit electronic copy of colour digital photography in jpg format, minimum resolution of 300dpi.
- .2 Identification: name and number of project and date of exposure indicated in the title of the file.
- .3 Number of viewpoints: Locations of viewpoints determined by Departmental Representative.
- .4 Frequency: monthly with progress statement and as directed by Departmental Representative].

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 NOT USED

- .1 Not Used.

END OF SECTION

1 GENERAL

1.01 DEFINITIONS

- .1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.
- .2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management system.
- .3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.
- .4 Construction Work Week: Monday to Friday, inclusive, will provide five day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.
- .5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.
- .6 Master Plan: summary-level schedule that identifies major activities and key milestones.
- .7 Milestone: significant event in project, usually completion of major deliverable.
- .8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.
- .9 Project Planning, Monitoring and Control System: overall system operated by Departmental Representative to enable monitoring of project work in relation to established milestones.

1.02 REQUIREMENTS

- .1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
- .2 Plan to complete Work in accordance with prescribed milestones and time frame.
- .3 Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting. Where total length of activity is longer than 10 days break down activity into sub activities and/or percentage complete per 10 working days. Milestones will be required if percentage complete breakdown is submitted and it is subject to approval.

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

1.03 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Submit to Departmental Representative within 15 working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.
- .3 Submit Project Schedule to Departmental Representative within 5 working days of receipt of acceptance of Master Plan.

1.04 PROJECT MILESTONES

- .1 Project milestones form interim targets for Project Schedule.
 - .1 Define project milestones and show on schedule.
 - .2 At minimum roofing completion shall be a milestone.
 - .3 At minimum Siding completion shall be a milestone.
 - .4 At minimum window and door completion shall be a milestone.
 - .5 At minimum interior structural alterations shall be a milestone with subtasks.
 - .5 Interior finishing and fitting, mechanical, and electrical work shall be broken into subtask milestones.
 - .6 Certificate of Substantial Performance shall be a milestone.

1.05 MASTER PLAN

- .1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).
- .2 Departmental Representative will review and return revised schedules within 5 working days.
- .3 Revise impractical schedule and resubmit within 5 working days.
- .4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

1.06 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 Structural.
 - .6 Siding, Roofing and windows.
 - .7 Interior Architecture (Walls, Floors and Ceiling).
 - .8 Plumbing.
 - .9 Lighting.

- .10 Electrical.
- .11 Piping.
- .12 Controls.
- .13 Heating, Ventilating, and Air Conditioning.
- .14 Millwork.
- .15 Fire Systems.
- .16 Testing and Commissioning.
- .17 Equipment with long delivery items.
- .18 Departmental Representative supplied equipment required dates.
Currently it is not anticipated that the Departmental Representative will be providing any equipment.

1.07 PROJECT SCHEDULE REPORTING

- .1 Update Project Schedule on bi-weekly basis 3 days before project meetings the schedule reflecting activity changes and completions, as well as activities in progress.
- .2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

1.08 PROJECT MEETINGS

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

2 PRODUCTS

2.01 NOT USED

- .1 Not used.

3 EXECUTION

3.01 NOT USED

- .1 Not used.

END OF SECTION

1 GENERAL

1.01 ADMINISTRATIVE

- .1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are co-ordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.
- .10 Keep one reviewed copy of each submission on site.
- .11 Submit number of hard copies specified for each type and format of submittal and also submit in electronic format as pdf files. Forward pdf files on USB compatible with Parks Canada encryption requirements or through email or alternate electronic file sharing service such as ftp, as directed by Departmental Representative.
- .12 All electronic files shall be labelled with the job number, name and description such that they do not have to be opened to be sorted and to know the anticipated contents. If names are too long in the opinion of the departmental representative, the departmental representative will review a consistent short form that is acceptable and provide direction as to how it is to be used.

1.02 SHOP DRAWINGS AND PRODUCT DATA

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

- .2 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario of Canada.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .5 Allow 10 working days for Departmental Representative's review of each submission.
- .6 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .7 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
- .8 Accompany submissions with transmittal letter, in duplicate, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
- .9 Submissions shall include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to adjacent work.
 - .11 All deviations from the contract documents shall be highlighted and clearly distinguishable and listed as request for change on the transmittal.
- .10 After Departmental Representative's review, distribute copies.

- .11 Submit three hard copies and one electronic copy (pdf format) of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
- .12 Submit one hard copy and one electronic copy (pdf format) of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .13 Submit one hard copy and one electronic copy (pdf format) of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
 - .2 Testing must have been within a maximum of 3 years of date of contract award for project.
- .14 Submit one hard copy and one electronic copy (pdf format) of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 - .2 Certificates must be dated after award of project contract complete with project name.
- .15 Submit one hard copy and one electronic copy (pdf format) of manufacturers instructions for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .16 Submit one hard copy and one electronic copy (pdf format) of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .17 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .18 Submit one hard copy and one electronic copy (pdf format) of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
- .19 Delete information not applicable to the project.
- .20 Supplement standard information to provide details applicable to project.
- .21 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, shop drawings 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.

- .22 The review of shop drawings by Parks Canada (PC)/Parks Canada Agency (PCA) and their agents is for sole purpose of ascertaining conformance with general concept.
 - .1 This review shall not mean that PC or their agents approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
 - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.03 SAMPLES

- .1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Departmental Representative's business address.
- .3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern or texture is criterion, submit full range of samples.
- .5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.04 MOCK-UPS

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

1.05 PHOTOGRAPHIC DOCUMENTATION

- .1 As per Section 01 32 00 Construction Progress Documentation

1.06 CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of Contract, submit Workers' Safety and Insurance Board Experience Report.
- .2 Submit transcription of insurance immediately after award of Contract.

1.07 FEES, PERMITS AND CERTIFICATES

- .1 Provide authorities having jurisdiction with information requested.

- .2 Pay fees and obtain certificates and permits required.
- .3 Furnish certificates and permits.
- .4 Submit acceptable certificate stating that suspended ceiling systems provide adequate support for electrical fixtures, as required by current bulletin of Electrical Safety Authority (ESA) .

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 NOT USED

- .1 Not Used.

END OF SECTION

1 GENERAL

1.01 REFERENCES

- .1 Canadian Standards Association (CSA): Canada
 - .1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.
- .2 National Building Code 2010 (NBC):
 - .1 NBC 2010, Division B, Part 8 Safety Measures at Construction and Demolition Sites.
- .3 National Fire Code 2010 (NFC):
 - .1 NFC 2010, Division B, Part 5 Hazardous Processes and Operations, subsection 5.6.1.3 Fire Safety Plan.
- .4 Province of Ontario:
 - .1 Occupational Health and Safety Act Revised Statutes of Ontario 1990, Chapter O.1 as amended, and Regulations for Construction Projects, O. Reg. 213/91 as amended.
 - .2 O. Reg. 490/09, Designated Substances.
 - .3 Workplace Safety and Insurance Act, 1997.
 - .4 Municipal statutes and authorities.
- .5 Treasury Board of Canada Secretariat (TBS):
 - .1 Treasury Board, Fire Protection Standard April 1, 2010
www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=17316§ion=text.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
 - .3 Measures and controls to be implemented to address identified safety hazards and risks.
- .3 Provide a Fire Safety Plan, specific to the work location, in accordance with NBC, Division B, Article 8.1.1.3 prior to commencement of work. The plan shall be coordinated with, and integrated into, the existing Building's Emergency Procedures and Evacuation Plan in place at the site. Deliver two copies of the Fire Safety Plan to the Departmental Representative not later than 14 days before commencing work.
- .4 Coordinate the Contractor's and Sub-contractors' Safety Communication Plan and include it in the submissions.
- .5 Contingency and Emergency Response Plan addressing standard operating procedures specific to the project site to be implemented during emergency situations.

- .6 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 5 days after receipt of plan. Departmental Representative may provide suggestions for the contractor's consideration. Revise plan as appropriate and resubmit plan to Departmental Representative within 3 days after receipt of comments from Departmental Representative.
- .7 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .8 Submit names of personnel and alternates responsible for site safety and health.
- .9 Submit records of Contractor's Health and Safety meetings [when requested].
- .10 Submit electronic copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative and/or authority having jurisdiction, weekly.
- .11 Submit electronic copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative, weekly.
- .12 Submit copies of orders, directions or reports issued by health and safety inspectors of the authorities having jurisdiction.
- .13 Submit copies of incident and accident reports.
- .14 Submit Material Safety Data Sheets (MSDS).
- .15 Submit Workplace Safety and Insurance Board (WSIB) - Experience Rating Report.
- .16 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel, in accordance with O. Reg. 490, prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.

1.03 FILING OF NOTICE

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

1.04 WORK PERMIT

- .1 Obtain building permits related to project prior to commencement of Work.

1.05 SAFETY ASSESSMENT

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

1.06 MEETINGS

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

1.07 REGULATORY REQUIREMENTS

- .1 Comply with the Acts and regulations of the Province of Ontario.
- .2 Comply with specified standards and regulations to ensure safe operations at site.

1.08 PROJECT/SITE CONDITIONS

- .1 Work at site will involve contact with:
 - .1 Silica in concrete and masonry.
 - .2 Mercury in switches, fluorescent light tubes, thermostats.
 - .3 Asbestos in pipe covering, vinyl composition tiles plaster.
 - .4 Lead in paint, solder in electronic equipment, solder caulking in ball fittings of cast iron pipes, and solder used on domestic water lines.
 - .5 Benzene in adhesives.
 - .6 Guano in attic, crawl space on roof parapet/cap flashing and on roof.
 - .7 PCBs in ballasts.
 - .8 Mould on painted insulation of air handling units duct lining gypsum board foundation wall, attic roof boards.
 - .9 Arsenic and acrylonitrile in paints and adhesives.
 - .10 Vinyl chloride in pipes, and conduits.
 - .11 and Designated substances in report.
- .2 Confined spaces in attic, crawl space, and maintenance holes.

1.09 GENERAL REQUIREMENTS

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns either accepting or requesting improvements.
- .3 Relief from or substitution for any portion or provision of minimum Health and Safety standards specified herein or reviewed site-specific Health and Safety Plan shall be submitted to Departmental Representative in writing.

1.10 COMPLIANCE REQUIREMENTS

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

1.11 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

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

1.12 UNFORSEEN HAZARDS

- .1 Should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of Work, immediately stop work and advise Departmental Representative verbally and in writing.
- .2 Follow procedures in place for Employees Right to Refuse Work as specified in the Occupational Health and Safety Act for the Province of Ontario.

1.13 HEALTH AND SAFETY CO-ORDINATOR

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

1.14 POSTING OF DOCUMENTS

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

1.15 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.

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

1.16 POWDER ACTUATED DEVICES

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

1.17 WORK STOPPAGE

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.
- .2 Assign responsibility and obligation to Health and Safety Coordinator or Competent Supervisor to stop or start Work when, at Health and Safety Coordinator's or Competent Supervisor's discretion, it is necessary or advisable for reasons of health or safety. Departmental Representative may also stop Work for health and safety considerations.

2 PRODUCTS

2.01 NOT USED

- .1 Not used.

3 EXECUTION

3.01 NOT USED

- .1 Not used.

END OF SECTION

1 GENERAL

1.01 RELATED SECTIONS

- .1 Section 01 14 00 - Work Restrictions.

1.02 GENERAL

- .1 This section specifies general requirements and procedures for fire safety. Additional requirements may be specified in individual sections elsewhere in specifications.
- .2 Note the building be constructed mainly of wood and this wood being aged has the potential to be very dry and susceptible to fire. Strict precautions must be observed.
- .3 No activities should occur near adjacent buildings.

1.03 REPORTING FIRES

- .1 The Contractor will present a procedure for summoning the fire department complete with numbers and a description of the building unique to the building and verified with the fire dispatch as representing the building.
- .2 Report immediately all fire incidents to Fire Department as follows:
 - .1 Telephone.
- .3 When reporting fire by telephone, give location of fire, name or number of building and be prepared to verify the location.

1.04 FIRE WATCH

- .1 Appoint a Fire Watch at locations where welding and soldering, torching or roofing is to take place.
- .2 A dedicated Fire Watch is required during welding. A competent person from the workforce on site may be assigned as Fire Watch for duration of work.
- .3 Assign a person who is knowledgeable in the correct use of fire extinguishers on the project.
- .4 Have work inspected by the Fire Watch up to 1.5 hours after work stoppage for each work period.

1.05 INTERIOR AND EXTERIOR FIRE PROTECTION AND ALARM SYSTEMS

- .1 Fire protection will not be active.
- .2 Fire hydrants, standpipes and hose systems will not be used for other than fire-fighting purposes unless authorized by Departmental Representative. Maintain free access to the hydrants and standpipes.
- .3 Provide and maintain free access to fire extinguishing equipment. Maintain exit facilities. Keep means of egress free from materials, equipment and obstructions.

1.06 FIRE EXTINGUISHERS

- .1 Supply fire extinguishers, as necessary to protect work in progress and contractor's physical plant on site. Have a minimum of two extinguishers on each level.

1.07 INSTALLATION AND/OR REPAIR OF ROOF TO INCLUDE CONTRACTORS PHYSICAL PLANT AT SITE

- .1 Ensure personnel use and take precautions as follows:
 - .1 Maintain continuous supervision and Fire extinguishers.
 - .2 All roofing materials will be stored in location no closer than 3 m to any structures.

1.08 BLOCKAGE OF ROADWAYS

- .1 Advise Departmental Representative of any work that would impede fire apparatus response. This includes violation of minimum required overhead clearance. No such obstructions shall be allowed if at all avoidable and if they are not avoidable the duration shall be kept to a minimum.

1.09 SMOKING PRECAUTIONS

- .1 Smoking is not permitted anywhere near the building or within areas of work or site storage.

1.10 RUBBISH AND WASTE MATERIALS

- .1 Rubbish and waste materials are to be kept to minimum.
- .2 Burning of rubbish is prohibited.
- .3 Remove all rubbish from work site at end of work day or shift or as directed.
- .4 Storage:
 - .1 Store oily waste in approved receptacles to ensure maximum cleanliness and safety.
 - .2 Deposit greasy or oily rags and materials subject to spontaneous combustion in approved receptacles and remove from site daily or at the end of each shift.

1.11 FLAMMABLE AND COMBUSTIBLE LIQUIDS

- .1 Handling, storage and use of flammable and combustible liquids are to be governed by the current National Fire Code of Canada.
- .2 Flammable and combustible liquids such as gasoline, kerosene and naphtha will be kept for ready use in quantities not exceeding 45 litres provided they are stored in approved safety cans bearing Underwriters' Laboratory of Canada or Factory Mutual seal of approval. Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes requires permission of Departmental Representative and generally will not be allowed.
- .3 Transfer of flammable and combustible liquids is prohibited within 30 m of any of the buildings.

- .4 Transfer of flammable and combustible liquids will not be carried out in vicinity of open flames or any type of heat-producing devices.
- .5 Flammable liquids having a flash point below 38°C such as naphtha or gasoline will not be used as solvents or cleaning agents.
- .6 Flammable and combustible waste liquids, for disposal, will be stored in approved containers located in a safe ventilated area. Quantities are to be kept to a minimum and Fire Department is to be notified when disposal is required.

1.12 HAZARDOUS SUBSTANCES

- .1 Work entailing use of toxic or hazardous materials, chemicals and/or explosives, or otherwise creating hazard to life, safety or health, will be in accordance with National Fire Code of Canada.
- .2 Obtain from Departmental Representative a "Hot Work" permit for work involving welding, burning or use of blow torches and salamanders, in buildings or facilities.
- .3 When Work is carried out in dangerous or hazardous areas involving use of heat, provide fire watchers equipped with sufficient fire extinguishers. Determination of dangerous or hazardous areas along with level of protection necessary for Fire Watch is at discretion of the Departmental Representative. Contractors are responsible for providing fire watch service for work on a scale established and in conjunction with the Departmental Representative at pre-construction meeting.
- .4 Where flammable liquids, such as lacquers or urethanes are to be used, proper ventilation will be assured and all sources of ignition are to be eliminated. Departmental Representative is to be informed prior to and at cessation of such work.

1.13 WELDING, BURNING AND CUTTING

- .1 Contractor performing work of this section must notify Departmental Representative in advance of commencing work.
- .2 Use non-combustible shields for electric and gas welding or cutting executed anywhere in the building.
- .3 Place cylinders supplying gases as close to work as possible. Secure cylinders in upright position, free from exposure to sun or high temperature.
- .4 Locate fire extinguishing equipment near all welding, cutting and soldering operations.
- .5 Contractor's mechanics shall be properly equipped with required protective clothing, including goggles or welding hood or face mask, gloves, etc.
- .6 Contractor is responsible for the protection of his work and the Departmental Representative's property.
- .7 Provide Fire Watch specifically to watch each welding operation with approved fire extinguisher while burning or welding is in progress.

1.14 QUESTIONS AND/OR CLARIFICATIONS

- .1 Direct any questions or clarification on Fire Safety in addition to above requirements to the Departmental Representative and Local Fire Department.

1.15 FIRE INSPECTION

- .1 Site inspections will be coordinated through Departmental Representative.
- .2 Co-operate with Departmental Representative during routine fire safety inspection of work site.
- .3 Immediately remedy all unsafe fire situations observed.

2 PRODUCTS

2.01 NOT USED

- .1 Not used.

3 EXECUTION

3.01 NOT USED

- .1 Not used.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittals.

1.02 DEFINITIONS

- .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.
- .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.

1.03 REFERENCES

- .1 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0-[2004], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum 2007).
 - .2 Rating System Addenda for New Construction and Major Renovations LEED Canada-NC Version 1.0- Addendum 2007.
 - .3 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.
 - .4 LEED Canada 2009 for Design and Construction-2010, LEED Canada 2009 for Design and Construction Leadership in Energy and Environmental Design Green Building Rating System Reference Guide
 - .5 LEED Canada for Existing Buildings, Operations and Maintenance-2009, LEED Canada 2009 Leadership In Energy and Environmental Design Green Building Rating System Reference Guide.
- .2 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-2008, Stipulated Price Contract.
- .3 U.S. Environmental Protection Agency (EPA)/Office of Water
 - .1 EPA 832/R-92-005-92, Storm Water Management for Construction Activities, Chapter 3.
 - .2 EPA General Construction Permit (GCP) 2012.

1.04 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit electronic copy of WHMIS MSDS.

- .3 Before commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Departmental Representative.
- .4 Environmental Protection Plan must include comprehensive overview of known or potential environmental issues to be addressed during construction.
- .5 Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .6 Include in Environmental Protection Plan:
 - .1 Name[s] of person[s] responsible for ensuring adherence to Environmental Protection Plan.
 - .2 Name[s] and qualifications of person[s] responsible for manifesting hazardous waste to be removed from site.
 - .3 Name[s] and qualifications of person[s] responsible for training site personnel.
 - .4 Descriptions of environmental protection personnel training program.
 - .5 Erosion and sediment control plan identifying type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.
 - .6 Drawings indicating locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.
 - .7 Traffic Control Plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather.
 - .1 Plans to include measures to minimize amount of material transported onto paved public roads by vehicles or runoff.
 - .8 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use.
 - .1 Plan to include measures for marking limits of use areas and methods for protection of features to be preserved within authorized work areas.
 - .9 Spill Control Plan to include procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
 - .10 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.
 - .11 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, are contained on project site.
 - .12 Contaminant Prevention Plan identifying potentially hazardous substances to be used on job site; intended actions to prevent introduction of such materials into air, water, or ground; and detailing provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.
 - .13 Waste Water Management Plan identifying methods and procedures for management or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.

- .14 Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.
- .15 Pesticide treatment plan to be included and updated, as required.

1.05 FIRES

- .1 Fires and burning of rubbish on site is not permitted.
- .2 Where fires or burning is permitted, prevent staining or smoke damage to structures, materials or vegetation which is to be preserved.
 - .1 Restore, clean and return to new condition stained or damaged work.
- .3 Provide supervision, attendance and fire protection measures as directed.

1.06 DRAINAGE

- .1 Develop and submit erosion and Sediment Control Plan (ESC) identifying type and location of erosion and sediment controls provided. Plan to include monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.
- .2 Storm Water Pollution Prevention Plan (SWPPP) to be substituted for erosion and sediment control plan.
- .3 Provide temporary drainage and pumping required to keep excavations and site free from water.
- .4 Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials.
- .5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.07 SITE CLEARING AND PLANT PROTECTION

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

1.08 WORK ADJACENT TO WATERWAYS

- .1 Construction equipment to be operated on land only.

- .2 Use waterway beds for borrow material only after written receipt of approval from Departmental Representative.
- .3 Waterways to be kept free of excavated fill, waste material and debris.
- .4 Design and construct temporary crossings to minimize erosion to waterways.
- .5 Do not skid logs or construction materials across waterways.
- .6 Avoid indicated spawning beds when constructing temporary crossings of waterways.

1.09 POLLUTION CONTROL

- .1 Maintain temporary erosion and pollution control features installed under this Contract.
- .2 Control emissions from equipment and plant in accordance with local authorities' emission requirements.
- .3 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area.
 - .1 Provide temporary enclosures where directed by Departmental Representative.
- .4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.10 HISTORICAL/ ARCHAEOLOGICAL CONTROL

- .1 The project is located in a National Historic Site of Canada, therefore, it is essential all existing features remain as found. Consequently, standards for environmental protection and for visual aesthetics of final product shall be of a quality standard. Contact limits shall be strictly adhered to and Contractor is to take special care to minimize damage and disruption and protect existing features. The Departmental Representative is to be notified immediately if any historic or natural resources are located during construction.
- .2 The intent is to only create minor disturbance to the surrounding historical grounds which would not significantly disturb the grounds below the grass and root system (75 mm) except in designated areas where excavation is required.
- .3 Buried artifacts, the remains and evidence of ancient persons and peoples, and any objects of historic value and worth, remain the property of the Crown. Any and all such objects shall be protected and immediately brought to the knowledge of the Departmental Representative or Designate.
- .4 Archeologist/Cultural Resource Staff will be on site to monitor work to ensure no archeology resources are damaged. Advise Departmental Representative or Designate and receive direction regarding protecting such resources should any be discovered by either archaeology or the contractor. The contractor could be directed to stop work on the area and redirect work elsewhere until the issue is resolved to the satisfaction of the Departmental Representative

or Designate.

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

1.11 NOTIFICATION

- .1 While the responsibility remains with the contractor the Departmental Representative will endeavor to notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.
- .2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.
 - .1 Take action only after receipt of written approval by Departmental Representative.
- .3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.
- .4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
 - .1 Leave Work area clean at end of each day.
- .2 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.
- .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .5 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

1 GENERAL

1.01 REFERENCES AND CODES

- .1 Perform Work in accordance with National Building Code of Canada (NBC) 2014, National Fire Code of Canada (NFC) 2010 and Ontario Building Code (OBC) 2012, including all amendments up to bid closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply as directed by the Departmental Representative.
- .2 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.
 - .3 Standards and Guidelines for Conservation of Historic Places in Canada 2nd Edition.

1.02 HAZARDOUS MATERIAL DISCOVERY

- .1 Stop work immediately and notify Departmental Representative if materials which may contain designated substances or PCB's, other than those identified in Section 01 11 01, 01 35 43, or as described in the designated substances report are discovered in course of work.

1.03 BUILDING SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions which indicate that no smoking what so ever is to occur in or near the buildings.

1.04 NATIONAL PARKS ACT

- .1 For projects located within boundaries of National Park, perform Work in accordance with National Parks Act.

1.05 RELICS AND ANTIQUITIES

- .1 Buried artifacts, the remains and evidence of ancient persons and peoples, and any objects of historic value and worth remain the property of the Crown. Any and all such objects shall be protected and immediately brought to the knowledge of the Site Representative or Designate.

1.06 IAQ - INDOOR AIR QUALITY

- .1 Comply with CSA-Z204-94(R1999), Guideline for Managing Indoor Air Quality in Office Buildings and CSA B651-12 during final stages of project.

1.07 TAXES

- .1 Pay applicable Federal, Provincial and Municipal taxes.

1.08 EXAMINATION

- .1 Examine existing conditions and determine conditions affecting work prior to the submitting tender.

2 PRODUCTS

2.01 NOT USED

.1 Not Used.

3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 ABBREVIATIONS AND ACRONYMS

- .1 The abbreviations and acronyms are commonly found in the Project Manual and represent the associated organizations or terms. While other terms may be used the following shall have the listed meanings unless it is obvious and consistent they have been used for other purposes.

1.02 MATERIALS, EQUIPMENT AND METHODS

- .1 A:
.1 AB: anchor bolt.
.2 AC: acoustic.
.3 AC PAN: acoustic panel.
.4 ACU: acoustic unit ceiling.
.5 AFF: above finished floor.
.6 AC PLAS: acoustic plaster.
.7 ACT: acoustic tile.
.8 ACR CU LVR: acrylic cube louvre.
.9 ADH: adhesive.
.10 ADJ: adjustable.
.11 A/C: air conditioner.
.12 AHU: air handling unit.
.13 AL: aluminum.
.14 ANOD: anodized.
.15 APPROX: approximate.
.16 ARCH: architecture.
.17 ARCH BLK: architectural block.
.18 AVB: air vapour barrier.
- .2 B:
.1 B: base.
.2 BEAST: benthic assessment of sediment.
.3 BH: bore hole.
.4 BHP: brake horse power.
.5 BL: bottom layer.
.6 BLK: block.
.7 BLKD: bulkhead.
.8 BM: beam.
.9 BOT: bottom.
.10 BMP: best management practice.
.11 B PL: base plate.
.12 BRG: bearing.
.13 BRK: brick.
.14 BSMT: basement.
.15 BTEX: benzene, toluene, ethylbenzene and xylenes.
.16 BUR: built-up roof.
- .3 C:
.1 CAL: caliper.
.2 CANTIL: cantilever.
.3 CB: catch basin.
.4 CC: centre to centre.

- .5 CCN: contemplated change notice.
 - .6 CDF: controlled density fill.
 - .7 CEC: Canadian Electrical Code.
 - .8 CF: chair fabric.
 - .9 CHAN: channel.
 - .10 CHS: Canadian hydrographic service.
 - .11 CJ: construction joint.
 - .12 CL: centreline.
 - .13 CK: cork.
 - .14 CLG: ceiling.
 - .15 CLR: clear.
 - .16 COL: column.
 - .17 CONC: concrete.
 - .18 CONC BLK: concrete block.
 - .19 CONC BRK: concrete brick.
 - .20 CONT: continuous.
 - .21 CONT J: control joint.
 - .22 COMPL: complete.
 - .23 CM: centimetre. (Nursery stock).
 - .24 CP: circulating pump.
 - .25 CPL: cement plaster.
 - .26 CPM: critical path method.
 - .27 CPT: carpet.
 - .28 CPTT: carpet tile.
 - .29 CT: ceramic tile.
 - .30 CTE: connect to existing.
 - .31 CV: control valve.
 - .32 CVT: conductive vinyl tile.
 - .33 C/W: complete with.
- .4 D:
- .1 D: deep.
 - .2 dB: decibels.
 - .3 DB: dry-bulb.
 - .4 DD: dutch door.
 - .5 DEG: degree.
 - .6 DF: drinking fountain.
 - .7 DIA: diameter.
 - .8 DIM: dimension.
 - .9 DL: dead load.
 - .10 DMNT: demountable.
 - .11 DP: dampproofing.
 - .12 DR: door.
 - .13 DRP: drapery.
 - .14 DWL: dowel.
- .5 E:
- .1 EA: each.
 - .2 EC: epoxy coating.
 - .3 ECF: engineered containment facility.
 - .4 EE: each end.
 - .5 EF: each face (architectural/structural).
 - .6 EF: exhaust fan (mechanical/electrical).
 - .7 EL: elevation.
 - .8 ELEC: electric.
 - .9 ELEV: elevator.

- .10 EM: expanded metal.
 - .11 ENCL: enclosure.
 - .12 EQ: equal.
 - .13 ET: expansion tank.
 - .14 EXH: exhaust.
 - .15 EXIST: existing.
 - .16 EXPJ: expansion joint.
 - .17 EXP STRUCT: exposed structure.
 - .18 EXT: exterior.
 - .19 EW: each way.
 - .20 EWT: entering water temperature.
- .6 F:
- .1 FC: fuel contributed.
 - .2 FD: floor drain.
 - .3 FDN: foundation.
 - .4 FEAT W: feature wall.
 - .5 FEXT: fire extinguisher.
 - .6 FH: fire hose.
 - .7 FHC: fire hose cabinet.
 - .8 FHR: fire hose rack.
 - .9 FIN: finish.
 - .10 FIP: federal identity program.
 - .11 FL: floor.
 - .12 FLD: field.
 - .13 FLUOR: fluorescent.
 - .14 FR: frame.
 - .15 FRR: fire resistance rating.
 - .16 FTG: footing.
- .7 G:
- .1 GALV: galvanized steel.
 - .2 GB: grab bar.
 - .3 GBD: gypsum board.
 - .4 GC: General Conditions.
 - .5 GF: ground floor.
 - .6 GFCI: ground fault circuit interrupter.
 - .7 GL: glass or glazing.
 - .8 GL BLK: glass block.
 - .9 GPC: gypsum plaster ceiling.
 - .10 GPW: gypsum plaster wall.
 - .11 GT: glass tile.
- .8 H:
- .1 HB: hose bib.
 - .2 HC: hollow core.
 - .3 HCWD: hollow core wood door.
 - .4 HD: hand dryer.
 - .5 HDW: hardware.
 - .6 HDWD: hardwood.
 - .7 HEX: heat exchanger.
 - .8 HM: hollow metal.
 - .9 HOR: horizontal.
 - .10 HOR EF: horizontal each face.
 - .11 HP: hydro pole.
 - .12 HPA: Hamilton Port Authority.

- .13 HR: hour.
- .14 HRV: heat recovery ventilator.
- .15 HT: height.
- .16 HTR: heater.
- .17 HUM: humidifier.
- .18 HWT: hot water tank.
- .19 HYD: hydrant.
- .20 HZ: Hertz frequency, cycles per second.

- .9 I:
 - .1 ICF: insulated concrete formwork.
 - .2 ID: inside diameter.
 - .3 INS: insulation.
 - .4 INTLK: interlock.

- .10 J:
 - .1 JT: joint.

- .11 K:
 - .1 KPL: kick plate.

- .12 L:
 - .1 LAT: leaving air temperature.
 - .2 LAV: lavatory.
 - .3 LDG: landing.
 - .4 LG: long.
 - .5 LINO: linoleum.
 - .6 LL: live load.
 - .7 LT: light.
 - .8 LWT: leaving water temperature.

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

- .14 N:
 - .1 NBC: national building code.
 - .2 NC: normally closed.
 - .3 NF: near face.

- .4 NFC: national fire code.
- .5 NIC: not in contract.
- .6 NO: number.
- .7 NRC: noise reduction coefficient.
- .8 NRP: non removable pin.
- .9 NTS: not to scale.

- .15 O:
 - .1 OA: outside air.
 - .2 OBC: Ontario building code.
 - .3 OC: on centre.
 - .4 OD: outside diameter.
 - .5 OPNG: opening.
 - .6 OPR: operator.
 - .7 OVHD: overhead.
 - .8 OWSJ: open web steel joist.

- .16 P:
 - .1 P: prefinished.
 - .2 PAH: polynuclear aromatic hydrocarbons.
 - .3 PARG: parging.
 - .4 PCC: precast concrete.
 - .5 PCT: porcelain ceramic tile.
 - .6 PED ACS FLG: pedestal access flooring.
 - .7 PF: panel fabric.
 - .8 PH: phase.
 - .9 PL: plate.
 - .10 PLAM: plastic laminate.
 - .11 PLAS: plaster.
 - .12 PLYWD: plywood.
 - .13 PR: pair.
 - .14 PREFAB: prefabricated.
 - .15 PREFIN: prefinished.
 - .16 PRESS: pressure.
 - .17 PRFL: profile.
 - .18 PRV: pressure regulating valve.
 - .19 PT: paint.
 - .20 PTD: paper towel dispenser.
 - .21 PTN: partition.
 - .22 PVC: polyvinyl chloride.

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

- .18 R:
 - .1 R: radius.
 - .2 RA: return air.
 - .3 RAD: return air damper.
 - .4 RB: resilient base.
 - .5 RC: reinforced concrete.
 - .6 RCPT: receptacle.
 - .7 RD: roof drain.
 - .8 REINF: reinforced/reinforcing.
 - .9 REQD: required.

- .10 REQT: requirement.
 - .11 RFT: rubber floor tile.
 - .12 RM: room.
 - .13 RO: rough opening.
 - .14 RP: radiant panel.
 - .15 RRS: recycled rubber sheet.
 - .16 RRT: recycled rubber tile.
 - .17 RSD: rolling steel door.
 - .18 RSF: rubber sheet flooring.
 - .19 RT: rubber tile.
 - .20 RTU: roof top unit.
 - .21 RWL: rain water leader.
- .19 S:
- .1 SA: supply air.
 - .2 SAN SEW: sanitary sewer.
 - .3 SCHED: schedule.
 - .4 SC: solid core.
 - .5 SCRN: screen.
 - .6 SCWD: solid core wood door.
 - .7 SD: smoke developed.
 - .8 SDT: static dissipative tile.
 - .9 SECT: section.
 - .10 SH: sill height.
 - .11 SIM: similar.
 - .12 SL: sliding.
 - .13 SLR: sealer.
 - .14 SPEC: specification.
 - .15 SS: stainless steel.
 - .16 STD: standard.
 - .17 STL: steel.
 - .18 STL BM: steel beam.
 - .19 STC: sound transmission class.
 - .20 STL FL DK: steel floor deck.
 - .21 STL PL: steel plate.
 - .22 STN: stone.
 - .23 STR: structure or structural.
 - .24 ST SEW: storm sewer.
 - .25 S&U: stain and urethane.
 - .26 S&V: stain and varnish.
 - .27 SVT: solid vinyl tile.
- .20 T:
- .1 T: top.
 - .2 T&B: top and bottom.
 - .3 TCB: turbidity control plan.
 - .4 TEL: telephone.
 - .5 TER: terrazzo.
 - .6 TERT: terrazzo tile.
 - .7 THKNS: thickness.
 - .8 THR: threshold.
 - .9 TMPD: tempered.
 - .10 TOPG: topping.
 - .11 TRANSV: transverse.
 - .12 TYP: typical.

- .21 U:
.1 U: urethane.
.2 U/C: undercut.
.3 UGRD: underground.
.4 UNO: unless noted otherwise.
.5 UOS: unless otherwise specified.
.6 U/S: underside.
.7 UR: urinal.
- .22 V:
.1 V: volt.
.2 VCF: vinyl coated fabric.
.3 VCT: vinyl composition tile.
.4 VEL: velocity.
.5 VERT: vertical.
.6 VERT B: vertical blinds.
.7 VERT EF: vertical each face.
.8 VSF: vinyl sheet flooring.
.9 VPT: vinyl plank flooring.
.10 VT: vinyl tile.
.11 VWC: vinyl wall covering.
- .23 W:
.1 WB: wet-bulb.
.2 WC: water closet.
.3 W-C: wall connectors.
.4 WD: wood.
.5 WDV: wood veneer.
.6 WG: water gauge.
.7 WH: wall hydrant.
.8 WHMIS: workplace hazardous materials information system.
.9 WP: waterproofing.
.10 WR: washroom.
.11 WSIB: workplace safety and insurance board.
.12 WT: weight.
.13 WTP: water treatment plant.

1.03 STANDARDS ORGANIZATIONS

- .1 Standards writing organizations:
.1 AA - Aluminum Association.
.2 ACPA - American Concrete Pipe Association.
.3 ANSI - American National Standards Institute.
.4 ASHRAE - American Society of Heating and Refrigerating and Air-Conditioning Engineers.
.5 ASTM - American Society for Testing and Materials.
.6 AWI/AWMAC - Architectural Woodwork Institute/Architectural Woodwork Manufacturers Association of Canada.
.7 AWPA - American Wood Preservers' Association.
.8 AWWA - American Water Works Association.
.9 BHMA - Builders Hardware Manufacturers Association.
.10 CCDC - Canadian Construction Documents Committee.
.11 CCMPA - Canadian Concrete Masonry Producers Association.
.12 CGSB - Canadian General Standards Board.
.13 CNTA - Canadian Nursery Trades Association.
.14 CPCA - Canadian Painting Contractors Association.
.15 CRCA - Canadian Roofing Contractors Association.

- .16 CSA - Canadian Standards Association.
- .17 CSC - Construction Specifications Canada.
- .18 CSDMA - Canadian Steel Door Manufacturers Association.
- .19 CSI - Construction Specifications Institute.
- .20 CSSBI - Canadian Sheet Steel Building Institute.
- .21 CRCA - Canadian Roofing Contractors Association.
- .22 DHI - Door and Hardware Insitute.
- .23 EEMAC - Electrical and Electronic Manufacturer's Association of Canada.
- .24 ESA - Electrical Safety Authority.
- .25 FCC - Fire Commissioner of Canada.
- .26 FSC - Forest Stewardship Council.
- .27 GANA - Glass Association of North America.
- .28 HMMA - Hollow Metal Manufacturers Association.
- .29 IEEE - Institute of Electrical and Electronics Engineers Inc.
- .30 ISO - International Organization for Standardization.
- .31 IWFA - International Window Film Association.
- .32 LEED - LEED Canada, Leadership in Energy and Environmental Design.
- .33 MPI - Master Painters Insitute.
- .34 NAAMM - National Association of Architectural Metal Manufacturers.
- .35 NCPI - National Clay Pipe Institute.
- .36 NEMA - National Electrical Manufacturers Association.
- .37 NFPA - National Fire Protection Association.
- .38 OPSD - Ontario Provincial Standard Drawings.
- .39 OPSS - Ontario Provincial Standard Specifications.
- .40 PPI - Plasctics Pipe Institute.
- .41 SDI - Steel Door Intitute.
- .42 SCAQMD - South Coast Air Quality Management District.
- .43 TIA - Telecommunications Industry Association.
- .44 TIAC - Thermal Insulation Association of Canada.
- .45 TTMAC - Terrazzo Tile and Marble Association of Canada.
- .46 UL - Underwriters Laboratories.
- .47 ULC - Underwriters Laboratories of Canada.
- .48 US EPA - United States Environmental Protection Agency.
- .49 WH - Warnock Hersey.

1.04 FEDERAL GOVERNMENT DEPART- MENTS AND AGENGIES

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

1.05 PROVINCIAL GOVERNMENT DEPART- MENTS AND AGENGIES

- .1 MOEE - Ontario Ministry of Environment and Energy.

- .2 MOL - Ontario Ministry of Labour.
- .3 MTO and MOT - Ontario Ministry of Transportation.
- .4 TSSA - Technical Standards and Safety Authority.

1.06 INTERNATIONAL GOVERNMENT DEPART- MENTS AND AGENCIES

- .1 DOHMH - New York City Department of Health and Mental Hygiene, USA.
- .2 GSA - Government Services Administration, USA.

1.07 UNITS OF MEASURE METRIC

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

1.08 UNITS OF MEASURE IMPERIAL

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

1.09 LEED TERMS

- .1 Acronyms specific to LEED:
 - .1 CI: commercial interiors.
 - .2 EQ: environmental quality.
 - .3 MR: material and resources.
 - .4 NC: new construction.

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 NOT USED

- .1 Not Used.

END OF SECTION

1 GENERAL

1.01 SECTION INCLUDES

- .1 Inspection and testing, administrative and enforcement requirements.
- .2 Test and mix designs.
- .3 Mock-ups.
- .4 Mill tests.
- .5 Equipment and system adjust and balance.

1.02 INSPECTION

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

1.03 INDEPENDENT INSPECTION AGENCIES

- .1 Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Departmental Representative.
- .2 Provide equipment required for executing inspection and testing by appointed agencies.
- .3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents and for the contractor's own quality control.
- .4 Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and re-inspection.

1.04 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.

1.05 PROCEDURES

- .1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in 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.

1.06 REJECTED WORK

- .1 Remove defective work, whether result of poor workmanship, use of defective products or damage and whether incorporated in work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly. Have skilled subtrades complete repairs to work that was originally completed by these subtrades.
- .3 If in opinion of Departmental Representative 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 Departmental Representative.

1.07 REPORTS

- .1 Submit 4 copies of inspection and test reports to Departmental Representative.
- .2 Provide copies to subcontractor of work being inspected or tested manufacturer or fabricator of material being inspected or tested.

1.08 TESTS AND MIX DESIGNS

- .1 Furnish concrete test results and performance certification for mix designs as may be requested.
- .2 The cost of tests and mix designs beyond the first and those called for in Contract Documents or beyond those required by law of Place of Work shall be appraised by Departmental Representative and may be authorized as recoverable.

1.9 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 Departmental Representative as specified in specific Section.
- .3 Prepare mock-ups for Departmental Representative 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 Remove mock-up at conclusion of Work or when acceptable to Departmental Representative.

1.10 MILL TESTS

- .1 Submit mill test certificates for all steel. Mill certificate dates shall reasonably match the dates that steel is supplied as well as illustrating that the steel meets the requirements of the Specification.

1.11 EQUIPMENT AND SYSTEMS

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

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 NOT USED

- .1 Not Used.

3.01 NOT USED

- .1 Not Used.

END OF SECTION

1 GENERAL

1.01 SECTION INCLUDES

- .1 Temporary utilities.

1.02 RELATED SECTIONS

- .1 Section 01 52 00 - Construction Facilities.
- .2 Section 01 56 00 - Temporary Barriers and Enclosures.

1.03 REFERENCES

- .1 Canadian Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0-December 2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System For New Construction and Major Renovations.
- .2 U.S. Environmental Protection Agency (EPA) / Office of Water
 - .1 EPA 833-R-06-004, May 2007, Developing Your Stormwater Pollution Prevention Plan - A Guide for Construction Sites.

1.04 SUBMITTALS

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

1.05 INSTALLATION AND REMOVAL

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

1.06 DEWATERING

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

1.07 WATER SUPPLY

- .1 Provide a continuous supply of potable water for construction use. Provide all modifications and connections to allow use.
- .2 Arrange for connection with appropriate utility company and pay all costs for installation, maintenance and removal.

1.08 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 type. Salamanders or open flames are not permitted.

- .3 Provide temporary heat and ventilation in enclosed areas as required to:
 - .1 Facilitate progress of Work.
 - .2 Protect Work and products against dampness and cold.
 - .3 Prevent moisture condensation on surfaces.
 - .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
 - .5 Provide adequate ventilation to meet health regulations for safe working environment.
- .4 Maintain temperatures of minimum 10°C in areas where construction is in progress.
- .5 Ventilating:
 - .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
 - .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
 - .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
 - .4 Ventilate storage spaces containing hazardous or volatile materials.
 - .5 Ventilate temporary sanitary facilities.
 - .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
- .6 Permanent heating system of building, may be used when available and construction has progressed where damage or overload is unlikely. Be responsible for damage to heating system if use is permitted.
- .7 On completion of Work for which permanent heating system is used, replace filters and clean system such that it is in like new condition.
- .8 Ensure Date of Substantial Performance and Warranties for heating system do not commence until entire system is in as near original condition as possible and is certified by Departmental Representative.
- .9 Pay costs for maintaining temporary heat and heating during construction.
- .10 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
 - .1 Conform with applicable codes and standards.
 - .2 Enforce safe practices and fire control.
 - .3 Prevent abuse of services.
 - .4 Prevent damage to finishes.
 - .5 Vent direct-fired combustion units to outside.
- .11 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.09 TEMPORARY POWER AND LIGHT

- .1 Provide and pay for temporary power during construction for temporary lighting and operating of power tools.
- .2 Arrange for connection with appropriate utility company. Pay all costs for installation, maintenance and removal.
- .3 Temporary power for electric cranes and other equipment is responsibility

of Contractor.

- .4 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx.
- .5 The existing building power is available and will be provided for construction use at current cost rates. Connect to existing power supply in accordance with Canadian Electrical Code.
- .6 Electrical power and lighting systems installed under this Contract may be used for construction requirements only with prior approval of Departmental Representative provided that guarantees are not affected. Make good damage to electrical system caused by use under this Contract. Replace lamps which have been used for more than 3 months.

1.10 FIRE PROTECTION

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and bylaws as well as the fire protection plan.
- .2 Burning rubbish and construction waste materials is not permitted on site.

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 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

1 GENERAL

1.01 SECTION INCLUDES

- .1 Construction aids.
- .2 Office and sheds.
- .3 Parking.
- .4 Project identification.

1.02 REFERENCES

- .1 Canadian Green Building Council (CaGBC)
 - .1 LEED Canada For New Construction and Major Renovations 2009.
 - .2 LEED Canada For Core and Shell 2009.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.189-2000, Exterior Alkyd Primer for Wood.
 - .2 CAN/CGSB-1.59-97, Alkyd Exterior Gloss Enamel.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CSA 0121-08(R2013), Douglas Fir Plywood.
 - .3 CSA Z797-09(R2014), Code of practice for Access Scaffold.
 - .4 CAN/CSA-Z321-96(R2006), Signs and Symbols for the Occupational Environment, withdrawn but still available from CSA, CCOHS and Techstreet.
- .4 U.S. Environmental Protection Agency (EPA)/ Office of Water
 - .1 EPA 833-R-06-004, May 2007, Developing Your Stormwater Pollution Prevention Plan - A Guide for Construction Sites.

1.03 SUBMITTALS

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

1.04 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.

1.05 SCAFFOLDING

- .1 Scaffolding in accordance with CSA Z797.
- .2 Provide and maintain all means of access.

1.06 HOISTING

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

1.07 SITE STORAGE/LOADING

- .1 Confine work and operations of employees to areas defined by Contract Documents. Do not unreasonably encumber premises with products.
- .2 Do not load or permit to load any part of Work with a weight or force that will endanger the Work or existing structure.

1.08 CONSTRUCTION PARKING

- .1 Parking will not be permitted directly on site a limited amount of parking is available in the adjacent lot and limited access will be allowed for work vehicles adjacent to the building site for deliveries. Repairs and cleaning of any areas used for parking will be required. Any vehicles leaking fluids will not be allowed on site.
- .2 Provide and maintain adequate access to project site.
- .3 Build and maintain temporary roads where indicated or directed by Departmental Representative and provide snow removal during period of Work.
- .4 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractors' use of roads.

1.09 SECURITY

- .1 Pay for responsible security personnel to guard site and contents of site after working hours and during holidays if left exposed and not secured.

1.10 OFFICES

- .1 Provide office heated to 22°C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table. Office can be located within the work area if it can be provided without slowing or affecting work.
- .2 Provide a clearly marked and fully stocked first-aid case in a readily available location.
- .3 Subcontractors may provide their own offices as necessary. Direct location of these offices.

1.11 EQUIPMENT, TOOL AND MATERIALS STORAGE

- .1 Provide and maintain, in a clean and orderly condition, lockable weatherproof shed or box for storage of tools, equipment and materials.
- .2 Locate materials not required to be stored in weatherproof sheds on site in a manner to cause least interference with work activities.

1.12 SANITARY FACILITIES

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition.
- .3 When permanent water and drain connections are completed, provide temporary water closets and urinals complete with temporary enclosures, inside building. Permanent facilities may be used on approval of Departmental Representative.

1.14 CONSTRUCTION SIGNAGE

- .1 Signs and notices for safety and instruction shall be in both official languages. Graphic symbols shall conform to CAN/CSA-Z321.
- .2 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or earlier if directed by Departmental Representative.

1.15 PROTECTION AND MAINTENANCE OF TRAFFIC

- .1 Provide access and temporary relocated roads as necessary to maintain traffic.
- .2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative. Do not prevent access to adjacent buildings and properties.
- .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 Haul roads: constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided. Any haulage road requires that geotextile be placed under the entire length prior to placement of granular fill such that upon removal no fill is incorporated into or below

the level of the grass.

- .8 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
- .9 Dust control: adequate to ensure safe operation at all times.
- .10 Location, grade, width, and alignment of construction and hauling roads: subject to approval by Departmental Representative.
- .11 Lighting: to assure full and clear visibility for full width of haul road and work areas during night work operations.
- .12 Provide snow removal during period of Work.

1.16 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.

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 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

1 GENERAL

1.01 SECTION INCLUDES

- .1 Barriers.
- .2 Environmental Controls.
- .3 Traffic Controls.
- .4 Fire Routes.

1.02 RELATED SECTIONS

- .1 Section 01 51 00 - Temporary Utilities.
- .2 Section 01 52 00 - Construction Facilities.

1.03 REFERENCES

- .1 Canadian General Standards Board (CGSB):
 - .1 CAN/CGSB-1.189-2000, Exterior Alkyd Primer for Wood.
 - .2 CAN/CGSB-1.59-97, Alkyd Exterior Gloss Enamel.
- .2 Canadian Standards Association (CSA):
 - .1 CSA O121-08(R2013), Douglas Fir Plywood.

1.04 INSTALLATION AND REMOVAL

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

1.05 HOARDING

- .1 Erect temporary site enclosures using 38 x 89 mm construction grade lumber framing at 600 mm o.c. and 1200 x 2400 x 13 mm exterior grade fir plywood to CSA O121 at doorways stairways and access points.
- .2 Apply plywood panels vertically flush and butt jointed.
- .3 Provide at least two lockable entrance gates as directed. Equip gates with locks and keys.
- .4 Erect and maintain pedestrian walkways.
- .5 Paint public side of site enclosure in selected colours with one coat primer to CAN/CGSB-1.189 and one coat exterior paint to CAN/CGSB-1.59. Maintain public side of enclosure in clean condition.
- .6 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.
- .7 Erect temporary site enclosure using modular freestanding fencing:

galvanized, minimum 1.8 m high, chain link or welded steel mesh, pipe rail. 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. Maintain fence in good repair.

1.06 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.

1.07 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.

1.08 DUST TIGHT SCREENS

- .1 Provide dust tight screens or 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.

1.09 ACCESS TO SITE

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

1.10 PUBLIC TRAFFIC FLOW

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

1.11 FIRE ROUTES

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

1.12 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.

1.13 PROTECTION OF BUILDING FINISHES

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

- .2 Provide necessary screens, covers, and hoardings.
- .3 Confirm with Departmental Representative locations and installation schedule 3 days prior to installation.
- .4 Be responsible for damage incurred due to lack of or improper protection.

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 NOT USED

- .1 Not Used.

END OF SECTION

1 GENERAL

1.01 SECTION INCLUDES

- .1 Product quality, availability, storage, handling, protection, and transportation.
- .2 Manufacturer's instructions.
- .3 Quality of Work, coordination and fastenings.
- .4 Existing facilities.

1.02 RELATED SECTIONS

- .1 Section 01 45 00 - Quality Control.

1.03 REFERENCES

- .1 Within text of specifications, reference may be made to reference standards.
- .2 Conform to these standards, in whole or in part as specifically requested in specifications.
- .3 If there is question as to whether any product or system is in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .4 The cost for such testing will be born by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.
- .5 Conform to latest date of issue of referenced standards in effect on date of submission of Bids, except where specific date or issue is specifically noted.
- .6 OPSS Ontario Provincial Standard Specifications and OPSD Ontario Provincial Standard Drawings quoted in these specifications are available online at <http://www.raqsa.mto.gov.on.ca/techpubs/ops.nsf/OPSHomepage>.

1.04 QUALITY

- .1 Products, materials, equipment and articles (referred to as products throughout specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of Products provided.
- .2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

- .3 Should any dispute arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
- .4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.05 AVAILABILITY

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, notify Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
- .2 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.06 METRIC SIZED MATERIALS

- .1 SI metric units of measurement are used exclusively on the drawings and in the specifications for this project.
- .2 The Contractor is required to provide metric products in the sizes called for in the Contract Documents except where a valid claim can be made that a particular product is not available on the Canadian market.
- .3 Claims for exemptions from use of metric sized products shall be in writing and fully substantiated with supportive documentation. Promptly submit application to Departmental Representative for consideration and ruling. Non-metric sized products may not be used unless Contractor's application has been approved in writing by the Departmental Representative.
- .4 Difficulties caused by the Contractor's lack of planning and effort to obtain modular metric sized products which are available on the Canadian market will not be considered sufficient reasons for claiming that they cannot be provided.
- .5 Claims for additional costs due to provision of specified modular metric sized products will not be considered.

1.07 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 timber beams on flat, solid supports and keep clear of ground. Slope to shed moisture.
 - .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
 - .8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.
 - .9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Touch ups that are visible and do not match the surface being repaired will be rejected. Use touch-up materials to match original. Do not paint over name plates.

1.08 TRANSPORTATION

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

1.09 MANUFACTURER'S INSTRUCTIONS

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

1.10 QUALITY OF WORK

- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.

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

1.11 CO-ORDINATION

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

1.12 CONCEALMENT

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

1.13 REMEDIAL WORK

- .1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Coordinate adjacent affected Work as required.
- .2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.14 LOCATION OF FIXTURES

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

1.15 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.

1.16 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.316 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.

1.17 PROTECTION OF WORK IN PROGRESS

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

1.18 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 existing.
- .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.

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 NOT USED

- .1 Not Used.

END OF SECTION

1 GENERAL

1.01 SECTION INCLUDES

- .1 Field engineering survey services to measure and stake site.
- .2 Survey services to establish inverts for Work.
- .3 Recording of subsurface conditions found.

1.02 REFERENCES

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

1.03 QUALIFICATIONS OF SURVEYOR

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

1.04 SURVEY REFERENCE POINTS

- .1 Existing base horizontal and vertical control points will be provided and will be designated on drawings.
- .2 Locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction.
- .3 Make no changes or relocations without prior written notice to Departmental Representative.
- .4 Report to Departmental Representative when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
- .5 Require surveyor to replace control points in accordance with original survey control.

1.05 SURVEY REQUIREMENTS

- .1 Establish two permanent bench marks on site, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data in Project Record Documents.
- .2 Establish lines and levels, locate and lay out, by instrumentation.
- .3 Stake for grading related to sanitary sewer installation.
- .4 Stake slopes.
- .5 Establish pipe invert elevations.
- .6 Establish column locations and floor elevations.
- .8 Establish lines and levels for mechanical and electrical work.

1.06 EXISTING SERVICES

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

1.07 LOCATION OF EQUIPMENT AND FIXTURES

- .1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 Inform Departmental Representative of impending installation and obtain approval for actual location. Be particularly careful to highlight changes from proposed layout so that the departmental representative can review but in all cases do not cause a code compliance or fit issue when moving items.
- .4 Submit field drawings to indicate relative position of various services and equipment when required by Departmental Representative.

1.08 RECORDS

- .1 Maintain a complete, accurate log of control and survey work as it progresses.
- .2 On completion of sanitary sewer, prepare a certified survey showing dimensions, locations, angles and elevations of Work.
- .3 Record locations of maintained, re-routed and abandoned service lines.

1.09 SUBMITTALS

- .1 Submit name and address of Surveyor to Departmental Representative.
- .2 On request of Departmental Representative, submit documentation to verify accuracy of field engineering work.
- .3 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform and do not conform with Contract Documents.

1.10 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.

2 PRODUCTS

2.01 NOT USED

.1 Not Used.

3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00.
- .2 Submit written request in advance of cutting or alteration which affects:
 - .1 Historically Significant or Original Material
 - .2 Structural integrity of elements of project.
 - .3 Integrity of weather-exposed or moisture-resistant elements.
 - .4 Efficiency, maintenance, or safety of operational elements.
 - .5 Visual qualities of sight-exposed elements.
 - .6 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.

1.02 MATERIALS

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

1.03 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.

1.04 EXECUTION

- .1 Execute cutting, fitting, and patching to complete Work.
- .2 Fit several parts together, to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.

- .4 Remove and replace defective and non-conforming Work.
- .5 Remove samples of installed Work for testing if directed and required.
- .6 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .7 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .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 Submit proposed materials, finishes and installation method for patching to Departmental Representative for approval, prior to patching.
- .12 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .13 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .14 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material in accordance with Section 07 84 00, full thickness of the construction element.
- .15 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

1.05 WASTE MANAGEMENT AND DISPOSAL

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

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 NOT USED

- .1 Not Used.

END OF SECTION

1 GENERAL

1.01 SECTION INCLUDES

- .1 Progressive cleaning.
- .2 Final cleaning.

1.02 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Owner or other Contractors.
- .2 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .3 Clear snow and ice from access to building to allow work to proceed in an efficient manner. Do not pile snow against any building or stair.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide on-site containers for collection of waste materials and debris.
- .6 Provide and use clearly marked separate bins for recycling. Refer to Section 01 74 20.
- .7 Remove waste material and debris from site and deposit in waste container at end of each working day.
- .8 Dispose of waste materials and debris off site.
- .9 Clean interior areas prior to start of finish work, and maintain areas free of dust and other contaminants during finishing operations.
- .10 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .11 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .12 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .13 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.03 FINAL CLEANING

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

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

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

BUTLERS BARRACKS
TWO STOREY BUILDING
PROJECT 000803-30024201

CLEANING

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3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 CONSTRUCTION & DEMOLITION WASTE

- .1 Carefully deconstruct and source separate materials/equipment and divert, from D&C waste destined for landfill to maximum extent possible. Target for this project is 60% diversion from landfill. Reuse, recycle, compost, anaerobic digest or sell material for reuse except where indicated otherwise. On site sales are not permitted.
- .2 Source separate waste and maintain waste audits in accordance with the Environmental Protection Act, Ontario Regulation 102/94 and Ontario Regulation 103/94.
 - .1 Provide facilities for collection, handling and storage of source separated wastes.
 - .2 Source separate the following waste:
 - .1 Brick and portland cement concrete.
 - .2 Corrugated cardboard.
 - .3 Wood, not including painted or treated wood or laminated wood.
 - .4 Gypsum board, unpainted.
 - .5 Steel.
 - .6 Items indicated in Section 02 42 93, Deconstruction and Waste Products Workplan Summary.
- .3 Submit a waste reduction workplan indicating the materials and quantities of material that will be recycled and diverted from landfill.
 - .1 Indicate how material being removed from the site will be reused, recycled, composted or anaerobically digested using Section 02 42 93, Deconstruction and Waste Products Workplan Summary.
- .4 Submit proof that all waste is being disposed of at a licensed land fill site or waste transfer site. A copy of the disposal/waste transfer site's license and a letter verifying that said landfill site will accept the waste must be supplied to Departmental Representative prior to removal of waste from the demolition site.

1.02 WASTE PROCESSING SITES

- .1 Information regarding waste processing sites can be obtained from the following.
- .2 Province of: Ontario
 - .1 Ministry of Environment and Energy, 135 St. Clair Avenue West, Toronto, ON, M4V 1P5.
 - .2 Telephone: 800-565-4923 or 416-323-4321.
 - .3 Fax: 416-323-4682.
- .3 Recycling Council of Ontario: 215 Spadina Avenue, #225, Toronto, ON, M5T 2C7.
 - .1 Telephone: 416-657-2797.
 - .2 Fax: 416-960-8053.
 - .3 Email: rco@rco.on.ca.
 - .4 Internet: <http://www.rco.on.ca/>.

2 PRODUCTS

2.01 NOT USED

.1 Not Used.

3 EXECUTION

3.01 CANADIAN GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT

.1 Government Chief Responsibility for the Environment.

Province	Address	General	Fax	<u>Inquiries</u>
Ontario	Ministry of Environment and Energy 135 St Clair Avenue West Toronto, ON M4V 1P5	(416) 323-4321 (800) 565-4923	(416) 323-4682	
	Environment Canada Toronto, ON	(416) 734-4494		

END OF SECTION

1 GENERAL

1.01 INSPECTION AND DECLARATION

- .1 Contractor's Inspection: Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 - .1 Notify Departmental Representative in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
 - .2 Request Departmental Representative's Inspection.
- .2 Departmental Representative's Inspection: Departmental Representative and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor to correct Work accordingly.
- .3 Completion: submit written certificate that following have been performed:
 - .1 Work has been completed and inspected for compliance with Contract Documents.
 - .2 Defects have been corrected and deficiencies have been completed.
 - .3 Equipment and systems have been tested, adjusted and balanced and are fully operational.
 - .4 Certificates required by all authorities have been submitted.
 - .5 Operation of systems have been demonstrated to Owner's personnel.
 - .6 Work is complete and ready for final inspection.
- .4 Final Inspection: when items noted above are completed, request final inspection of Work by Departmental Representative and Contractor. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.

1.02 CLEANING

- .1 In accordance with Section 01 74 11.
- .2 Remove waste and surplus materials, rubbish and construction facilities from the site in accordance with Section 01 74 20.

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 NOT USED

- .1 Not Used.

END OF SECTION

1 GENERAL

1.01 SECTION INCLUDES

- .1 As-built, samples, and specifications.
- .2 Equipment and systems.
- .3 Product data, materials and finishes, and related information.
- .4 Operation and maintenance data.
- .5 Spare parts, special tools and maintenance materials.
- .6 Warranties and bonds.
- .7 Final site survey.

1.02 RELATED SECTIONS

- .1 Section 01 33 00 Submittals

1.03 SUBMISSION

- .1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .2 Copy will be returned after final inspection, with Departmental Representative's comments.
- .3 Revise content of documents as required prior to final submittal.
- .4 Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, four final copies of maintenance manuals and commissioning documentation in English.
- .5 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
- .6 If requested, furnish evidence as to type, source and quality of products provided.
- .7 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .8 Pay costs of transportation.

1.04 FORMAT

- .1 Organize data in the form of an instructional manual.
- .2 Binders: white vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.

- .3 When multiple binders are used for one complete copy, correlate data into related consistent groupings. Identify contents of each binder on spine.
- .4 Cover: Identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by system under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: Manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- .9 Provide 1:1 scaled CAD files in dwg format and additional set in PDF format. Forward pdf, and Autocad dwg files on USB compatible with Parks Canada encryption requirements or through email or alternate electronic file sharing service such as ftp, as directed by Departmental Representative.

1.05 CONTENTS - EACH VOLUME

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

1.06 AS-BUILTS AND SAMPLES

- .1 In addition to requirements in General Conditions, maintain at the site for Departmental Representative one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Amendments and addenda.
 - .4 Change Orders and other modifications to the Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Field test records.
 - .7 Inspection certificates.

- .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Departmental Representative.
- .6 Turn one set, paper copy and electronic copy, of AS-BUILT drawings and specifications over to Departmental Representative on completion of work. Submit files on USB compatible with PWGSC encryption requirements or through email or alternate electronic file sharing service such as ftp, as directed by Departmental Representative.
- .7 If project is completed without significant deviations from Contract drawings and specifications submit to Departmental Representative one set of drawings and specifications marked "AS-BUILT".

1.07 RECORDING ACTUAL SITE CONDITIONS

- .1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by Departmental Representative.
- .2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: legibly mark each item to record actual construction, including:
 - .1 Measured depths of elements of foundation in relation to finish first floor datum.
 - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .4 Field changes of dimension and detail.
 - .5 Changes made by change orders.
 - .6 Details not on original Contract Drawings.
 - .7 References to related shop drawings and modifications.
- .5 Specifications: legibly mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Amendments and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications

sections.

1.08 FINAL SURVEY

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

1.09 EQUIPMENT AND SYSTEMS

- .1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.
- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide Contractor's coordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports as specified in Section 01 45 00.
- .15 Additional requirements: As specified in individual specification sections.

1.10 MATERIALS AND FINISHES

- .1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture

designations. Provide information for re-ordering custom manufactured products.

- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture-protection and Weather-exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .4 Additional Requirements: as specified in individual specifications sections.

1.11 SPARE PARTS

- .1 Provide spare parts, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Deliver to site; place and store.
- .4 Receive and catalogue all items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

1.12 MAINTENANCE MATERIALS

- .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Deliver to site; place and store.
- .4 Receive and catalogue all items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

1.13 SPECIAL TOOLS

- .1 Provide special tools, in quantities specified in individual specification section.
- .2 Provide items with tags identifying their associated function and equipment.
- .3 Deliver to site; place and store.
- .4 Receive and catalogue all items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.

1.14 STORAGE, HANDLING AND PROTECTION

- .1 Store spare parts, maintenance materials, and special tools in manner to

prevent damage or deterioration.

- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paints and freezable materials in a heated and ventilated room.
- .5 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

1.15 WARRANTIES AND BONDS

- .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
- .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
- .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work.
- .4 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Certificate of Substantial Performance is determined.
- .5 Verify that documents are in proper form, contain full information, and are notarized.
- .6 Co-execute submittals when required.
- .7 Retain warranties and bonds until time specified for submittal.

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 NOT USED

- .1 Not Used.

END OF SECTION

1 GENERAL

1.01 SECTION INCLUDES

- .1 Procedures for demonstration and instruction of equipment and systems to Owner's O&M personnel.
- .2 O&M personnel includes property facility manager, building operators, maintenance staff, security staff and technical specialists, as applicable.

1.02 RELATED SECTIONS

- .1 Section 01 33 00 Submittals.

1.03 DESCRIPTION

- .1 Demonstrate operation and maintenance of equipment and systems to Departmental Representative's personnel prior to date of final inspection.
- .2 Departmental Representative will provide list of personnel to receive instructions, and will coordinate their attendance at agreed-upon times.

1.04 QUALITY CONTROL

- .1 When specified in individual Sections, require manufacturer to provide authorized representative to demonstrate operation of equipment and systems, instruct Owner's personnel, and provide written report that demonstration and instructions have been completed.
- .2 Submit training schedule of time and date for demonstration and training of each item of equipment and each system in accordance with the training plan four weeks prior to designated dates, for Departmental Representative's approval.
- .3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.
- .4 Report shall give time and date of each demonstration and training, with list of persons present.

1.05 CONDITIONS FOR DEMONSTRATIONS

- .1 Equipment has been inspected and put into operation.
- .2 Testing, adjusting, and balancing has been performed and equipment and systems are fully operational.
- .3 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.06 PREPARATION

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

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

1.07 DEMONSTRATION AND INSTRUCTIONS

- .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment.
- .2 Instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.
- .3 Review contents of manual in detail to explain all aspects of operation and maintenance.
- .4 Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instructions.

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 02 41 20 - Selective Interior Demolition.

1.2 REGULATORY REQUIREMENTS

- .1 Work shall meet or exceed the following regulatory requirements; comply with the Specifications; in cases of perceived conflict, the more stringent requirement applies.
 - .1 Ontario Building Code 2012 and Amendments.
 - .2 All Federal, Provincial, Regional and Municipal laws, regulations, ordinances and by-laws pertaining to the Work shall apply for the duration of the project.
 - .3 *Standards and Guidelines for Conservation of Historic Places in Canada*, 2nd Edition.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

- .1 Cutting and Patching Proposal: Submit a proposal in accordance with Division 01 General Requirements: Submittal Procedures, describing procedures at least 7 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
 - .1 Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
 - .2 Changes to Existing Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
 - .3 Products: List products to be used and firms or entities that will perform the Work.
 - .4 Dates: Indicate when cutting and patching will be performed.
 - .5 Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.

- .6 Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure to the Departmental Representative prior to making cuts or modifications.
- .7 Departmental Representative's Acceptance: Obtain acceptance of cutting and patching proposal before cutting and patching. Review and acceptance of cutting and patching proposal does not waive right to later require removal and replacement of unsatisfactory work.

1.5 QUALITY ASSURANCE

- .1 Structural Elements: Do not cut and patch structural elements in a manner that could change their load carrying capacity or load deflection ratio.
- .2 Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety, including the following:
 - .1 Primary operational systems and equipment.
 - .2 Air or smoke barriers.
 - .3 Fire protection systems.
 - .4 Control systems.
 - .5 Communication systems.
 - .6 Conveying systems.
 - .7 Electrical wiring systems.
- .3 Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety, including the following:
 - .1 Water, moisture, or vapour barriers.
 - .2 Membranes and lashings.
 - .3 Exterior wall construction.
 - .4 Equipment supports.
 - .5 Piping, ductwork, vessels, and equipment.
 - .6 Noise and vibration control elements and systems.

- .4 Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Departmental Representative's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner. If possible, retain original Installer or fabricator to cut and patch exposed Work listed below. If it is impossible to engage original Installer or fabricator, engage another recognized, experienced, and specialized firm.
- .5 Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- .6 Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

1.6 SITE CONDITIONS

- .1 Should material resembling spray or trowel applied asbestos or other designated substance listed as hazardous as defined by the Hazardous Materials Act be encountered, stop work in area affected, take preventative measures, notify Departmental Representative immediately, and await instructions. Proceed only after written instructions have been received from Departmental Representative.

Part 2 Products

2.1 MATERIALS

- .1 Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible:
 - .1 If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

Part 3 Execution

3.1 EXAMINATION

- .1 Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed:
 - .1 Perform non-destructive, non-ionizing radio frequency scanning or other approved scanning procedures to determine locations of services and reinforcing in concrete slabs and block walls before cutting and renovations. Advise Departmental Representative of findings before proceeding with Work and revise penetration locations as required and directed by Departmental Representative. Concrete slab thickness and construction is to be confirmed by Contractor prior to cutting or coring.
 - .2 Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - .3 Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 COORDINATION

- .1 Coordinate with other trades as required.
- .2 Coordinate work with requirements of Section 07 84 00 - Firestopping.

3.3 PREPARATION

- .1 Temporary Support: Provide temporary support of Work to be cut in accordance with Division 01 General Requirements: Temporary Barriers and Enclosures.
- .2 Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- .3 Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- .4 Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to minimize interruption of services to occupied areas.

3.4 PERFORMANCE

- .1 General: employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay:
 - .1 Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- .2 Cutting: cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations:
 - .1 In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - .2 Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - .3 Concrete or Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond core drill.

- .4 Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
- .5 Proceed with patching after construction operations requiring cutting are complete.
- .3 Patching: patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections:
 - .1 Inspection: where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 - .2 Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - .3 Floors and Walls: where walls or partitions that are removed extend from one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, colour, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform colour and appearance.
 - .1 Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 - .4 Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 - .5 Ceilings: patch, repair, or re-hang existing ceilings as necessary to provide an even plane surface of uniform appearance.
 - .6 Exterior Building Enclosure: patch components in a manner that restores enclosure to a weather tight condition.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Division 01 General Requirements: 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 Division 01 General Requirements: Cleaning.
- .3 Waste Management: Separate waste materials for reuse and recycling in accordance with Division 01 General Requirements: Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 02 07 50 - Cutting and Patching.
- .2 Section 03 31 00.10 - Heritage Concrete.
- .3 Section 06 01 40.91 - Interior Wood Restoration.
- .4 Section 06 20 00.01 - Interior Finish Carpentry.
- .5 Section 09 25 00 - Gypsum Board.
- .6 Section 09 64 00 - Wood Flooring.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI A10.8-2011, Safety Requirements for Scaffolding & Comparison Document.
- .2 Canadian Federal Legislation
 - .1 Motor Vehicle Safety Act (MVSA), 1995.
 - .2 Hazardous Materials Information Review Act, 1985.
 - .3 Transportation of Dangerous Goods Act, 1992 (1992, c. 34).
- .3 CSA International (CSA)
 - .1 CSA S350 M1980 (R2003), Code of Practice for Safety in Demolition of Structures.
- .4 National Fire Protection Association (NFPA)
 - .1 NFPA (Fire) 241-13, Standard for Safeguarding Construction, Alteration, and Demolition Operations.
- .5 U.S. Environmental Protection Agency (EPA)
 - .1 EPA CFR 86.098-10, Emission standards for 1998 and later model year Otto-cycle heavy-duty engines and vehicles.
 - .2 EPA CFR 86.098-11, Emission standards for 1998 and later model year diesel heavy-duty engines and vehicles.
 - .3 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 COORDINATION

- .1 Coordinate with other trades as required to permit accurate measuring of elements to be removed prior to and during removal, including but not confined to floor construction details and hearth design, layout and dimensions.

1.4 DEFINITIONS

- .1 Demolition: rapid destruction of building following removal of hazardous materials.
- .2 Deconstruction: systematic dismantling of structure in a manner that achieves safe removal/disposal of hazardous materials and maximum salvage/recycling of materials.
 - .1 Ultimate objective is to recover potentially valuable resources while diverting from landfill what has traditionally been significant portion of waste system.
- .3 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, may include but not limited to: asbestos, lead-based paint, PCB's, CFC's, HCFC's poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly.
- .4 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
- .5 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form.
 - .1 Recycling does not include burning, incinerating, or thermally destroying waste.
- .6 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:
 - .1 Salvaging reusable materials from remodelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
 - .2 Returning reusable items including pallets or unused products to vendors.
- .7 Salvage: removal of structural and non-structural materials from deconstruction and disassembly work for purpose of reuse or recycling.

1.5 REGULATORY REQUIREMENTS

- .1 Work shall meet or exceed the following regulatory requirements; comply with the Specifications; in cases of perceived conflict, the more stringent requirement applies.
 - .1 Ontario Building Code 2012 and Amendments.

- .2 All Federal, Provincial, Regional and Municipal laws, regulations, ordinances and by-laws pertaining to the Work shall apply for the duration of the project.
- .3 *Standards and Guidelines for Conservation of Historic Places in Canada*, 2nd Edition.

1.6 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Demolition Meeting: Conduct a pre-demolition meeting at Project site 1 week prior to beginning work of this Section to:
 - .1 Verify project requirements.
 - .2 Verify existing site conditions adjacent to demolition work.
 - .3 Coordination with other construction trades.
- .2 Hold project meetings every week.
- .3 Ensure key personnel attend.
- .4 Departmental Representative will provide written notification of change to meeting schedule established upon contract award 24 hours prior to scheduled meeting.
- .5 Scheduling:
 - .1 Employ necessary means to meet project time lines without compromising specified minimum rates of material diversion.
 - .2 In event of unforeseen delay notify Departmental Representative in writing.
- .6 Give notice to utility authorities having jurisdiction controlling services and appurtenances that will be affected by demolition Work.

1.7 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Qualification Data: For firms and persons specified below to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses and other information specified.
- .2 Shop Drawings:
 - .1 Submit for review and approval demolition drawings, diagrams or details showing sequence of demolition work and supporting structures and underpinning.
 - .2 Submit demolition drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

1.8 QUALITY ASSURANCE

- .1 Comply with requirements indicated on the Contract Drawings. Work shall conform to CSA S350.
- .2 Regulatory Requirements: Perform work as follows; use most restrictive requirements where differences occur between the municipal, provincial and federal jurisdictions:
 - .1 Provincial and Federal Requirements: Perform work in accordance with governing environmental notification requirements and regulations of the authority having jurisdiction.
 - .2 Municipal Requirements: Perform hauling and disposal operations in accordance with regulations of authority having jurisdiction.
 - .3 Collection and transport of hazardous materials, if required, shall comply with The Transportation of Dangerous Goods (TDG) Act.
- .3 Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project:
 - .1 Conform to the Ontario Occupational Health and Safety Act and Regulations, as amended.
 - .2 Conform to WCIB Regulations.
 - .3 Conform to Regulatory Requirements.

1.9 SITE CONDITIONS

- .1 Prevent extraneous materials from contaminating air beyond work areas by providing temporary enclosures during demolition work.
- .2 Cover or wet down dry materials and waste being transported to prevent blowing dust and debris.

1.10 EXISTING CONDITIONS

- .1 If material resembling spray or trowel applied asbestos or other designated substance listed as hazardous is encountered or is reasonable thought to be encountered in course of demolition, stop work, take preventative measures, and notify Departmental Representative immediately. Proceed only after receipt of written instructions have been received.
- .2 Structures to be demolished are based on their condition on date that tender is accepted.
 - .1 Remove, protect and store salvaged items as directed by Departmental Representative.

- .2 Salvage items as identified by Departmental Representative.
- .3 Deliver to Departmental Representative as directed.

Part 2 Products

2.1 TEMPORARY SUPPORT STRUCTURES

- .1 Design temporary support structures required for demolition work as necessary for the project using a qualified professional engineer registered or licensed in province of the Work.

2.2 EQUIPMENT

- .1 Use equipment suitable for work required, meeting current emissions standards.
- .2 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

Part 3 Execution

3.1 DECONSTRUCTION / DEMOLITION

- .1 Do Work in accordance with Division 01 General Requirements: Temporary Barriers and Enclosures.
- .2 Drawings indicate extent of requirements for demolition, remove and salvage, and remove and store for reuse. Demolish or deconstruct parts of structures to remain as required to make way for new installations, and facilitate repairs, restoration work, and renovations.
- .3 Use deconstruction processes and procedures to the extent practicable to maximize meeting waste diversion, salvage requirements, and minimize damage to interior finishes and structure.
- .4 Do not damage heritage designated elements without prior approval of Departmental Representative.
- .5 Deconstruct carefully, do not damage materials or finishes, salvage for installation by other trades, clean and store securely on site as directed by Departmental Representative. Coordinate with Section 09 64 00 - Wood Flooring.
- .6 Blasting operations not permitted.

- .7 Remove contaminated or dangerous materials as defined by authorities having jurisdiction from site and dispose of in safe manner to minimize danger at site, and during transportation and disposal. Comply with applicable laws and regulations.
- .8 Prior to start of Work, remove contaminated or hazardous materials as defined by authorities having jurisdiction from site and dispose of at designated disposal facilities in safe manner and in accordance with TDGA and other applicable requirements.
- .9 At end of each day's work, leave Work in safe and stable condition.
- .10 Demolish using procedures that minimize dusting; prevent migration of dust outside of work areas.
- .11 Contain fibrous materials to minimize release of airborne fibres while being transported within facility.
- .12 Remove and dispose of demolished materials in accordance with requirements of authorities having jurisdiction.
- .13 Remove salvaged materials and equipment selected by Departmental Representative, and store in location designated by Departmental Representative.
- .14 Use natural lighting to do Work where possible.
- .15 Shut off lighting except those required for security and safety purposes at end of each day.

3.2 CLEANING

- .1 Progress Cleaning: clean in accordance with Division 01 General Requirements: 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 Division 01 General Requirements: Cleaning.
- .3 Waste Management: Separate waste materials for reuse and recycling in accordance with Division 01 General Requirements: Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

1 GENERAL

1.01 DESCRIPTION OF WORK

- .1 This section covers the requirements for the demolition and removal of:
 - .1 The existing wood shingle roofing and associated flashings,
 - .2 Soffits and fascia,
 - .3 Metal flashings,
 - .4 Siding, two layers of tar paper insulation,
 - .5 Blocking and strapping,
 - .6 Removal of sufficient first floor flooring to complete the work.
 - .7 Removal of first floor beams and columns coordinated with bracing and shoring to allow replacement of columns and beams,
 - .8 Any "Miscellaneous Removals" of items not covered by the above and are necessary for the completion of the work.

1.02 REFERENCES

- .1 Canadian Federal Legislation
 - .1 Canadian Environmental Protection Act (CEPA), 1988.
- .2 Canadian Environmental Assessment Act (CEAA), 1995.
- .3 Transportation of Dangerous Goods Act (TDGA), 1992.
- .4 Motor Vehicle Safety Act (MVSA), 1995.

1.03 MEASUREMENT AND PAYMENT

- .1 No measurement for payment will be made for the Removals. Payment shall be included in the contract lump sum price.
- .2 All costs for labour, materials and equipment necessary to do the work of the above items, in accordance with the drawings and these detailed specifications, shall be included in the contract lump sum price.

1.04 STORAGE AND PROTECTION

- .1 Protect existing items designated to remain. In event of damage to such items, immediately replace or make repairs to approval of Departmental Representative and at no cost to the owner.
- .2 In all circumstances ensure that demolition work does not adversely affect any remaining mechanical / electrical systems, or contribute to excess air and noise pollution.
- .3 Do not dispose of waste or volatile materials such as, mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses,

storm or sanitary sewers. Ensure proper disposal procedures are maintained throughout the project.

- .4 Do not pump or allow water containing suspended materials to enter into watercourses, storm or sanitary sewers or onto adjacent properties.
- .5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authorities.

1.05 EXISTING CONDITIONS

- .1 Prior to the start of any demolition work remove contaminated or hazardous materials as defined by authorities having jurisdiction from site and dispose of at designated disposal facilities in safe manner in accordance with TDGA and all other applicable regulatory requirements.
- .2 A Designated Substance Report is available and should be reviewed.

1.06 REGULATORY REQUIREMENTS

- .1 Ensure all work is performed in compliance with CEPA, CEAA, TDGA, MVSA, and all applicable provincial regulations.

1.07 SUBMITTALS

- .1 Prior to commencement of work on site, submit detailed waste reduction workplan indicating anticipated percentages of reuse, recycling and landfill, schedule of selective demolition, material description and quantities of materials to be salvaged, number and location of dumpsters, anticipated frequency of tipping, and name and address of all waste receiving organizations.
- .2 Supply certified bills of lading from authorized disposal sites and reuse and recycling facilities for all material removed from site. Written authorization from the Departmental Representative is required to deviate from the receiving organizations listed in waste reduction workplan.

2 PRODUCTS

2.01 EQUIPMENT

- .1 Equipment and heavy machinery used to meet or exceed all applicable emission requirements.
- .2 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.
- .3 Sawing equipment shall not be used unless it can be demonstrated that no damage will occur to the structure to remain. This includes control of sparks and cutting, nicking or otherwise affecting the existing members. Note that original wood material may easily catch fire and special care shall be taken.

3 EXECUTION

3.01 PREPARATION

- .1 Inspect site with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling and items to remain.
- .2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.

3.02 SEQUENCES OF OPERATION

- .1 Adequate access shall be provided to facilitate, determination of location and extent of repair, performance of the work and inspection and measurement of the work.
- .2 Removals
 - .1 Complete removals in accordance with removals plan submitted in accordance with shop drawing requirements.
 - .2 Provide all temporary bracings to the structure so that stability of the structure is maintained throughout the duration of the construction. This is particularly required when replacing all first floor beams and columns along the centerline of the building.
- .3 Disposal of Material
 - .1 Dispose of materials not designated for reuse at authorized facilities approved in waste reduction workplan.

3.03 RESTORATION

- .1 Restore areas and existing works outside areas of demolition to conditions that existed prior to commencement of work.
- .2 Use only procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

3.04 CLEANUP

- .1 Upon completion of work, remove debris, trim surfaces and leave work site clean.
- .2 Use only cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

3.05 REPORTING

- .1 Record off-site removal of debris and materials and provide following information regarding removed materials to Engineer within 48 hours.
 - .1 Time and date of removal.
 - .2 Type of material.
 - .3 Weight and quantity of materials.
 - .4 Final destination of materials.
- .2 The Contractor is responsible for ensuring all reporting requirements are

fulfilled to the satisfaction of Departmental Representative.

3.06 MISCELLANEOUS REMOVALS

- .1 During the course of the work should removals of items be required to completed the work that are not scheduled for removal in designated items, complete those removals as "Miscellaneous Removals" under this contract the cost of which shall be included as part of the removals item.
- .2 All "Miscellaneous Removals" shall be completed to the satisfaction of the Engineer and shall in no way cause any damage to structures to remain.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedures.

1.02 REFERENCES

- .1 ASTM International
 - .1 ASTM A 185/A 185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - .2 ASTM D 260-86(2001), Standard Specification for Boiled Linseed Oil.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-19.24-M90, Multicomponent, Chemical-Curing Sealing Compound.
- .3 CSA International
 - .1 CSA-A23.1/A23.2-2004, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .3 CAN/CSA-G30.18-M92 (R2002), Billet-Steel Bars for Concrete Reinforcement.

1.03 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation Meetings: in accordance with one week prior to beginning of concrete works.
 - .1 Ensure site supervisor and Departmental Representative attend.
 - .2 Verify project requirements.

1.04 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
 - .1 Submit placing drawings prepared in accordance with plans to clearly show size, shape, location and necessary details of reinforcing.
 - .2 Submit drawings showing formwork and falsework design to: CSA A23.1/A23.2.
- .3 Concrete hauling time: provide for review by Departmental Representative deviations exceeding maximum allowable time of 120 for concrete to be delivered to site of Work and discharged after batching.

1.05 QUALITY ASSURANCE

- .1 Provide to Departmental Representative, 4 weeks minimum prior to starting concrete work, valid and recognized certificate from plant delivering concrete.
 - .1 Quality Control Plan: provide written report to Departmental

Representative verifying compliance that concrete in place meets performance requirements.

1.06 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements:
- .1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
 - .1 Do not modify maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2.
 - .2 Deviations to be submitted for review by the Departmental Representative.
- .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

2 PRODUCTS

2.01 DESIGN CRITERIA

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

2.02 PERFORMANCE CRITERIA

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by Departmental Representative and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

2.03 MATERIALS

- .1 Cement: to CSA A3001, Type HS.
- .2 Water: to CSA A23.1/A23.2.
- .3 Reinforcing bars: to CAN/CSA-G30.18, Grade 400.
- .4 Welded steel wire fabric: to ASTM A 185.
- .5 Premoulded joint filler:
 - .1 Bituminous impregnated fibreboard: to ASTM D 1751.
- .6 Joint sealer/filler: grey to CAN/CGSB-19.24, Type 1, Class B.
- .7 Sealer: boiled linseed oil to ASTM D 260, mixed with mineral spirits 1:1 proprietary poly-siloxane resin blend.
- .8 Other concrete materials: to CSA A23.1/A23.2.

2.04 MIXES

- .1 Performance Method for specifying concrete: to meet Departmental Representative performance criteria to CSA A23.1/A23.2.
 - .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as described in PART 3

- VERIFICATION.
- .2 Provide concrete mix to meet following plastic state requirements:
 - .1 Uniformity: CSA A23.1/A23.2.
 - .2 Workability: free of loss of mortar colour variations segregation.
- .3 Provide concrete mix to meet following hard state requirements:
 - .1 Durability and class of exposure: F-1.
 - .2 Compressive strength at 28 days. age: 35 MPa minimum.
 - .3 Intended application: Footings.
 - .4 Aggregate size 19 mm maximum.
- .4 Concrete supplier's certification.
- .5 Provide quality management plan to ensure verification of concrete quality to specified performance.

3 EXECUTION

3.01 PREPARATION

- .1 Provide Departmental Representative 48 hours' notice before each concrete pour.
- .2 During concreting operations:
 - .1 Development of cold joints not allowed.
 - .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
- .3 Protect previous Work from staining.
- .4 Clean and remove stains prior to application of concrete finishes.

3.02 INSTALLATION/ APPLICATION

- .1 Do cast-in-place concrete work in accordance with CSA A23.1/A23.2.
- .2 Sleeves and inserts:
 - .1 Cast in sleeves, ties, slots, anchors, reinforcement, frames, conduit, bolts, waterstops, joint fillers and other inserts required to be built-in.

3.03 FINISHES

- .1 Formed surfaces exposed to view: sack rubbed finish in accordance with CSA A23.1/A23.2.
- .2 Equipment pads: provide smooth trowelled surface.
- .3 Pavements, walks, curbs and exposed site concrete:
 - .1 Screed to plane surfaces and use wood floats.
 - .2 Provide round edges and joint spacings using standard tools.
 - .3 Trowel smooth to provide lightly brushed non-slip finish.

3.04 CONTROL JOINTS

- .1 Cut and Form control joints in slabs on grade at locations indicated, to

CSA A23.1/A23.2 and install specified joint sealer/filler.

3.05 CURING

- .1 Use curing compounds compatible with applied finish on concrete surfaces free of bonding agents and to CSA A23.1/A23.2.

3.06 SEALING APPLICATION

- .1 After curing is complete, apply two even coats of linseed oil mixture to clean dry surfaces, each at 8 m³ /L. Allow first coat to dry before applying second coat apply poly-siloxane resin blend sealer at 4 m³ /L.

3.07 SITE TOLERANCES

- .1 Concrete floor slab finishing tolerance to CSA A23.1/A23.2.

3.08 FIELD QUALITY CONTROL

- .1 Concrete testing: to CSA A23.1/A23.2 by testing laboratory designated and paid for by Departmental Representative. Accelerated test methods will apply.

3.09 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .2 Use trigger operated spray nozzles for water hoses.
- .3 Designate cleaning area for tools to limit water use and runoff.
- .4 Cleaning of concrete equipment to be done in accordance with Section 01 35 43 Environmental Procedures.
- .5 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section specifies requirements for new concrete hearth, installed level with adjacent finished floor.

1.2 RELATED SECTIONS

- .1 Section 02 41 20 - Selective Interior Demolition.
- .2 Section 06 10 0.01 - Interior Rough Carpentry.
- .3 Section 07 90 00.01 - Interior Joint Sealants.
- .4 Section 09 64 00 - Wood Flooring.

1.3 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM A1064/A1064M-16b, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
 - .2 ASTM C109/C109M-16a, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens).
 - .3 ASTM C260/C260M-10a(2016), Standard Specification for Air-Entraining Admixtures for Concrete.
 - .4 ASTM C330/C330M-14, Standard Specification for Lightweight Aggregates for Structural Concrete.
 - .5 ASTM C494/C494M-16, Standard Specification for Chemical Admixtures for Concrete.
 - .6 ASTM C827/C827M-16, Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.
 - .7 ASTM C939/C939M-16a, Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).
 - .8 ASTM C979/C979M-16 Standard Specification for Pigments for Integrally Colored Concrete.
- .2 CSA International
 - .1 CSA A23.1/A23.2-14, Concrete materials and methods of concrete construction / Test methods and standard practices for concrete, Includes Update No. 1 (2015).
 - .2 CSA A3000-13, Cementitious materials compendium (Consists of A3001, A3002, A3003, A3004 and A3005), Includes Update No. 1 (2014), Update No. 2 (2014), Update No. 3 (2014).
 - .3 CAN/CSA G30.18-09(R2014), Carbon steel bars for concrete reinforcement, Includes Update No. 1 (2012).

.4 CSA S269.1-16, Falsework and Formwork.

1.4 REGULATORY REQUIREMENTS

.1 Work shall meet or exceed the following regulatory requirements; comply with the Specifications; in cases of perceived conflict, the more stringent requirement applies.

- .1 Ontario Building Code 2012 and Amendments.
- .2 All Federal, Provincial, Regional and Municipal laws, regulations, ordinances and by-laws pertaining to the Work shall apply for the duration of the project.
- .3 *Standards and Guidelines for Conservation of Historic Places in Canada*, 2nd Edition.

1.5 ADMINISTRATIVE REQUIREMENTS

.1 Pre-installation Meetings: in accordance with Division 01 - General Requirements: Meetings, convene pre-installation meeting one week prior to beginning concrete works.

- .1 Ensure site supervisor, affected trades, and Departmental Representative attend.
- .2 Verify project requirements.

1.6 COORDINATION

- .1 Coordinate with Section 02 41 20 - Selective Interior Demolition for dimensions and samples.
- .2 Coordinate schedule with Section 09 64 00 - Wood Flooring: sequence Work so that flooring work immediately adjacent to concrete work proceeds after removal of forms.
- .3 Obtain samples of existing hearth as required and obtain detailed measurements and other details as required to duplicate slab with new concrete work.

1.7 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Division 01 General Requirements: Submittal Procedures.
- .2 Product Data:
 - .1 Submit product technical datasheets and specifications for all products included in the Work of this Section.
- .3 Shop Drawings:
 - .1 Submit placing drawings prepared in accordance with plans to clearly show size, shape, location and necessary details of reinforcing.
 - .2 Submit drawings showing formwork design to: CSA A23.1/A23.2.

- .4 Samples:
 - .1 At least 4 weeks prior to beginning Work, submit samples of materials proposed for use to Departmental Representative.
 - .2 Submit samples of aggregates to be used in concrete mix; match range and colour of aggregate in pre-existing original concrete as closely as possible. Submit sample of original concrete, broken down sufficiently to permit a comparison of aggregates with proposed aggregates.
 - .3 Submit a range of colour samples of cured concrete in 50 mm x 50 mm x 50 mm cubes for initial selection; colour to match prior existing hearth as closely as possible.
- .5 Provide testing results for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Division 01 - General Requirements: Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect products from damage.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 GENERAL

- .1 Use same brands and source of cement and aggregate for entire project to ensure uniformity of colouration and other mix characteristics.
- .2 Design criteria: Alternative 2 - Prescription: to CSA A23.1/A23.2, and as described in MIXES of PART 2 - PRODUCTS.
 - .1 Ensure materials used in concrete mix have been submitted for testing and meet requirements of CSA A23.1. Submit test results to Departmental Representative prior to commencement of Work.

- .1 Sampling, to CSA A23.2-1C.
- .2 Compressive strength, to CSA A23.2-3C.
- .3 Air content of fresh concrete, to CSA A23.2-4C.
- .4 Slump, to CSA A23.2-5C.

2.2 MATERIALS

- .1 Blended hydraulic cement: Type GUb to CSA A3001.
- .2 Supplementary cementing materials: with minimum 20% Type fly ash replacement by mass of total cementitious materials to CSA A3001.
- .3 Water: to CAN/CSA A23.1/A23.2.
- .4 Reinforcing Steel: to CSA G30.18, 400 MPa yield grade deformed steel bars.
- .5 Welded steel wire fabric: to ASTM A1064.
- .6 Aggregate: to CAN/CSA A23.1/A23.2.
 - .1 Coarse aggregates to be normal density.
- .7 Air entraining admixture: to ASTM C260/C260M.
- .8 Forms: to CSA S269.1, plastic or steel lined for smooth, unmarked finish.
- .9 Accessory and other products, to CAN/CSA A23.1/A23.2.
- .10 Perimeter floor-to-concrete joint sealant: to Section 07 90 00.01 - Interior Joint Sealants: Type S-4.

2.3 CONCRETE MIX DESIGN

- .1 Proportion concrete in accordance with CAN/CSA A23.1/A23.2, Alternative 1, to following requirements:
 - .1 Class of exposure: C-1.
 - .2 Maximum Water/Cement Ratio: 0.40.
 - .3 Minimum 28 day strength: 35 MPa.
 - .4 Intended application: interior fireplace hearth.
 - .5 Air content: 5 - 8%, Table 10.
 - .6 Aggregate: not to exceed 10 mm.
 - .7 Slump: at time and point of discharge 40 to 60 mm.
 - .8 Air content category: 1.
 - .9 Colouring materials: Pure mineral pigments, lime-proof and nonfading, complying with ASTM C979.
 - .10 Supplementary cementing materials: to CSA A3000.

2.4 CONCRETE MIXING

- .1 Project Site Mixing: Measure, batch, and mix concrete materials and concrete according to CSA A23.1. Mix concrete materials in appropriate drum type batch machine mixer.

2.5 FINISH

- .1 Finish and colour of cured concrete to match approved sample.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates are acceptable for concrete installation.
- .2 Visually inspect substrate in presence of Departmental Representative.
- .3 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

- .1 Clean surfaces of all bond inhibiting materials, dirt, debris and dust.

3.3 FORMWORK

- .1 Formwork: to CSA A23.1.
- .2 New hearth shall match dimensions and location of removed hearth; coordinate with Section 02 41 20 - Selective Interior Demolition to record layout, location and dimensions.
- .3 New hearth shall be finished flush with top surface of adjacent finished floor.

3.4 STEEL REINFORCEMENT

- .1 Comply with CSA A23.1 for fabricating, placing, and supporting reinforcement.

3.5 CONCRETE PLACEMENT

- .1 Comply with recommendations in CSA A23.1 for measuring, mixing, transporting, and placing concrete.
- .2 Do not add water to concrete during delivery, at Project site, or during placement.
- .3 Consolidate concrete with mechanical vibrating equipment.

- .4 Install grout to perimeter joints after adjacent flooring has been installed; protect floor surface from damage or staining.

3.6 FINISHING FORMED SURFACES

- .1 Vertical surfaces of hearth shall be smooth form finished.
 - .1 Smooth Formed Finish: as-cast concrete texture imparted by form-facing material, installed with minimum of seams. Repair and patch defective areas. Completely remove fins and other projections.

3.7 FINISHING UNFORMED SURFACES

- .1 Comply with CSA A23.1 for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- .2 Screed surfaces with straightedge and strike off. Begin initial floating using bull floats or darbies to form uniform and open textured surface plane before excess moisture or bleed water appears on the surface:
- .3 Do not further disturb surfaces before starting finishing operations.
- .4 Trowel Finish: Apply steel trowel finish to unformed surfaces.

3.8 TOLERANCES

- .1 Horizontal Surfaces: comply with CSA A23.1 for Class C: Floors having a straightedge value of ± 5 mm over 3050 mm.
- .2 Vertical surfaces shall be plumb, square, straight and true.

3.9 CONCRETE PROTECTION AND CURING

- .1 Curing and protection of concrete shall be to CSA A23.1 Section 21.

3.10 JOINT SEALANT

- .1 Prepare surfaces as required, and install joint sealant at slab-to-floor joints, to Section 07 90 00.01 - Interior Joint Sealants: Type S-4. Colour as selected by Departmental Representative from manufacturer's full range.

3.11 FIELD QUALITY CONTROL

- .1 Testing Agency: Engage qualified independent testing and inspecting agency, as approved by Departmental Representative, to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Section in accordance with CSA A23.2. Submit test results to Departmental Representative.

3.12 CLEANING

- .1 Progress Cleaning: clean in accordance with Division 01 General Requirements: Cleaning. Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Division 01 General Requirements: Cleaning.
- .3 Waste Management: Separate waste materials for reuse and recycling in accordance with Division 01 General Requirements: Construction/Demolition Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.13 PROTECTION

- .1 Protect installed work from construction operations damage until Final Completion or Parks Canada Agency occupancy, whichever comes first.
- .2 Repair damage to adjacent materials caused by Work of this Section.
- .3 Prohibit traffic or Work on or adjacent to hearth until concrete has cured to 40% of design strength.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section includes requirements for supply and installation of lightweight gypsum cement floor underlayment system over existing subfloor.

1.2 RELATED SECTIONS

- .1 Section 09 30 00 - Tiling.
- .2 Section 09 64 00 - Wood Flooring.

1.3 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C472-99(2014), Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete.
 - .2 ASTM D4263-83(2012), Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
 - .3 ASTM E90-09, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
 - .4 ASTM E492-09(2016)E1, Standard Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine.
 - .5 ASTM F2419-11, Standard Practice for Installation of Thick Poured Gypsum Concrete Underlayments and Preparation of the Surface to Receive Resilient Flooring.

1.4 REGULATORY REQUIREMENTS

- .1 Work shall meet or exceed the following regulatory requirements; comply with the Specifications; in cases of perceived conflict, the more stringent requirement applies.
 - .1 Ontario Building Code 2012 and Amendments.
 - .2 All Federal, Provincial, Regional and Municipal laws, regulations, ordinances and by-laws pertaining to the Work shall apply for the duration of the project.
 - .3 *Standards and Guidelines for Conservation of Historic Places in Canada*, 2nd Edition.

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate surface sealer requirements recommended by gypsum cement underlayment manufacturer with finish flooring products and adhesives and verify compatibility before starting work of this Section; mock-up can be used to test compatibility of materials.
- .2 Scheduling: Schedule installation of gypsum cement underlayment with finish flooring installers and allow sufficient time to allow underlayment to dry to moisture vapour emission rate acceptable to flooring manufacturer.

1.6 SUBMITTALS

- .1 Submit in accordance with Division 01 General Requirements: Submittal Procedures.
- .2 Product Data
 - .1 Submit manufacturer's printed product literature, specifications and data sheet for each product specified.
 - .2 Submit manufacturer's installation instruction for product specified.
- .3 Informational Submittals: Provide the following submittals when requested by the Departmental Representative:
 - .1 Certificates:
 - .1 Fire Testing: Submit fire resistance assembly listing indicating ULC requirements or UL requirements accepted by ULC
 - .2 Material Compatibility: Submit assurance that underlayment is compatible with finish flooring products applied to materials specified in this Section.
 - .2 Site Quality Control (refer to article 3.6 of this Section):
 - .1 Submit results of specified slump and compression tests.
 - .2 Submit manufacturer's site testing results indicating successful tests, and modification used to correct deficiencies when testing indicates substandard performance.

1.7 QUALITY ASSURANCE

- .1 Qualifications: Provide proof of qualifications when requested by Departmental Representative:

- .1 Installer: Use applicators trained and authorized by manufacturer of gypsum cement underlayment using only approved mixing and pumping equipment.

1.8 **MOCK-UPS**

- .1 Apply mock-up to demonstrate qualities of materials and execution before installing gypsum cement underlayment as follows:
 - .1 Departmental Representative will select one area or surface to represent surfaces and conditions for application on each substrate required.
 - .2 Notify Departmental Representative 7 days in advance of date and time required for mock-up applications; obtain Departmental Representative's review of mock-up before starting work of this Section.
 - .3 Keep mock-ups in undisturbed condition as a standard for judging completed work of this Section until completion of underlayment installation.
 - .4 Reviewed mock-ups may become part of the completed work if undisturbed when finish flooring is installed.

1.9 **DELIVERY, STORAGE AND HANDLING**

- .1 Delivery and Acceptance Requirements: Deliver materials in original, unopened packages protected from exposure to the elements and detrimental conditions; remove and replace damaged or deteriorated materials from site.
- .2 Storage and Handling Requirements: Store materials in accordance with manufacturer's written instruction to prevent deterioration or degradation arising from moisture or other deleterious effects.

Part 2 Products

2.1 **MANUFACTURERS**

- .1 Acceptable Materials Manufacturers: Subject to compliance with requirements specified in this Section, manufacturers offering products that may be incorporated into the Work include; but are not limited to, the following:
 - .1 Maxxon Corporation.
 - .2 USG Corporation Inc.

2.2 **MATERIALS**

- .1 Primers: Manufacturer's recommended materials for application to wood substrate.

- .2 Gypsum Cement Underlayment: Gypsum cement requiring only the addition of sand and mix water, and as follows:
 - .1 Material: Gypsum Cement
 - .2 Compressive Strength (ASTM C472): Minimum 14 MPa. Average between 14 MPa to 22 MPa.
 - .3 Nominal Average Density: 1840 kg/m³.
 - .4 Acceptable Materials:
 - .1 Maxxon, Gyp-Crete.
 - .2 USG Levelrock 2500.
- .3 Mix Water: potable; free from impurities and from a domestic source.
- .4 Sand Aggregate: to ASTM C33 and as recommended by manufacturer's applicator manual.

2.3 ACCESSORIES

- .1 Repair Materials: as recommended by manufacturer, suitable for substrate and conditions.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: Verify that substrates are structurally sound and dry, and free of deleterious materials before beginning installing products specified in this Section.
- .2 Installation of products specified in this Section means acceptance of site conditions.

3.2 COORDINATION

- .1 Coordinate with other trades as required.

3.3 SITE CONDITIONS

- .1 Ambient Conditions:
 - .1 Temperature: Maintain interior ambient conditions of enclosed spaces at a temperature above 10°C for a period 24-hours before, during and after installation until permanent heating system for building is activated and operating.
 - .2 Ventilation: Maintain ventilation as required to dissipate moisture levels that are potentially damaging to exterior wall systems and other materials during installation and until after gypsum cement underlayment has fully cured.

3.4 PREPARATION

- .1 Surface Preparation:
 - .1 Leak Prevention: Fill cracks and voids in floor substrates using manufacturers recommended quick setting patching materials.
 - .2 Priming: Prime substrates in accordance with manufacturer's recommendations using materials appropriate to site conditions.

3.5 INSTALLATION

- .1 Mix and proportion materials to achieve compressive strength and density requirements in accordance with manufacturer's recommendations.
- .2 Install materials in accordance with manufacturer's written instructions after building is fully enclosed and minimum ambient conditions are established; and in accordance with ASTM F2419.
- .3 Pour gypsum cement underlayment to 2-inch (51 mm) thickness; spread and screed to achieve a smooth surface; cut joints at isolation, expansion or control joints located in substrate materials.
- .4 Remove and replace underlayment in areas that indicate a lack of bond to the substrate or that fails to cure to a satisfactory substrate required by flooring materials manufacturers.

3.6 SITE QUALITY CONTROL

- .1 Site Testing:
 - .1 Slump Test: Test gypsum cement underlayment for slump once every 250 m² as it is being pumped using a 50 mm x 100 mm cylinder resulting in a patty size of 215 mm to 230 mm in diameter.
 - .2 Compression Strength Test: Prepare and test three (3) moulded cube samples from each day's pour or once each 1000 m² poured in a day; test in accordance with ASTM C472.

3.7 CLEANING

- .1 Progress Cleaning: clean in accordance with Division 01 General Requirements: 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 Division 01 General Requirements: Cleaning.

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .3 Waste Management: Separate waste materials for reuse and recycling in accordance with Division 01 General Requirements: Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.8 PROTECTION

- .1 Close off areas of installation during underlayment application for time period during and after work of this section for time period recommended by gypsum cement underlayment manufacturer.
- .2 Protect work of this Section from heavy loads by placing temporary wood planking or other non-staining protection board acceptable to manufacturer over gypsum cement underlayment in areas that are subjected to heavy wheeled or concentrated point loads.

END OF SECTION

Part 1 General

1.1 REGULATORY REQUIREMENTS

- .1 Work shall meet or exceed the following regulatory requirements; comply with the Specifications; in cases of perceived conflict, the more stringent requirement applies.
 - .1 Ontario Building Code 2012 and Amendments.
 - .2 All Federal, Provincial, Regional and Municipal laws, regulations, ordinances and by-laws pertaining to the Work shall apply for the duration of the project.
 - .3 *Standards and Guidelines for Conservation of Historic Places in Canada*, 2nd Edition.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination:
 - .1 Coordinate lines, levels and coursing with work of other trades.
 - .2 Obtain built-in items prior to start of this work.
- .2 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section and on-site installation, with Contractor's representative, trade contractor, material supplier and Departmental Representative in accordance with Division 01 General Requirements: Construction Schedule to:
 - .1 Verify project requirements including specification and details for project.
 - .2 Review mix design, batch control and grouting procedures.
 - .3 Coordination with related Work.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Division 01 General Requirements: Submittal Procedures.
- .2 Product Data
 - .1 Submit manufacturer's printed product literature, specifications and data sheet for each product specified.
 - .2 Submit manufacturer's installation instruction for product specified.

1.4 QUALITY ASSURANCE

- .1 Qualifications: Provide proof of qualifications when requested by Departmental Representative:
 - .1 Installer: Use applicators trained and authorized by manufacturer of gypsum cement underlayment using only approved mixing and pumping equipment.

1.5 MOCK-UPS

- .1 Provide a sample range of cleaning intensities for each method to determine the minimum treatment required to achieve a satisfactory level of cleanliness.
- .2 If initially specified methods prove unsatisfactory, provide combination of methods from those specified, as requested, and at no extra cost to achieve an acceptable result without damaging the surface.
- .3 Agree location and size of each test patch site with Department Representative.
- .4 Provide 7 days' notice to Department Representative of intent to commence testing.
- .5 Provide additional mock-ups on-site to determine the effectiveness and implications of the chosen cleaning methods if initial tests prove unsatisfactory.
- .6 No work shall proceed until the mock-up for each soiling type and method has been reviewed by Department Representative. The reviewed mock-up shall establish the quality of the work against which all other work shall be performed. A test shall be considered complete when mock-up area has dried to moisture content similar to surrounding area.
- .7 Test report:
 - .1 Submit written results of all tests, outlining method, intensity of cleaning, chemical concentrations, and time elapsed for each test.

1.6 SPECIAL APPROVALS

- .1 Obtain written approval from Departmental Representative and authorities having jurisdiction for use of all chemicals and for method of disposal for all chemicals and wastes.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Division 01 General Requirements: Common Product Requirements and with manufacturer's written instructions.

- .2 Delivery and Acceptance Requirements: Deliver materials in original, unopened packages protected from exposure to the elements and detrimental conditions; remove and replace damaged or deteriorated materials from site.
- .3 Storage and Handling Requirements: Store materials in accordance with manufacturer's written instruction to prevent deterioration or degradation arising from moisture or other deleterious effects.

1.8 SITE CONDITIONS

- .1 Ambient conditions:
 - .1 Do not use wet cleaning methods when there is threat of frost.
 - .2 Do not use chemical cleaners when temperature is below 10 degrees C.
 - .3 Follow manufacturer's written instructions on use of chemical cleaners in accordance with product's temperature range application.
 - .4 Provide shading to wall to avoid cleaning in full, hot sunlight.
 - .5 Do not clean if there is risk of chemical spray being blown onto surrounding historic material, publicly accessible areas or plants.
 - .6 Protect work in the event of high winds.

Part 2 Products

2.1 MATERIALS

- .1 Mix Water: potable; free from impurities and from a domestic source. Treat water that has high metal content before use in cleaning.
- .2 Tools and Equipment
 - .1 All brushes shall be of the natural bristle or soft plastic type. Metal brushes are abrasive and are not to be used for cleaning operations.
 - .2 Scrapers used shall be made of wood or plastic only.
- .3 Brick cleaning solution:
 - .1 Sure Klean Light Duty Restoration Cleaner, by Prosoco Inc., or similar, meeting or exceeding the following requirements:
 - .1 Proprietary blend: purpose-made for heritage restoration work, low-acid cleaner combined with nonacidic cleaners, surface wetting agents, and inhibitors.

- .2 Approved by Departmental Representative.
- .3 Form: clear, gelled liquid.
- .4 Specific gravity: approximately 1.12.
- .5 pH: 1.5 - 2.0.

Part 3 Execution

3.1 COORDINATION

- .1 Coordinate with other trades as required.

3.2 COMPLIANCE

- .1 Comply with cleaning solution manufacturer's printed preparation and cleaning instructions, technical datasheet, and specifications.

3.3 PREPARATION AND PROTECTION

- .1 Protect operatives and other site personnel from hazards.
 - .1 Ensure good ventilation in work area.
 - .2 Ensure workers wear eye, head, and face protection, and protective gloves, coveralls, boots and respirator to CAN/CSA-Z94.4.
- .2 Place safety devices and signs near work areas.
- .3 Protect all adjacent areas and adjoining materials against damage by overspray or run-off of chemical or water cleaning action.
- .4 Provide a shelter around work areas. Obtain approval of sheltering method from Departmental Representative before commencing cleaning procedure.
- .5 Repair openings and joints prior to cleaning where there is potential risk of water/chemical infiltration.
- .6 Cap ends of scaffolding or other pipes, tubes, cups or trays which might fill with chemical residue and pose a danger to workmen or the public.
- .7 Obtain appropriate permits before commencing work. Agree disposal of toxic effluent with Parks Canada Agency and Authorities having jurisdiction.

3.4 MASONRY CLEANING

- .1 Remove existing soiling from interior masonry to achieve natural homogeneous finish without damaging the surface or removing the overall patina of the masonry. Obtain approval of methods from Departmental Representative before proceeding.

- .2 Provide set up to capture all run off liquid resulting from work. Dispose of all runoff according to applicable legislation.
- .3 Working from bottom to top, pre-wet the surface with clean water.
- .4 Apply cleaner using a brush or roller. Gently scrub to improve results.
- .5 Let dwell for 5 to 15 minutes. Gently scrub heavily soiled areas. Do not let product dry on the surface. If drying occurs, lightly wet treated surfaces with fresh water. Reapply the cleaner in a gentle scrubbing manner.
- .6 Working from bottom to the top, rinse thoroughly with clean water.
- .7 Repeat steps above if necessary

3.5 PROGRESS AND FINAL CLEANING

- .1 Progress Cleaning: clean in accordance with Division 01 General Requirements: Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Rinse off masonry until no indications of chemicals are present.
- .3 Rinse from bottom to top and from top to bottom.
- .4 Clean up work area as work progresses. At end of each work day remove debris and waste from site.
- .5 Upon completion, clean and restore areas used for work to condition equal to that previously existing.
- .6 Waste Management: separate waste materials for reuse and recycling in accordance with Division 01 General Requirements: Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
 - .2 Collect, neutralize and dispose of water and chemicals in accordance with contract requirements, applicable regulations and Canadian Environmental Protection Act, (CEPA).
- .7 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Division 01 General Requirements: Cleaning.

3.6 PROTECTION OF WORK

- .1 Protect finished Work from damage until take-over.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedures.

1.02 REFERENCES

- .1 ASTM International Inc.
 - .1 ASTM A 325-07a, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 - .2 ASTM A 325M-08, Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength Metric.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-85.10-99, Protective Coatings for Metals.
- .3 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturers Association (CPMA).
 - .1 Handbook of the Canadian Institute of Steel Construction.
 - .2 CISC/CPMA Standard 2-75, Quick-Drying Primer for use on Structural Steel.
- .4 Canadian Standards Association (CSA International)
 - .1 CSA G40.20/G40.21-04, 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 CAN/CSA-S16-01(R2007), Limit States Design of Steel Structures.
 - .4 CAN/CSA-S136-07, North American Specifications for the Design of Cold Formed Steel Structural Members.
 - .5 CSA W47.1-03, Certification of Companies for Fusion Welding of Steel.
 - .6 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding.
 - .7 CSA W55.3-1965(R2003), Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
 - .8 CSA W59-03, Welded Steel Construction (Metal Arc Welding).
- .5 Master Painters Institute
 - .1 MPI-INT 5.1-08, Structural Steel and Metal Fabrications.
 - .2 MPI-EXT 5.1-08, Structural Steel and Metal Fabrications.
- .6 The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers (NACE) International
 - .1 NACE No. 3/SSPC SP-6-06, Commercial Blast Cleaning.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
 - .1 Provide drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Complete removals to expose conditions prior to completing Shop

Drawings. Meet with the Departmental Representative prior to completing the Shop Drawings to confirm as found conditions.

- .3 Erection drawings:
 - .1 Submit erection drawings indicating details and information necessary for assembly and erection purposes including:
 - .1 Description of methods.
 - .2 Sequence of erection.
 - .3 Type of equipment used in erection.
 - .4 Temporary bracings.
- .4 Fabrication drawings:
 - .1 Submit fabrication drawings showing designed assemblies, components and connections are stamped and signed by qualified professional engineer licensed in the Province of Ontario, Canada.
- .5 Samples:
 - .1 Prepare sample of typical exposed structural connections in accordance with AISC Specifications of Architecturally exposed structural steel for approval of Departmental Representative. Samples to be judged upon alignment of surfaces, uniform contact between surfaces, smoothness and uniformity of finished welds. When approved, sample units will serve as a standard for workmanship, appearance and material acceptable for entire project.
- .6 Source Quality Control Submittals:
 - .1 Submit PDF copies of mill test reports 4 weeks prior to fabrication of structural steel.
 - .1 Mill test reports to show chemical and physical properties and other details of steel to be incorporated in project.

1.04 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials in manufacturer's original, undamaged containers with identification labels intact.
- .3 Packaging Waste Management: remove for reuse in accordance with Section 01 74 20 - Construction/Demolition Waste Management and Disposal.

2 PRODUCTS

2.01 MATERIALS

- .1 Structural steel: to CSA-G40.20/G40.21 350 W Grade or CAN/CSA-S136.
- .2 Anchor bolts: to CSA-G40.20/G40.21, Grade 300W.
- .3 Bolts, nuts and washers: to ASTM A 325 ASTM A 325M.
- .4 Welding materials: to CSA W48 Series CSA W59 and certified by Canadian Welding Bureau.

- .5 Shop paint primer: to CISC/CPMA 2-75 solvent reducible alkyd, red oxide grey. Except for exposed fabrications to receive special paint systems.
- .6 Hot dip galvanizing: galvanize steel, where indicated, to CAN/CSA-G164, minimum zinc coating of 600 g/m².

2.02 FABRICATION

- .1 Fabricate structural steel in accordance with CAN/CSA-S16 and in accordance with approved reviewed shop drawings.
- .2 Continuously seal members by continuous welds.
- .3 Provide holes in flanges for attachment of wood nailers.

2.03 SHOP PAINTING

- .1 Exposed fabrications shall receive coating system specified for Salvaged Door Hardware.
- .2 Clean, prepare surfaces and shop prime structural steel in accordance with CAN/CSA-S16 except where members to be encased in concrete.
- .3 Clean members, remove loose mill scale, rust, oil, dirt and foreign matter. Prepare surface according to NACE No.3/SSPC-SP-6.
- .4 Apply one coat of primer in shop to steel surfaces except:
 - .1 Surfaces and edges to be field welded.
 - .2 Faying surfaces of slip-critical connections.
 - .3 Below grade surfaces in contact with soil.
- .5 Apply paint under cover, on dry surfaces when surface and air temperatures are above 5 degrees C.
- .6 Maintain dry condition and 5 degrees C minimum temperature until paint is thoroughly dry.
- .7 Strip paint from bolts, nuts, sharp edges and corners before prime coat is dry.

3 EXECUTION

3.01 APPLICATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.02 GENERAL

- .1 Structural steel work: in accordance with CAN/CSA-S16.
- .2 Welding: in accordance with CSA W59.
- .3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion

welding of steel structures and/or CSA W55.3 for resistance welding of structural components.

3.03 CONNECTION TO EXISTING WORK

- .1 Expose and verify dimensions and condition of existing work, report discrepancies and potential problem areas to Departmental Representative for direction before commencing Shop Drawings and fabrication.

3.04 ERECTION

- .1 Erect structural steel, as indicated and in accordance with CAN/CSA-S16 and in accordance with reviewed erection drawings.
- .2 Field cutting or altering structural members: to approval of Departmental Representative.
- .3 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.
- .4 Continuously seal members by continuous welds where indicated. Grind smooth.

3.05 FIELD QUALITY CONTROL

- .1 Inspection and testing of materials and workmanship will be carried out by testing laboratory designated by Departmental Representative.
- .2 Provide safe access and working areas for testing on site, as required by testing agency and as authorized by Departmental Representative.
- .3 Submit test reports to Departmental Representative.

3.06 FIELD PAINTING

- .1 Paint in accordance with Section 09 91 23 - Interior Painting.
 - .1 Touch up damaged surfaces and surfaces without shop coat with primer to NACE No.3/SSPC-SP-6 except as specified otherwise. Apply in accordance: MPI Architectural Painting Specification Manual.

3.07 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal 01 35 21 - LEED Requirements.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 05 73 13 - Decorative Steel Mesh Balustrades.
- .2 Section 06 20 00.01 - Interior Finish Carpentry.
- .3 Section 09 64 00 - Wood Flooring.
- .4 Section 09 91 23 - Interior Painting.

1.2 REFERENCES

- .1 ASTM International, (ASTM)
 - .1 ASTM A53/A53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A123/A123M-15 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .3 ASTM A153/A153M-16, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - .4 ASTM A153/A153M-16, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - .5 ASTM A269/A269M-15a Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - .6 ASTM A276-16a, Standard Specification for Stainless Steel Bars and Shapes.
 - .7 ASTM A307-14, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .8 ASTM A325M-14, Specification for Structural Bolts, Steel, Heat Treated, 830 MPa Minimum Tensile Strength (Metric).
 - .9 ASTM A500/A500M-13, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - .10 ASTM A653/A653M-13, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .11 ASTM A738/A738M-12a, Standard Specification for Pressure Vessel Plates, Heat-Treated, Carbon-Manganese-Silicon Steel, for Moderate and Lower Temperature Service.
 - .12 ASTM A747/A747M-16a, Standard Specification for Steel Castings, Stainless, Precipitation Hardening.

- .13 ASTM A1064/A1064M-16, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- .14 ASTM E488/E488M-15, Standard Test Methods for Strength of Anchors in Concrete Elements.
- .15 ASTM F593-13ae1, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
- .2 Canadian Institute of Steel Construction (CISC)
 - .1 Code of Standard Practice for Structural Steel, 2010.
 - .2 Guide for Specifying Architecturally Exposed Steel, 2nd Edition.
 - .3 Handbook of Steel Construction - 11th Edition.
 - .4 Limit States Design in Structural Steel, 9th Edition.
 - .5 Steel Fabrication Quality Systems Guideline, 2nd Edition with Commentary.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel, Includes Update No. 1 (2014).
 - .2 CSA S16-14, Design of Steel Structures.
 - .3 CSA W59-13, Welded Steel Construction (Metal Arc Welding), Includes Update No. 1 (2014), Update No. 3 (2015), Update No. 4 (2015).
 - .4 CSA W47.1-09 (R2014), Certification of companies for fusion welding of steel.
 - .5 CSA W48-14, Filler metals and allied materials for metal arc welding.
- .4 National Association of Architectural Metal Manufacturers (NAAMM)
 - .1 NAAMM AMP 500-06, Metal Finishes Manual.
 - .2 NAAMM AMP 510-92, Metal Stair Manual.
 - .3 NAAMM AMP 521-01 (R2012), Pipe Railing Systems Manual.
 - .4 NAAMM AMP 555-92, Code of Standard Practice for the Architectural Metal Industry.
- .5 SAE International (The Society of Automotive Engineers)
 - .1 SAE steel grades.
- .6 Steel Structures Painting Council (SSPC), Systems and Specifications Manual, Volume 2.

1.3 DEFINITIONS

- .1 Usage Classifications: NAAMM AMP 510 provides four usage classifications for finishing of metal stair and railing systems. The following applies to this Contract:
 - .1 Architectural Class: NAAMM Architectural Class stairs shall serve as an architectural feature where appearance and finish are of prime importance.

1.4 REGULATORY REQUIREMENTS

- .1 Work shall meet or exceed the following regulatory requirements; comply with the Specifications; in cases of perceived conflict, the more stringent requirement applies.
 - .1 Ontario Building Code 2012 and Amendments.
 - .2 All Federal, Provincial, Regional and Municipal laws, regulations, ordinances and by-laws pertaining to the Work shall apply for the duration of the project.
 - .3 *Standards and Guidelines for Conservation of Historic Places in Canada*, 2nd Edition.

1.5 COORDINATION

- .1 Integrate and coordinate Work of Section 05 73 13 - Decorative Steel Mesh Balustrades, Section 06 20 00.01 - Interior Finish Carpentry: hardwood planks (treads and landings), and Section 09 64 00 - Wood Flooring: wood finishing.

1.6 PRE-INSTALLATION MEETINGS

- .1 Pre-Installation Meetings: convene pre-installation meeting to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Coordination with other building trades.
 - .4 Review manufacturer's installation instructions.

1.7 SUBMITTALS

- .1 Submit in accordance with Division 01 General Requirements: Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheets.
- .3 Shop Drawings:
 - .1 Indicate construction details, sizes of metal sections, and thickness of metal sheet. Include connections to other materials, such as steel mesh balustrades and hardwood plank treads and landings.
 - .2 Indicate fasteners, welds and connection details between stringers; treads; risers; headers; newels; platforms; struts, columns and hangers; railings; balusters; pickets; handrails; brackets; reinforcements; anchors; and welded and bolted connections.
 - .3 Submit shop drawings bearing stamp of a qualified professional engineer registered in Province of Ontario.

1.8 QUALITY ASSURANCE

- .1 Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Qualifications:
 - .1 Use a fabricator experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
 - .2 Welders shall be qualified by Canadian Welding Bureau for classification of Work being performed.
 - .3 Welding of load supporting components shall be performed by companies certified by Canadian Welding Bureau in accordance with CSA W47.1.

.4 Delegated Design:

- .1 Retain a Professional Engineer, registered in the Province of the Ontario, to design fabrication and erection of the work of this section in accordance with Ontario Building Code 2012 and Amendments, and the requirements of this specification section. Sign and seal shop drawings and design submittals. Review installations.

.5 Welding:

- .1 Welders shall be qualified by Canadian Welding Bureau for classification of work being performed.
- .2 The fabricator shall be certified to CSA W47.1 or CSA W47.2 as required.
- .3 Welding inspection: to CSA W178.
- .4 Resistance welding: to CSA W55.3.
- .5 Fusion / Metal Arc welding: to CSA W59.
- .6 Stainless steel:
 - .1 Weld stainless steel by the electric arc process, to CSA W59.
 - .2 Use electrodes compatible with and of the same properties as the stainless steel. Grind smooth and polish to match finish.
 - .3 Structural stainless steel welding: to AWS D1.6/D1.6M.
 - .4 Stainless steel tube and pipe: to AWS D18.1/D18.1M.

1.9 DELIVERY, STORAGE, AND HANDLING

- .1 Store materials in a location and manner to avoid damage; stack materials to prevent bending or applying stress to components; keep handling of materials on-site to a minimum.
- .2 Store components and materials in clean, dry location, away from uncured concrete or masonry; cover with waterproof paper, tarpaulin, or polyethylene sheeting in a manner that permits air circulation inside of covering.
- .3 Correct damaged material and where damage is deemed irreparable by the Departmental Representative, replace the affected item at no additional expense to the Parks Canada Agency.

- .4 Apply protective covering to face of all exposed finished metalwork before it leaves shop, covering to remain until item installed and ready for final finishing.
- .5 Fabricate large assemblies so they can be safely and easily transported and handled to their place of installation.

Part 2 Products

2.1 PERFORMANCE AND DESIGN CRITERIA

- .1 Provide delegated design as required.
- .2 Design Requirements:
 - .1 Design metal stair, balustrade, railing, and landing construction and connections in accordance with Ontario Building Code 2012 and Amendments for vertical and horizontal live load requirements.
 - .2 Detail stairs to NAAMM Metal Stairs Manual.
 - .3 Minimum performance requirements for balustrades:
 - .1 Support uniform load of 50 pounds per linear foot (0.73 kN/M) applied in any direction.
 - .2 Support concentrated load of 200 pounds (0.89 kN) applied at any point in any direction.
 - .3 These loads need not to be assumed to act concurrently.
 - .3 Comply with CISC Code of Standard Practice for Structural Steel, Appendix I, Architecturally Exposed Structural Steel.
 - .4 Fabricate and finish metal assemblies in accordance with CISC Guide for Specifying Architecturally Exposed Steel: to AESS 3 *Feature Elements* (see Table 1 - AESS Category Matrix).

2.2 MATERIALS

- .1 Steel sections and plates: to CAN/CSA G40.20/G40.21, Grade 300W.
- .2 Hollow structural sections: to CAN/CSA G40.20/G40.21, Grade 350W, Class C.
- .3 Structural steel: to CAN/CSA G40.20/G40.21, grade 350W.
- .4 Steel tubing: to ASTM A500, shapes and configuration as indicated, 6 mm wall thickness, sizes and dimensions as indicated.
- .5 Welding materials: to CSA W59.
- .6 Welding electrodes: to CSA W48.

- .7 Fasteners: Bolts, nuts, washers, rivets, lock washers, anchor bolts, machine screws, and machine bolts.
 - .1 Unfinished fasteners: In areas not exposed to public, use unfinished bolts conforming to ASTM A307, Grade A, with hexagon heads and nuts. Supply bolts of lengths required to suit the thickness of the material being joined, but not projecting more than 6 mm beyond nut, without the use of washers.
 - .2 Finished fasteners:
 - .1 In areas exposed to public use, bolts, nuts, washers, rivets, lock washers, anchor bolts, machine screws and machine bolts to be hot dip galvanized in accordance with ASTM A153/A153M.
 - .2 For joining stainless steel components use stainless steel fasteners of same type.
- .8 Structural bolts: to ASTM A325.
- .9 Emulsified asphalt protective coating for metals: to ASTM D1187/D1187M.
- .10 Coordinate and cooperate with other trades as required for a complete construction in compliance with the Construction Schedule.

2.3 **HARDWOOD MATERIALS**

- .1 Hardwood planks (treads, landings), to Section 06 20 00.01 - Interior Finish Carpentry; coordinate with other trades as required.
 - .1 Dimensions: in accordance with Contractor's delegated design engineered shop drawings. Tread and landing hardwood planks shall be dimensioned to prevent trip hazards in coordination with other trades.

2.4 **FABRICATION - GENERAL**

- .1 Fabricate in accordance with NAAMM, Metal Stair Manual. Finish in accordance with in accordance with CISC Guide for Specifying Architecturally Exposed Steel: to AESS 3 *Showcase Elements* (see Table 1 - AESS Category Matrix).
- .2 Fabricate in compliance with Ontario Building Code 2012 and Amendments.
- .3 Weld connections where possible, otherwise bolt connections. Countersink exposed fastenings, cut off bolts flush with nuts. Make exposed connections of same material, colour and finish as base material on which they occur.
- .4 Accurately form connections with exposed faces flush.
 - .1 Make mitres and joints tight.

- .2 Make risers of equal height.
- .5 Grind or file exposed welds and steel sections smooth.
- .6 Shop-fabricate stairs in sections as large and complete as practicable.
- .7 Insulate dissimilar materials to prevent electrolysis arising from metal to metal contact or metal to masonry or concrete contact; use bituminous paint or other acceptable method acceptable to Departmental Representative.

2.5 STEEL STAIRS WITH HARDWOOD TREADS AND LANDINGS

- .1 Refer to Structural Drawings and specifications.
- .2 Fabricate stairs with open riser construction, framing designed for insertion of hardwood treads.
- .3 Secure hardwood treads to L 35 x 35 x 5 horizontal members welded to stringers.
- .4 Form wall stringers from MC 310 x 15.8.
- .5 Form outer stringers from MC 310 x 15.8 with 5 mm thick plate fascia welded on.
- .6 Extend stringers around mid-landings to form steel framing for hardwood decking. Support hardwood decking with L 55 x 55 x 6 mm framing.
- .7 Close ends of stringers where exposed.

2.6 BALUSTRADES

- .1 Balustrades: to Section 05 73 13 - Decorative Steel Mesh Balustrades; configurations and profiles as indicated.

2.7 RAILINGS

- .1 Railing materials: stainless steel in accordance with this Section 05 51 29.01, configurations and profiles as indicated, and coordinated to match similar elements of balustrades.
- .2 Cap and weld railing exposed ends.
- .3 Terminate railings at abutting wall with end flange.
- .4 Fabricate railings to NAAMM Metal Stair Manual, Ontario Building Code 2012 and Amendments.
- .5 Fabricate handrail assembly components to lengths and configurations complying with engineered shop drawings.
- .6 Machine joint edges smooth and plane to produce hairline seams when site assembled; supply concealed sleeve connectors for joints.

- .7 Fabricate work square, true straight and accurate to required size, with joints closely fitted and properly secured.
- .8 Where work of other Sections is attached to work of this section, prepare work by drilling and tapping holes as required facilitating installation of such work.

2.8 ACCESSORIES

- .1 Internal handrail connection sleeves: steel tube, material to match railing.
- .2 Railing Wall Brackets: constructed of same material as railing with rod and mounting flange, purpose-made to suit application. Match finish of railing.
- .3 Sealants: in accordance with Section 07 90 00.01 - Interior Joint Sealants.

2.9 SHOP PREPARATION - STEEL

- .1 Prepare and prime steel materials to Section 09 91 23 - Interior Painting.
- .2 Do not coat surfaces to be field welded.

2.10 FINISHING - STEEL

- .1 Prepare, prime and finish steel materials to Section 09 91 23 - Interior Painting.

2.11 FINISHING - HARDWOOD TREADS AND LANDINGS

- .1 Finishing: to Section 09 64 00 - Wood Flooring: finishing.

Part 3 Execution

3.1 EXAMINATION

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

3.2 PREPARATION

- .1 Provide anchorage devices and fasteners to other trades as necessary for securing metal stairs, railings and ladders to structure; include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors as required.
- .2 Perform cutting, drilling, and fitting required for erection.
- .3 Field check and verify that structural framing, enclosures, weld plates, blocking, and that size and location of pockets are placed in accordance with engineered and stamped shop drawings.
- .4 Report discrepancies to Departmental Representative, and recommend corrective action by responsible parties.
- .5 Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- .6 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates and instructions for installation.

3.3 ERECTION

- .1 Compliance: comply with Ontario Building Code 2012 and Amendments, CSA S16, Code of Standard Practice for Structural Steel, and NAAMM, Metal Stair Manual.
- .2 Install plumb and true in required locations, using welded connections wherever possible to provide rigid structure. Provide anchor bolts, bolts and plates for connecting stairs and railings to structure.
- .3 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
- .4 Do welding work in accordance with CSA W59 unless specified otherwise.
- .5 Touch-up shop primer and galvanized finish to bolts, welds, and burned or scratched surfaces at completion of erection.
- .6 Install hardwood treads and landings for a complete installation; coordinate with other trades as required. Installation shall meet Code.
 - .1 Allow for expansion and contraction of hardwood material in design and fabrication.
 - .2 Method of fastening to be by hidden fastening system.

- .3 Completed installation shall not be subject to creaking, popping, squishy, bouncy, or sea saw effects.
- .4 Ensure hardwood installation meets site conditions for temperature and relative humidity, in accordance with Section 09 64 00 - Wood Flooring, article 1.8 Environmental Requirements.

3.4 **CLEANING**

- .1 Progress Cleaning: clean in accordance with Division 01 General Requirements: Cleaning. Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Division 01 General Requirements: Cleaning. Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Division 01 General Requirements: Construction/Demolition Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 **PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 05 51 29.01 - Interior Metal Stairs.
- .2 Section 06 40 00 - Architectural Woodwork.

1.2 REFERENCES

- .1 American Architectural Manufacturers Association (AAMA)
 - .1 AAMA CW-12-84, Structural Properties of Glass.
- .2 ASTM International (ASTM)
 - .1 ASTM A307-14, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .2 ASTM A325M-14, Specification for Structural Bolts, Steel, Heat Treated, 830 MPa Minimum Tensile Strength (Metric).
 - .3 ASTM D1187/D1187M-97(2011)e1, Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
 - .4 ASTM E488/E488M-10, Standard Test Methods for Strength of Anchors in Concrete Elements.
 - .5 ASTM E2358-04(2010), Standard Specification for the Performance of Glass in Permanent Glass Railing Systems, Guards, and Balustrades.
 - .6 ASTM F468-12, Standard Specification for Nonferrous Bolts, Hex Cap Screws, Socket Head Cap Screws, and Studs for General Use.
- .3 Canadian Institute of Steel Construction (CISC)
 - .1 Code of Standard Practice for Structural Steel, 2010.
 - .2 Guide for Specifying Architecturally Exposed Steel, 2nd Edition.
 - .3 Handbook of Steel Construction - 11th Edition.
 - .4 Limit States Design in Structural Steel, 9th Edition.
 - .5 Steel Fabrication Quality Systems Guideline, 2nd Edition with Commentary.
- .4 Canadian Standards Association (CSA International)
 - .1 CSA C22.2 NO. 60-M1990 (R2006), Arc Welding Equipment.
 - .2 CAN/CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .3 CSA S16-14, Design of Steel Structures.

- .4 CSA W47.1-09, Certification of companies for fusion welding of steel, Includes Update No. 3 (2011), Update No. 5 (2012).
- .5 CSA W48-06 (R2011), Filler metals and allied materials for metal arc welding.
- .6 CSA W55.3-08, Certification of companies for resistance welding of steel and aluminum.
- .7 CSA W59-13, Welded Steel Construction (Metal Arc Welding), Includes Update No. 1 (2014), Update No. 3 (2015).
- .8 CSA W178.2-08 (R2013), Certification of Welding Inspectors.
- .5 SAE International (The Society of Automotive Engineers)
 - .1 SAE steel grades.

1.3 REGULATORY REQUIREMENTS

- .1 Work shall meet or exceed the following regulatory requirements; comply with the Specifications; in cases of perceived conflict, the more stringent requirement applies.
 - .1 Ontario Building Code 2012 and Amendments.
 - .2 All Federal, Provincial, Regional and Municipal laws, regulations, ordinances and by-laws pertaining to the Work shall apply for the duration of the project.
 - .3 *Standards and Guidelines for Conservation of Historic Places in Canada*, 2nd Edition.

1.4 SYSTEM DESCRIPTION

- .1 Minimum Performance Requirements for Guard Assembly (Balustrade):
 - .1 Support uniform load of 50 pounds per linear foot (0.73 kN/M) applied in any direction.
 - .2 Support concentrated load of 200 pounds (0.89 kN) applied at any point in any direction.
 - .3 These loads need not to be assumed to act concurrently.

1.5 PRODUCTS SUPPLIED BUT NOT INSTALLED UNDER THIS SECTION

- .1 Supply decorative steel mesh balustrades for installation as part of the metal stair assembly, to Section 05 51 29.01 - Interior Metal Stairs.
- .2 Supply decorative steel mesh swing cabinet doors and hardware (hinges, etc.) for installation as part of the cabinetry work: coordinate and cooperate with Section 06 40 00 - Architectural Woodwork.
- .3 Supply following products for installation under other Sections:
 - .1 Screws, fasteners, anchor bolts, bearing plates, sleeves and other components for a complete installation and/or to be built into other construction and required for anchorage and support of fabricated steel components.
 - .2 Fabricated steel components to be built into other construction.

1.6 PRODUCTS SUPPLIED BY OTHER SECTIONS AND INSTALLED UNDER THIS SECTION

- .1 Incorporate into the construction cabinet swing door hardware as required, supplied by Section 06 40 00 - Architectural Woodwork.

1.7 COORDINATION

- .1 Coordinate this Work with the remainder of the Work and exercise the necessary scheduling to ensure that all Work is carried out and all items incorporated during the appropriate construction phase.
- .2 Provide instructions, templates and drawings to other trades for setting bearing plates, anchors bolts, inserts, and components that are built in to Work of other trades.
- .3 Protect other Sections of the Work from damage by this Section of the Work.

1.8 PRE-INSTALLATION MEETINGS

- .1 Pre-Installation Meetings: convene pre-installation meeting in accordance with Division 01 General Requirements: Project Meetings to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Coordination with other building trades.

1.9 SUBMITTALS

- .1 Submit under the provisions of Division 01 General Requirements: Submittal Procedures.
- .2 Submit manufacturer's printed product literature, printed installation instructions, standard details, specifications, and data sheets.
- .3 Submit shop drawings: Dimensioned drawings of railing assemblies indicating the following:
 - .1 Elevations; include joint locations, transitions, and terminations.
 - .2 Support layout, details and attachment to support structure.
 - .3 Manufacturer's installation and maintenance instructions.
 - .4 Submit shop drawings bearing stamp of a qualified professional engineer registered in Province of Ontario.
- .4 Submit engineering design report: Calculations showing point support reactions and glass stresses.
- .5 Samples of manufacturer's finishes for initial selection and quality assurance.

1.10 QUALITY ASSURANCE

- .1 Delegated Design:
 - .1 Retain a Professional Engineer, registered in the Province of Ontario, to design fabrication and erection of the work of this section in accordance with Ontario Building Code 2012 and Amendments, and the requirements of this specification section. Sign and seal shop drawings and design submittals. Review installations.
- .2 Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
- .3 Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .4 Qualifications:
 - .1 Use a fabricator experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

- .2 Welders shall be qualified by Canadian Welding Bureau for classification of Work being performed.
- .3 Welding of load supporting components shall be performed by companies certified by Canadian Welding Bureau in accordance with CSA W47.1.
- .5 Welding:
 - .1 Welders shall be qualified by Canadian Welding Bureau for classification of work being performed.
 - .2 The fabricator shall be certified to CSA W47.1 or CSA W47.2 as required.
 - .3 Welding inspection: to CSA W178.
 - .4 Resistance welding: to CSA W55.3.
 - .5 Fusion / Metal Arc welding: to CSA W59.

1.11 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver materials properly protected against damage to finished surfaces during transit.
- .2 Inspect materials upon delivery for damage. Unless minor defects can be made to meet the Architect's specifications and satisfaction, damaged parts shall be removed and replaced.
- .3 Store materials in a location and manner to avoid damage; stack materials to prevent bending or applying stress to components; keep handling of materials on site to a minimum.
- .4 Store components and materials in clean, dry location, away from uncured concrete or masonry; cover with waterproof paper, tarpaulin or polyethylene sheeting in a manner that permits air circulation inside of covering.
- .5 Correct damaged material and where damage is deemed irreparable by the Departmental Representative, replace the affected item at no additional expense to the Parks Canada Agency.
- .6 Apply protective covering to face of all exposed finished metalwork before it leaves shop, covering to remain until item installed and ready for final finishing.
- .7 Fabricate large assemblies so they can be safely and easily transported and handled to their place of installation. Pre-assemble railings prior to shipping to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and for coordination with shop drawings.

Part 2 Products

2.1 PERFORMANCE AND DESIGN CRITERIA

- .1 Provide delegated design as required.
- .2 Design balustrades and connections to Ontario Building Code 2012 and Amendments for vertical and horizontal live load requirements.
- .3 Design to CSA S16, ASTM E2358, and AAMA CW-12-84.
- .4 Comply with CISC Code of Standard Practice for Structural Steel.
- .5 Fabricate and finish balustrades in accordance with CISC Guide for Specifying Architecturally Exposed Steel: to AESS 4 *Showcase Elements* (see Table 1 - AESS Category Matrix).

2.2 MATERIALS

- .1 Steel sections and plates: to CAN/CSA G40.20/G40.21, Grade 300W.
- .2 Hollow structural sections: to CAN/CSA G40.20/G40.21, Grade 350W, Class C.
- .3 Structural steel: to CAN/CSA G40.20/G40.21, grade 350W.
- .4 Steel tubing: to ASTM A500, shapes and configuration as indicated, 6 mm wall thickness, sizes and dimensions as indicated.
- .5 Welding materials: to CSA W59.
- .6 Welding electrodes: to CSA W48.
- .7 Fasteners: Bolts, nuts, washers, rivets, lock washers, anchor bolts, machine screws, and machine bolts.
 - .1 Unfinished fasteners: In areas not exposed to public, use unfinished bolts conforming to ASTM A307, Grade A, with hexagon heads and nuts. Supply bolts of lengths required to suit the thickness of the material being joined, but not projecting more than 6 mm beyond nut, without the use of washers.
 - .2 Finished fasteners:
 - .1 In areas exposed to public use, bolts, nuts, washers, rivets, lock washers, anchor bolts, machine screws and machine bolts to be hot dip galvanized in accordance with ASTM A153/A153M.
- .8 Structural bolts: to ASTM A325.
- .9 Emulsified asphalt protective coating for metals: to ASTM D1187/D1187M.

- .1 Coordinate and cooperate with other trades as required for a complete construction in compliance with the Construction Schedule.

2.3 WELDED WIRE MESH BALUSTRADES AND CABINET SWING DOORS

- .1 Steel tubing:
 - .1 Profiles: as indicated.
 - .2 Material: steel.
 - .3 Finish: clear coated.
- .2 Material: steel welded mesh, hardware and accessories as required for a complete installation.
- .3 Locations: as indicated.
- .4 Fabricate associated components from steel materials, sizes as required to suit engineered design shop drawings.
- .5 Edge Requirements: flush-edge, trimmed.
- .6 Basis-of-Design for welded wire mesh:
 - .1 Manufacturer: Cambridge Architectural or approved similar, matching design, with same or better physical properties and performance characteristics.
 - .1 Style: Chaos.

2.4 ACCESSORIES

- .1 Internal connection sleeves: steel tube, material to match balustrade.

2.5 FABRICATION

- .1 Fabricate in accordance with NAAMM, Metal Stair Manual. Finish in accordance with in accordance with CISC Guide for Specifying Architecturally Exposed Steel: to AESS 3 *Showcase Elements* (see Table 1 - AESS Category Matrix).
- .2 Fabricate in compliance with Ontario Building Code 2012 and Amendments.
- .3 Fabricate assembly components to dimensions, profiles and configurations complying with engineered shop drawings, and in compliance with the Contract Drawings.
- .4 Shop-fabricate balustrades in sections as large and complete as practicable.
- .5 Machine joint edges smooth and plane to produce hairline seams when site assembled; supply concealed sleeve connectors for joints as required.

- .6 Weld connections where possible, otherwise bolt connections. Countersink exposed fastenings, cut off bolts flush with nuts. Make exposed connections of same material, colour and finish as base material on which they occur.

2.6 FINISHING

- .1 Prepare, prime and finish steel materials to Section 09 91 23 - Interior Painting.

Part 3 Execution

3.1 INSTALLATION

- .1 Supply steel mesh balustrades to Section 05 51 29.01 for incorporation into the stair assembly.
- .2 Supply steel mesh swing doors to Section 06 40 00 - Architectural Woodwork for incorporation into the casework.
- .3 Coordinate as required to maintain construction schedule.

3.2 CLEANING

- .1 Progress Cleaning: clean in accordance with Division 01 General Requirements: Cleaning. Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Division 01 General Requirements: Cleaning. Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Division 01 General Requirements: Construction/Demolition Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.3 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section includes requirements for interior wood restoration.

1.2 RELATED SECTIONS

- .1 Section 09 91 23 - Interior Painting.

1.3 REFERENCES

- .1 Architectural Woodwork Manufacturers Association of Canada (AWMAC) - Quality Standards for Architectural Woodwork.
- .2 ASTM F1667-15, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- .3 CSA 0115-M, Hardwood and Decorative Plywood.
- .4 CAN/CSA 0141, Softwood Lumber.
- .5 CSA 0151-M, Canadian Softwood Plywood.

1.4 REGULATORY REQUIREMENTS

- .1 Work shall meet or exceed the following regulatory requirements; comply with the Specifications; in cases of perceived conflict, the more stringent requirement applies.
 - .1 Ontario Building Code 2012 and Amendments.
 - .2 All Federal, Provincial, Regional and Municipal laws, regulations, ordinances and by-laws pertaining to the Work shall apply for the duration of the project.
 - .3 *Standards and Guidelines for Conservation of Historic Places in Canada*, 2nd Edition.

1.5 REPAIR INTENT

- .1 The intent of the work is to make existing interior woodwork sound, stable, and properly connected while conserving the maximum amount of material and its existing character.
- .2 As far as is possible, original woodwork is to be repaired instead of replaced.
- .3 Obtain approval from Departmental Representative for any areas or components needing replacement not identified which are revealed in the course of the work.
- .4 Fabricate replacement parts to the original profiles and sizes.
- .5 Ensure that the trades people understand these conditions and the approach required for the work.

- .6 Undertake repair of one representative example of each element as agreed with Departmental Representative for approval before continuing repair work.

1.6 MOCK-UPS

- .1 Provide a mock-up on site of restoration techniques for approval of the Departmental Representative.
- .2 Agree upon locations with Departmental Representative.
- .3 Review completed mock-ups with the Departmental Representative.
- .4 The accepted mock-ups shall become the standard method of assembly used on the job. Do not make changes without the written approval of the Departmental Representative.

1.7 ACCEPTANCE AT SITE

- .1 Identify lumber by grade stamp of an agency certified by Canadian Lumber Standards Administration Board, to National Lumber Grades Authority standards.
- .2 Use shed stock with maximum moisture content of 12% for exterior, 7% for interior, at time of installation.

1.8 QUALIFICATIONS

- .1 Execute all work in this Section under the continuous supervision and direction of a qualified trades person.
- .2 Where applicable, perform finish carpentry work in accordance with Architectural Woodwork Manufacturers' Association of Canada (AWMAC) Custom Quality.
- .3 Wood restoration subcontractors shall have minimum 5-years proven and documented experience in heritage wood restoration work performed under the review authority of a professional member in good standing of the Canadian Association of Heritage Professionals.

1.9 STORAGE AND PROTECTION

- .1 Keep material dry during delivery. Store lumber in a dry place indoors and protect from injury.

Part 2 Products

2.1 MATERIALS

- .1 Lumber generally:
 - .1 Use lumber conforming to CSA O141.
 - .2 Identify lumber by grade stamp of an agency certified by Canadian Lumber Standards Administration Board, to National Lumber Grades Authority standards.
 - .3 Use shed stock with maximum moisture content of 7% for interior use at time of installation.
 - .4 Douglas Fir, equivalent to No. 1 & 2 Select rift sawn.

2.2 ACCESSORIES

- .1 Nails, generally:
 - .1 In conformance with ASTM F1667, hot-dipped galvanized, spiral-shank nails for exterior work and treated lumber;
- .2 Bolts, nuts, washers, lags and screws, generally:
 - .1 Medium carbon steel, hot-dip galvanized coating, size and type to suit application;
- .3 Adhesive: waterproof, synthetic, resinous type.
- .4 Wood preservative surface application:
 - .1 To CSA O80M, clear copper naphthanate solution, or clear zinc naphthenate brush application.
- .5 Epoxy Wood Consolidant:
 - .1 PC-Rot Petrifier by PC-Products, contact by tel: (800) 220-2103, Consolidant 100 by Conserv Epoxy LLC, contact tel (203) 484-4123, LiquidWood by Abatron, contact tel: 1-800-445-1754 or approved equal.
- .6 Epoxy Wood Filler:
 - .1 PC-Woody Epoxy Paste by PC-Products, contact by tel: (800) 220-2103, Patch 200 by Conserv Epoxy LLC contact tel (203) 484-4123, WoodEpoxy by Abatron, contact tel: 1-800-445-1754 or approved equal. Note: only epoxy-based wood fillers will be accepted.

2.3 FABRICATION

- .1 Fabricate replacement parts to match existing in length, section and profile. Use as far as possible the original methods of attachment.
- .2 Fabricate replacement mouldings with sharp true profiles, to match existing exactly.

2.4 TOLERANCES

- .1 Fabrication: custom cut members: 1mm (1/32") different maximum, from existing.
- .2 Installation: alignment at joints: 1mm (1/32") different maximum, from existing.

Part 3 Execution

3.1 EXAMINATION

- .1 Take site measurements of construction to which work of this Section must conform.
- .2 Cooperate with Work of other Sections to ensure; fastenings set by others are provided and located, their work is installed to their specifications and that those responsible for back priming are notified in sufficient time for them to schedule work.

3.2 PREPARATION

- .1 Carefully dismantle and retain all woodwork where specified for replacement.
- .2 Review dismantled components on site with Departmental Representative prior to commencement of work.
- .3 Salvage good examples of each available wood element to use as basis for replication.
- .4 Report any other deterioration, damage or missing components uncovered in the course of the work to the Departmental Representative. Await Departmental Representative's instructions before proceeding with any additional work.

3.3 INSTALLATION TOLERANCE

- .1 Fabrication: custom cut members: 1 mm (1/32") different maximum, from existing.
- .2 Installation: alignment at joints: 1 mm (1/32") different maximum, from existing.

3.4 INSTALLATION

- .1 General:
 - .1 Install new work / replacement pieces to align with existing and as far as possible plumb, square, level and straight and fasten it securely to backing to support itself and anticipated superimposed loads.

- .2 Install small repairs plumb, square and level except where joining up to irregular existing fabric.
- .3 Join work with square ends and only over solid backing. Use material in lengths as long as possible.
- .4 Use only adhesives and fastenings that develop sufficient strength for intended use, which are non-staining, and are unaffected by the environment to which exposed.
- .2 Cutting and Fitting:
 - .1 Cut mouldings with sharp true profiles.
 - .2 Cope trim and mouldings at interior corners and at returns.
 - .3 Mitre trim and mouldings at exterior corners and at returns.
 - .4 Scribe and joint work accurately together, and to other work, to fit tightly and with flat smooth surfaces.
 - .5 Install trim or filler panels to close gaps.
 - .6 Lightly ease all exposed corners.
- .3 Fastening:
 - .1 Fasten work with nails generally, but use screws or special fasteners at critical joints where strain, usage and excessive shrinkage are anticipated, and where specified quality grade standards require.
 - .2 Blind nail wherever possible.
 - .3 Set finishing nails below finished surfaces to receive putty.
- .4 Finishing:
 - .1 Fill all nail holes and surface damage with specified wood filler.
 - .2 Fine sand wood after installation to leave surfaces smooth, level, in true planes and free of machine or tool marks.
 - .3 Paint and preparation for painting as directed, Section 09 91 23 - Interior Painting.

3.5 EPOXY WOOD CONSOLIDANT APPLICATION

- .1 Provide dry, clean surface removing all dry rot, dirt, saw dust or loose paint. Remove existing paint and/or varnish to increase acceptance of consolidant by wood.
- .2 For vertical surfaces drill small holes in wood on angle to hold consolidant.

- .3 Apply mixture by pouring and brushing onto the wood surface until damaged area is fully saturated. The applicator bottle can be used to inject into drilled holes or larger openings in the wood. Consolidant will readily follow grain of wood. Apply wood consolidant while absorption continues.
- .4 Epoxy wood consolidant to be used only on repairs that are less than 50 mm x 50 mm (2" x 2") in area.

3.6 EPOXY WOOD FILLER APPLICATION

- .1 Provide dry, clean surface removing all dry rot, dirt, saw dust or loose paint.
- .2 Where rotted wood is present, remove or encapsulate with epoxy consolidant before applying epoxy wood filler.
- .3 Use screen wire or wood blocks to bridge or reinforce larger holes.
- .4 Using separate knives to remove equal amount needed, mix equal parts of A (off-white) and B (light brown) on flat surface until uniform tan colour. Mixing for a longer period of time will assure better performance.
- .5 For best results, allow 15 - 20 minutes of standing time after application before roughly shaping and moulding.
- .6 Form mould profiles to match existing wood profiles and / or as indicated on drawings.
- .7 Let filler cure. Full cure achieved in 3-7 days. Cured epoxy can be worked and tooled similar to real wood.
- .8 Sanding can generally take place within 1-2 days - premature sanding will gum up sand paper. Always sand with wood grain.

3.7 CLEAN UP

- .1 Remove all debris resulting from work of this section from site.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section includes requirements for framing and rough carpentry work.

1.2 RELATED SECTIONS

- .1 Section 03 31 00.10 - Heritage Concrete.
- .2 Section 05 51 29.01 - Interior Metal Stairs.
- .3 Section 06 20 00.01 - Interior Finish Carpentry.
- .4 Section 06 40 00 - Architectural Woodwork.
- .5 Section 07 21 13.01 - Interior Fibrous Insulation.
- .6 Section 08 20 00.01 - Interior Wood Doors.
- .7 Section 09 64 00 - Wood Flooring.
- .8 Section 10 28 10 - Toilet Accessories.

1.3 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI/NPA A208.1-2009, Particleboard.
 - .2 ANSI A208.2-2009, Medium Density Fibreboard (MDF) for Interior Applications.
- .2 ASTM International (ASTM)
 - .1 ASTM A307-12, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .2 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .3 ASTM C954-11, 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
 - .4 ASTM D1165-13, Standard Nomenclature of Commercial Hardwoods and Softwoods.
 - .5 ASTM D1761-12, Standard Test Methods for Mechanical Fasteners in Wood.
 - .6 ASTM D3931-08(2015), Standard Test Method for Determining Strength of Gap-Filling Adhesive Bonds in Shear by Compression Loading.
 - .7 ASTM D5055-12, Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.

- .8 ASTM D5456-14b, Standard Specification for Evaluation of Structural Composite Lumber Products.
- .9 ASTM D5572-95(2012), Standard Specification for Adhesives Used for Finger Joints in Nonstructural Lumber Products.
- .10 ASTM D5751-99(2012), Standard Specification for Adhesives Used for Laminate Joints in Nonstructural Lumber Products.
- .11 ASTM E1333-10, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber.
- .12 ASTM F1667-15, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- .3 American Wood Preservers Association (AWPA):
 - .1 AWPA Book of Standards, 2012
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-11.3-M87, Hardboard.
 - .2 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
 - .3 CAN/CGSB-51.34-M86 Amend., Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
 - .4 CAN/CGSB-71.26-M88, Adhesive for Field-Gluing Plywood to Lumber Framing for Floor Systems.
- .5 CSA International (CSA)
 - .1 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .2 CAN/CSA O80 Series-08, Wood Preservation
 - .3 CSA O86-14, Engineering Design in Wood.
 - .4 CSA O112 Series-M1977 (R2006), CSA Standards for Wood Adhesives.
 - .5 CSA O121-08, Douglas Fir Plywood.
 - .6 CSA O122-06 (R2011), Structural Glued-Laminated Timber.
 - .7 CSA O141-05 (R2009), Softwood Lumber.
 - .8 CSA O151-09, Canadian Softwood Plywood.
 - .9 CSA O153-M1980 (R2008), Poplar Plywood.
 - .10 CAN/CSA-O325-07, Construction Sheathing.
 - .11 CSA O437 Series-93 (R2011), Standards on OSB and Waferboard
- .6 National Lumber Grading Association (NLGA):
 - .1 NLGA SPS2-2010, Special Products Standards on Machine Stress-Rated Lumber.

- .2 Standard Grading Rules for Canadian Lumber 2010.
- .7 South Coast Air Quality Management District (SCAQMD), California State (SCAQMD)
 - .1 SCAQMD Rule 1113-04, Architectural Coatings.
 - .2 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.
- .8 Truss Plate Institute of Canada (TPIC)
 - .1 TPIC 2014, Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses.
- .9 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC S102-10, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.4 REGULATORY REQUIREMENTS

- .1 Work shall meet or exceed the following regulatory requirements; comply with the Specifications; in cases of perceived conflict, the more stringent requirement applies.
 - .1 Ontario Building Code 2012 and Amendments.
 - .2 All Federal, Provincial, Regional and Municipal laws, regulations, ordinances and by-laws pertaining to the Work shall apply for the duration of the project.
 - .3 *Standards and Guidelines for Conservation of Historic Places in Canada*, 2nd Edition.

1.5 SUBMITTALS

- .1 Submit in accordance with Division 01 General Requirements: Submittal Procedures:
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheets.
 - .2 Submit MSDS sheets or official manufacturer literature stating no added urea-formaldehyde was used in the manufacturing of composite wood.

1.6 QUALITY ASSURANCE

- .1 Lumber identification: Grade stamp of an agency certified by the Canadian Lumber Standards Accreditation Board.
- .2 Plywood identification: Grade mark in accordance with applicable CSA standards.
- .3 Each board of fire retardant treated material to shall bear the ULC label indicating 'Flame Spread Classification' (FSC), and smoke developed.

1.7 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver wood products bundled or crated to provide adequate protection during transit. Inspect wood products for damage upon delivery and remove and replace damaged materials.
- .2 Store materials a minimum of 150 mm off the ground on blocking. Keep materials under cover and dry. Provide for air circulation within and around stacks and under temporary coverings.
- .3 Protect sheet materials to prevent breaking of corners and damage to surfaces.

Part 2 Products

2.1 GRADES

- .1 Use CLS grade marked lumber conforming to the Standard Grading Rules for Canadian Lumber published by the National Lumber Grades Authority.

2.2 LUMBER

- .1 Lumber: kiln dried, Stud Grade to CAN/CSA-0141, softwood, S-P-F, S4S, graded and stamped in accordance with National Lumber Grading Association (NLGA) Standard Grading Rules for Canadian Lumber and as follows:
 - .1 Moisture Content: maximum 8% at time of installation.
 - .2 Maximum moisture content when used for attachment of drywall: 8%.
 - .3 Stud (No.3) Grade or better, having the following minimum properties:
 - .1 Sizes: 38 mm or 89 mm wide by maximum 140 mm depth as noted on drawings.
 - .2 Bending at extreme fibre (F_b): 7.0 MPa.
 - .3 Longitudinal shear (F_v): 1.0 MPa.
 - .4 Compression parallel to grain (F_c): 7.0 MPa.
 - .5 Compression perpendicular to grain (F_{cp}): 5.3 MPa.
 - .6 Tension parallel to grain (F_t): 3.2 MPa.
 - .7 Modulus of elasticity (E/E_{05}): 9000/5500 MPa.
 - .8 Finger jointed material will not be acceptable without written acceptance from the Departmental Representative.

- .2 Lumber: kiln dried, Structural Light Framing and Structural Joists and Planks to CAN/CSA O141, softwood, S-P-F, S4S, graded and stamped in accordance with National Lumber Grading Association (NLGA) Standard Grading Rules for Canadian Lumber and as follows:
 - .1 Moisture Content: maximum 8% at time of installation.
 - .2 Maximum moisture content when used for attachment of drywall: 8%.
 - .3 Grade: No. 2 or better, and having the following minimum properties:
 - .1 Sizes: 38 mm or 89 mm wide by depth as indicated on drawings.
 - .2 Bending at extreme fibre (F_b): 11.8 MPa.
 - .3 Longitudinal shear (F_v): 1.0 MPa.
 - .4 Compression parallel to grain (F_c): 11.5 MPa.
 - .5 Compression perpendicular to grain (F_{cp}): 4.6 MPa.
 - .6 Tension parallel to grain (F_t): 5.5 MPa.
 - .7 Modulus of elasticity (E/E_{05}): 9500/6500.

2.3 PANEL MATERIALS

- .1 Sheathing for structural shear wall and diaphragms:
 - .1 Plywood: Douglas Fir (DFP) Sheathing Grade to CSA O121, thickness as indicated on drawings.
 - .2 OSB: Oriented Strand Board panels to CSA O437, Grade O-2, thickness as indicated on drawings. Grade stamp shall indicate span rating. Grade O-2 material may be used thickness for thickness on the same spans as plywood.
- .2 Other sheathing:
 - .1 Plywood or Oriented Strand Board (OSB) panels to CSA O325, thickness as indicated.
- .3 Other panels: Tempered hardboard (high-density fiberboard), to ANSI A135.4.
- .4 Panels shall have no added urea formaldehyde.

2.4 MISCELLANEOUS LUMBER

- .1 Provide lumber for support or attachment of other construction, including furring, blocking, nailing strips, ground, rough bucks, cants, curbs, fascia, backing sleepers, and similar members.
- .2 Fabricate miscellaneous lumber from dimension lumber of sizes indicated, and into shapes shown on drawings.

- .3 Moisture Content: 19% maximum for lumber items not specified to receive wood preservative treatment.
- .4 Grade: for dimension lumber sizes provide No. 2 or Standard grade lumber per NLGA. For board-sized lumber, provide sheathing grade, S2S.

2.5 METAL FRAMING CONNECTORS AND HANGERS

- .1 Fabricated zinc coated steel products tested or designed in accordance with CSA O86.1 and CSA S16.1. Types and products as indicated on drawings.
- .2 Acceptable Materials: Simpson Strong Tie Company Inc., or similar with same or better material properties and performance characteristics.

2.6 ACCESSORIES

- .1 Sealants: in accordance with Section 07 90 00.01 - Interior Joint Sealants.
- .2 General purpose adhesive: to CSA O112 Series. Maximum allowable VOC limit 70 g/L in accordance with SCAQMD Rule 1168.
- .3 Nails, spikes, and staples: to ASTM F1667, double hot dipped galvanized for exterior work and pressure preservative and fire retardant treated materials; hot dipped galvanized for all other purposes.
- .4 Screws for Fastening to Cold-Formed Metal Framing: ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
- .5 Rough Hardware (bolts, nuts, washers, etc.): hot dip galvanized in conformity to CSA G164 or Grade A low carbon steel, conforming to ASTM A307.
- .6 Joist hangers: minimum 1 mm thick sheet steel, galvanized ZF001 coating designation.
- .7 Nailing discs: flat caps, minimum 25 mm diameter, minimum 0.4 mm thick, fibre, formed to prevent dishing. Bell or cup shapes not acceptable.
- .8 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead plugs, recommended for purpose by manufacturer.
- .9 Adhesives: moisture-resistant Type I.

Part 3 Execution

3.1 COMPLIANCE

- .1 Work shall meet or exceed the requirements of Part 9 of the OBC 2012; where the requirements of this Section exceed those of the OBC, this Section takes precedence.
- .2 Accurately frame and properly assemble rough carpentry work. Include all necessary nails or other connectors.

3.2 FASTENERS AND ROUGH HARDWARE

- .1 Unless indicated otherwise, fasten to hollow masonry units with toggle bolts; to solid masonry or concrete surfaces with expansion shields and bolts.
- .2 Where screws are required use lead or inorganic fibre plugs. Wood or organic plugs not permitted.
- .3 Powder actuated fasteners may be used in lieu of bolts if approved by the Departmental Representative in writing prior to materials arriving on site.
- .4 Provide all rough hardware such as nails, bolts, nuts, washers, screws, clips and strap metal.

3.3 WOOD FRAMING

- .1 Space framing members as indicated on drawings. Construct members of continuous pieces of longest possible length.
- .2 Provide 38 x 89 mm blocking at 610 mm on centre between floor joists for lateral support of wall plates where walls run parallel to joists.
- .3 Make allowance for erection stresses. Securely brace members in place to maintain plumb and true until permanently fixed and held to structure.
- .4 Install fire blocking as required.
- .5 Fabricate wood frame construction to the requirements of the Ontario Building Code 2012, Part 9, except where more stringent requirements are indicated or specified.
- .6 Minimum sizes and spacing of members, thickness of materials, allowable species and lumber grades, shall meet the requirements of the above noted standards, unless indicated or specified otherwise.
- .7 Minimize cutting of framing members for pipes, etc. by prior consultation with other trades. Cutting limitations in accordance with Part 9 of the Ontario Building Code 2012.
- .8 Construct framing as necessary to accommodate the work of other trades.

3.4 BLOCKS, PLATES, STRAPPING AND FURRING

- .1 Install wood plates where indicated. Erect plumb and true. Rigidly support and securely anchor to masonry, concrete, and metal stud framing, as required.
- .2 Provide and install wood strapping or furring indicated on drawings or as required.
- .3 Strapping: Shimmed out plumb, square and true to line. Use 19 mm x 64 mm at 406 mm on centre, unless indicated otherwise.
- .4 Furring: install as required; refer to Drawings.
- .5 Install at least one row of solid blocking to wood stud walls not more than 2440 mm high, two rows if over 2440 mm high.
- .6 Install blocking behind all sheathing and wallboard joints, and where required for items to be fixed to walls.

3.5 PANEL INSTALLATION

- .1 Install panels horizontally to wood framing using minimum 50 mm long coated nails at 150 mm along edges and 305 mm along vertical members in the middle of the sheets.
- .2 Leave 2 mm to 3 mm between sheets to allow for shrinkage of wood framing.
- .3 Install blocking behind all panel joints.

3.6 MISCELLANEOUS

- .1 Install wood stud framing for temporary hoarding.

3.7 CLEANING

- .1 Progress Cleaning: clean in accordance with Division 01 General Requirements: Cleaning. Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Division 01 General Requirements: Cleaning. Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Division 01 General Requirements: Construction/Demolition Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.8 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

1 GENERAL

1.01 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA B111-1974(R1998), Wire Nails, Spikes and Staples.
 - .2 CAN/CSA-G164-M92 (R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CSA O121-M1978 (R1998), Douglas Fir Plywood.
 - .4 CAN/CSA-O141-91(R1999), Softwood Lumber.
 - .5 CSA O151-M1978 (R1998), Canadian Softwood Plywood.
 - .6 CAN/CSA-O325.0-92(R1998), Construction Sheathing.
- .2 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2000.

1.02 QUALITY ASSURANCE

- .1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2 Plywood identification: by grade mark in accordance with applicable CSA standards.
- .3 Plywood construction sheathing identification: by grademark in accordance with applicable CSA standards.

1.04 MEASUREMENT FOR PAYMENT

- .1 No measurement for payment will be made for the Plywood Decking, battens, spacers etc. All costs associated with the removal of material and installation of the plywood, battens, spacers etc. as indicated on the drawings or as directed by the Departmental Representative shall be included in the contract lump sum price. Crickets shall be fully supported by new framing.
- .2 Miscellaneous blocking cants and the construction of the crickets behind the chimneys including plywood decking of the crickets shall be included in the lump sum price.
- .3 Blocking, strapping and supports necessary to support the new siding and windows as indicated on the drawing or necessary to support the siding shall be included in the contract lump sum price.
- .4 Two additional sheets of plywood 1200 x 2400, 19 mm thick, shall be included for up to five locations of repairs to roof decking in the contract lump sum.
- .5 Blocking and modifications to first floor structure, to support stair, create access and as required to allow other work including electrical and mechanical.
- .6 Payment for the above work includes all material, labour, stainless steel fasteners etc. to complete the work.

2 PRODUCTS

2.01 LUMBER MATERIAL

- .1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% or less in accordance with following standards:
 - .1 CAN/CSA-0141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
- .2 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.

2.02 PANEL MATERIALS

- .1 Douglas fir plywood (DFP): to CSA 0121, standard construction.
- .2 Canadian softwood plywood (CSP): to CSA 0151, standard construction.
- .3 Plywood: to CAN/CSA-0325.

2.03 ACCESSORIES

- .1 Nails, spikes and staples to be stainless steel: to CSA B111.
- .2 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.
- .3 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, recommended for purpose by manufacturer.

2.04 FINISHES

- .1 Stainless steel: use stainless steel fasteners throughout the work.

2.05 WOOD PRESERVATIVE

- .1 Surface-applied wood preservative: copper naphthenate or 5% pentachlorophenol solution, water repellent preservative.
- .2 Pentachlorophenol use is restricted to building components that are in ground contact and subject to decay or insect attack only. Where used, pentachlorophenol-treated wood must be covered with two coats of an appropriate sealer.

3 EXECUTION

3.01 PREPARATION

- .1 Treat surfaces of material with wood preservative, before installation.

- .2 Apply preservative by dipping, or by brush to completely saturate and maintain wet film on surface for minimum 3 minute soak on lumber and one minute soak on plywood.
- .3 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.
- .4 Also treat material as follows:
 - .1 Wood cants, fascia backing, curbs, nailers, sleepers on roof deck.
 - .2 Wood furring on surface of masonry and concrete walls.

3.02 INSTALLATION

- .1 Comply with requirements of NBC, supplemented by the following paragraphs.
- .2 Install furring and blocking as required to space-out and support casework, facings, fascia, soffit, siding and other work as required.
- .3 Align and plumb faces of furring and blocking to tolerance of 1:600.
- .4 Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using stainless steel fasteners.
- .5 Install wood backing, dressed, tapered and recessed slightly below top surface of roof.
- .6 Install sleepers as indicated.

3.03 ERECTION

- .1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .2 Countersink bolts where necessary to provide clearance for other work.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section includes requirements for site-fabricated finish carpentry.

1.2 RELATED SECTIONS

- .1 Section 05 51 29.01 - Interior Metal Stairs.
- .2 Section 06 10 00.01 - Interior Rough Carpentry.
- .3 Section 06 40 00 - Architectural Woodwork.
- .4 Section 08 20 00.01 - Interior Wood Doors.
- .5 Section 09 64 00 - Wood Flooring.
- .6 Section 09 91 23 - Interior Painting.

1.3 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI A208.1-2009, Particleboard.
 - .2 ANSI A208.2-2009, Medium Density Fibreboard (MDF) for Interior Applications.
 - .3 ANSI/HPVA HP-1-2009, Standard for Hardwood and Decorative Plywood.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM E1333-10, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emissions Rates from Wood Products Using a Large Chamber.
 - .2 ASTM D5574-94(2012), Standard Test Methods for Establishing Allowable Mechanical Properties of Wood-Bonding Adhesives for Design of Structural Joints.
 - .3 ASTM F1667-13, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples
- .3 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWS)
 - .1 (AWS or AWMAC) Architectural Woodwork Standards, 2nd Edition.
- .4 Canadian Plywood Association (CertiWood™)
 - .1 CertiWood™ CANPLY Plywood Handbook.
- .5 Canadian Standards Association (CSA International)
 - .1 CAN/CSA G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

- .2 CSA O115-M1982 (R2001), Hardwood and Decorative Plywood.
- .3 CSA O160-16, Formaldehyde emissions standard for composite wood products.
- .6 National Hardwood Lumber Association (NHLA)
 - .1 Rules for the Measurement and Inspection of Hardwood and Cypress 1998.
- .7 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2007.
- .8 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC S104-15, Standard Method for Fire Tests of Door Assemblies.
 - .3 CAN/ULC S105-16, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN/ULC-S104.

1.1 REGULATORY REQUIREMENTS

- .1 Work shall meet or exceed the following regulatory requirements; comply with the Specifications; in cases of perceived conflict, the more stringent requirement applies.
 - .1 Ontario Building Code 2012 and Amendments.
 - .2 All Federal, Provincial, Regional and Municipal laws, regulations, ordinances and by-laws pertaining to the Work shall apply for the duration of the project.
 - .3 *Standards and Guidelines for Conservation of Historic Places in Canada*, 2nd Edition.

1.2 SUBMITTALS

- .1 Submit in accordance with Division 01 General Requirements: Submittal Procedures.
- .2 Shop Drawings:
 - .1 Indicate details of construction, profiles, jointing, fastening and other related details.
 - .2 Indicate materials, thicknesses, finishes and hardware.
- .3 Samples:
 - .1 Submit samples, 300 mm x 300 mm of each wood species to receive finish, to the Departmental Representative for review.

- .2 Submit natural wood samples unfinished and finished for initial colour selection, and also for quality control.
 - .1 For finished samples, apply stain and topcoat as specified, and allow cure before submission.
 - .2 Confirm staining requirements with Departmental Representative prior to ordering materials.
- .3 Submit 250 mm long samples of each type of trim, moulding and handrail.
- .4 Reviewed samples shall become the standard for the work.
- .4 Mock-Ups:
 - .1 Provide mock ups of the following:
 - .1 Wood baseboard and door frame and trim, showing interrelationship of each.
- .5 Closeout Submittals:
 - .1 Provide operations and maintenance data in accordance with Division 01 General Requirements: Closeout Submittals.

1.3 QUALITY ASSURANCE

- .1 Wood paneling shall have a thickness not greater than 25 mm, and a flame spread rating not greater than 150, to CAN/ULC S102.
- .2 Fire rating: where Drawings indicate a fire rated assembly, doors and frames shall pass CAN/ULC S104 and CAN/ULC S105.
- .3 Architectural Woodwork Standards (AWS) published by the Architectural Woodwork Manufacturers Association of Canada, together with authorized additions and amendments will be used as a reference standard and shall form part of this project specification. Where differences occur between the drawings and specifications requirements and the AWS, the more restrictive requirement shall prevail.
- .4 Any reference to Custom or Premium grade in this specification shall be as defined in the AWS.
- .5 Any item not given a specific quality grade shall be Premium grade as defined in the AWS.
- .6 A copy of the AWS shall be made readily available for reference purposes on the job site.
- .7 References in this specification to part and item numbers mean those parts and items contained within the AWS.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 The Architectural Woodwork Manufacturer and the Contractor shall be jointly responsible to make certain that architectural woodwork is not delivered until the building and storage areas are sufficiently dry so that the architectural woodwork will not be damaged by excessive changes in moisture content.
- .2 Architectural woodwork delivery, storage and handling shall be in accordance with Section 2 Care and Storage of the AWS.
- .3 Delivered materials which are damaged in any way or do not comply with these specifications will be rejected by the Departmental Representative and shall be removed from the job site and replaced with acceptable materials.

1.5 PROJECT CONDITIONS

- .1 Environmental Conditions: Comply with the AWS Section 2 - Care & Storage for optimum temperature and humidity conditions for woodwork during its storage and installation. Do not install woodwork until these conditions have been attained and stabilized.

1.6 COORDINATION

- .1 Coordinate provision of concealed blocking or supports.
- .2 Ensure that back-priming of finish carpentry surfaces concealed after installation, has been performed as specified in Section 09 91 23 - Interior Painting, prior to installation.

Part 2 Products

2.1 LUMBER MATERIAL

- .1 Stair treads, stair landings, mics. elements as indicated on the drawings:
 - .1 Hardwood lumber: White Maple species, S4S, average moisture content of 6% and maximum of 9% for interior work, an average moisture content of 12% and maximum of 15% for exterior work, in accordance with following standards:
 - .1 National Hardwood Lumber Association (NHLA), Select or better grade; white wood only; for transparent finish.
 - .2 AWS premium grade, moisture content as specified.

- .1 Widths: as indicated; full tread width at stairs.
 - .2 Lengths: longest practicable.
 - .3 Thicknesses: as indicated: full thickness required at treads and landings.
- .2 Baseboards, doorframes and trim (Pre-Painted):
- .1 Softwood lumber: unless specified otherwise, spruce-pine-fir species, S4S, average moisture content of 6% and maximum of 9% for interior work, an average moisture content of 12% and maximum of 15% for exterior work, in accordance with following standards:
 - .1 CAN/CSA O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.

2.2 ACCESSORIES

- .1 Fasteners: to suit size and nature of components being fastened.
- .2 Nails and staples: to ASTM F1667; hot dip galvanized to CAN/CSA G164 for exterior work, interior humid areas and for treated lumber; plain finish elsewhere.
- .3 Wood screws: stainless steel type and size to suit application.
- .4 Splines: wood.
- .5 Adhesives: water-proof exterior grade, recommended by manufacturer.

2.3 SITE FABRICATION

- .1 Fabricate items rigid, plumb and square, as detailed, with tight, bevelled, hairline joints. Sand work smooth, set all nails and screws.
- .2 Countersink bolts and washers, fill holes with matching wood plugs.
- .3 Fabricate handrails to provide butt and dowel joints.
- .4 Fit shelves with hardwood edging.

2.4 FINISHES

- .1 Finishes: to Section 09 91 23 - Interior Painting, and as indicated. Confirm finish and colour with Departmental Representative prior to ordering materials and applying finishes.

- .2 Hardwood veneer and lumber materials shall be shop-finished transparent natural and tinted as elected by Departmental Representative.
 - .1 Basecoat of catalyzed sealing lacquer.
 - .2 Two finish coats of catalyzed topcoat lacquer.
 - .1 Acceptable Materials:
 - .1 ML Campbell.
 - .2 Sadolin.
 - .3 Sand between coats per lacquer manufacturer's printed directions.
- .3 White Maple stair treads and landings: finish, to match hardwood flooring in accordance with Section 09 64 00 - Wood Flooring.
- .4 Baseboards and trim: pre-painted before installation, paint cut ends: semi-gloss, to Section 09 91 23 - Interior Painting.

Part 3 Execution

3.1 INSTALLATION

- .1 Do finish carpentry to Premium Quality Standards of the AWS Premium grade.
- .2 Work shall meet or exceed the requirements of Part 9 of the OBC 2012; where the requirements of this Section exceed those of the OBC, this Section takes precedence.
- .3 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.
- .4 Form joints to conceal shrinkage.

3.2 INSPECTION

- .1 Contractor and Departmental Representative to visit site at 80% completion and note state of Work and finishes in the various areas in which cabinet and millwork to be installed.
- .2 Ensure surfaces are ready to receive Work. All surfaces of other Work to be finished and painted before being built-over or covered in any way or millwork installed.

3.3 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 Standing and running trim:
 - .1 Butt and cope internal joints of baseboards to make snug, tight, joint. Cut right angle joints of casing and base with mitred joints.
 - .2 Fit backs of baseboards and casing snugly to wall surfaces to eliminate cracks at junction of base and casing with walls.
 - .3 Make joints in baseboard, where necessary using a 45-degree scarf type joint.
 - .4 Install door and window trim in single lengths without splicing.
- .3 Doorframes and trim:
 - .1 Coordinate with Section 08 20 00.01 - Interior Wood Doors.
 - .2 Set frames with plumb sides, level heads and sills, and secure. Mitre corner joints, 45-degree angle, tight hairline joints, water-proof exterior grade Type I adhesive..
 - .3 Rated and Non-Rated Frames:
 - .1 Grade: 'A'.
 - .2 Material: solid wood, White Maple species.
 - .3 Construction:
 - .1 Eased & Bevelled Door Jambs, $\frac{3}{4}$ -inch thick.
 - .2 Profile: as detailed; if not detailed, Bevel Casing $\frac{3}{4}$ -inch x $2\frac{1}{2}$ -inches.
 - .4 Fire Rated Assemblies: $\frac{3}{4}$ Hour.
- .4 Stairs:
 - .1 Install White Maple treads and landings to locations and details specified and as indicated.

.1 Finish: match hardwood flooring.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Division 01 General Requirements: Cleaning. Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Division 01 General Requirements: Cleaning. Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Division 01 General Requirements: Construction/Demolition Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

1 GENERAL

1.01 SECTION INCLUDES

- .1 Standing and running trim.
- .2 Fascia and Soffits.
- .3 Windows and Exterior Doors.
- .4 First floor beams and columns including modifications to existing floor joists.
- .5 Floor repairs to first floor flooring.

1.02 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures..
- .2 Section 01 74 20 - Construction/Demolition Waste Management and Disposal.
- .3 Section 01 61 00 - Common Product Requirements.

1.03 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM E 1333-96, Test Method for Determining Formaldehyde Concentrations in Air and Emissions Rates from Wood Products Using a Large Chamber.
- .2 Architectural Woodwork Manufacturers Association of Canada (AWMAC)
 - .1 AWMAC Quality Standards for Architectural Woodwork 1994.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-11.3-M87, Hardboard.
- .4 Canadian Standards Association (CSA)
 - .1 CSA B111-74(R1998), Wire Nails, Spikes and Staples.
 - .2 CAN/CSA-G164-M92 (R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CSA O115-M82 (R2001), Hardwood and Decorative Plywood.
 - .4 CSA O121-M78 (R1998), Douglas Fir Plywood.
 - .5 CAN/CSA O141-91(R1999), Softwood Lumber.
 - .6 CSA O151-M78 (R1998), Canadian Softwood Plywood.
 - .7 CSA O153-M80 (R1998), Poplar Plywood.
 - .8 CSA Z760-94, Life Cycle Assessment.
- .5 International Organization for Standardization (ISO)
 - .1 ISO 14040-97, Environmental Management-Life Cycle Assessment - Principles and Framework.
 - .2 ISO 14041-98, Environmental Management-Life Cycle Assessment - Goal and Scope Definition and Inventory Analysis.
- .6 National Hardwood Lumber Association (NHLA)

- .1 Rules for the Measurement and Inspection of Hardwood and Cypress January 1996.
- .7 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2000.

1.04 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures or samples of work in place.
- .2 Indicate details of construction, profiles, jointing, fastening and other related details.
- .3 Indicate materials, thicknesses, finishes and hardware.
- .4 Indicate shoring and method of installation of beams and columns.

1.05 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, handle, store and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Protect materials against dampness during and after delivery.
- .3 Store materials in ventilated areas, protected from extreme changes of temperature or humidity.

1.06 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal and Waste Reduction Workplan, and Waste Management plan to maximum extent economically possible.
- .2 Do not burn scrap at project site.

1.7 MEASUREMENT AND

PAYMENT

- .1 No measurement for payment shall be made for the work of replacing all soffits, trim fascias, including dormer fascia and woodwork. All costs for this work shall be included in the Contract lump sum price.

2 PRODUCTS

2.01 LUMBER MATERIAL

- .1 Softwood lumber: unless specified otherwise, S4S, moisture content 19% or less in accordance with following standards:
 - .1 CAN/CSA-0141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
 - .3 AWMAC custom premium grade, moisture content as specified.
- .2 Machine stress-rated lumber is acceptable.

- .3 Material for first floor beams and columns shall be select structural Spruce Pine Fir (SPF) graded in accordance with NLGA rules.
- .4 Material for first floor flooring repairs to match existing including splines, tongues, grooves, species, dimension and finish.

2.02 ACCESSORIES

- .1 Nails and staples for trim: to CSA B111; use stainless steel.
- .2 Wood screws: stainless steel (316), type and size to suit application.
- .3 Threaded Rod: Stainless steel (316) complete with stainless steel (316) nuts.
- .4 Splines: wood.
- .5 Adhesive: recommended by manufacturer.
- .6 Use least toxic sealants, adhesives, sealers, and finishes necessary to comply with requirements of this section.

3 EXECUTION

3.01 INSTALLATION

- .1 Do finish carpentry to Quality Standards of the Architectural Woodwork Manufacturers Association of Canada (AWMAC), except where specified otherwise.
- .2 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.
- .3 Form joints to conceal shrinkage.

3.02 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 cleanly 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 Standing and running trim.
 - .1 Butt and cope internal joints of trim to make snug, tight, joint. Cut right angle joints of casing and base with mitred joints.
 - .2 Fit backs of trim and casing snugly to surfaces to eliminate cracks at junction with walls.

.3 Make joints in trim, where necessary using a 45° scarf type joint.

.4 Install door and window trim in single lengths without splicing.

3.2 BEAMS AND

COLUMNS

.1 All beams and columns shall have a finished appearance generally matching the finish of the existing wood beam and column system that they replace.

.2 Steel socket connections floor stringer support at stair and all fabricated steel braces and connections shall be fully welded all around in accordance with CSA CAN3 S16.1 and welded in accordance with CSA W59 by a welder qualified under CSA W47.1. Minimum weld size shall be 6 mm fillet or equivalent.

3.3 WOOD STRINGERS

AT STAIR OPENING

.1 At the stair opening the cuts to the floor stringers must be carefully laid out such that they are within 5 mm of the web of beam supporting the stringers and that the stringers are notched to fit into the beams. Prior to cutting layout and draw cuts to be made and review with the departmental representative.

.2 Do not cut stringers until all support work at this location has been confirmed by the Departmental Representative.

3.03 SCHEDULES

- .1 Standing and running trim.
 - .1 Exterior:
 - .1 Grade: 'C' Select.
 - .2 Solid stock: Eastern White Pine species.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section specifies requirements for shop-fabricated millwork and casework, and site-fabricated built-in casework.

1.2 RELATED SECTIONS

- .1 Section 05 73 13 - Decorative Steel Mesh Balustrades: steel mesh swing cabinet doors.
- .2 Section 06 10 00.01 - Interior Rough Carpentry.
- .3 Section 06 20 00.01 - Interior Finish Carpentry.
- .4 Section 07 90 00.01 - Interior Joint Sealants.
- .5 Section 09 91 23 - Interior Painting.

1.3 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI/NPA A208.1-2009, Particleboard.
 - .2 ANSI A208.2-2009, Medium Density Fibreboard (MDF) for Interior Applications.
 - .3 ANSI/HPVA HP-1-2009, Standard for Hardwood and Decorative Plywood.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM E1333 10, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber.
 - .2 ASTM D2555 - 06(2011), Standard Practice for Establishing Clear Wood Strength Values.
 - .3 ASTM D2559 - 12a, Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions.
 - .4 ASTM D2832 92(R2011), Standard Guide for Determining Volatile and Nonvolatile Content of Paint and Related Coatings.
 - .5 ASTM D3930 - 08, Standard Specification for Adhesives for Wood-Based Materials for Construction of Manufactured Homes.
 - .6 ASTM D4300 - 01(2008), Standard Test Methods for Ability of Adhesive Films to Support or Resist the Growth of Fungi.
 - .7 ASTM D5116 10, Standard Guide for Small Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products.

- .8 ASTM F1667-11a e1, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- .3 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWS)
 - .1 (AWS) Architectural Woodwork Standards, 2nd Edition.
- .4 Canadian Hardwood Plywood and Veneer Association (CHPVA)
 - .1 CHPA Official Grading Rules for Rotary Cut Face Veneers.
- .5 Canadian Plywood Association (CanPly)
 - .1 The Plywood Handbook 2005.
- .6 Canadian Standards Association (CSA International)
 - .1 CSA O112.9-10, Evaluation of Adhesives for Structural Wood Products (Exterior Exposure), Includes Update No. 1 (2011).
 - .2 CSA O112.10-08 (R2013), Evaluation of Adhesives for Structural Wood Products (Limited Moisture Exposure), Includes Update No. 1 (2010), Update No. 2 (2010).
 - .3 CSA O115-M1982 (R2001), Hardwood and Decorative Plywood.
 - .4 CSA O121-08, Douglas Fir Plywood.
 - .5 CSA O141-05 (R2009), Softwood Lumber.
 - .6 CSA O151-09, Canadian Softwood Plywood.
 - .7 CSA O153-M1980 (R2008), Poplar Plywood.
 - .8 CAN/CSA-O325-07, Construction Sheathing.
 - .9 CSA O437 Series-93 (R2011), Standards on OSB and Waferboard
- .7 National Electrical Manufacturers Association (NEMA)
 - .1 ANSI/NEMA LD-3-05, High-Pressure Decorative Laminates, includes Annexes A, B, C and D.
- .8 National Hardwood Lumber Association (NHLA)
 - .1 Standard Grading Rules for Canadian Lumber (2010).
 - .2 Rules for the Measurement and Inspection of Hardwood and Cypress 2011 (v.1.1).
- .9 National Lumber Grading Association (NLGA):
 - .1 NLGA SPS2-2010, Special Products Standards on Machine Stress-Rated Lumber.
 - .2 Standard Grading Rules for Canadian Lumber 2010.

1.1 REGULATORY REQUIREMENTS

- .1 Work shall meet or exceed the following regulatory requirements; comply with the Specifications; in cases of perceived conflict, the more stringent requirement applies.
 - .1 Ontario Building Code 2012 and Amendments.
 - .2 All Federal, Provincial, Regional and Municipal laws, regulations, ordinances and by-laws pertaining to the Work shall apply for the duration of the project.
 - .3 *Standards and Guidelines for Conservation of Historic Places in Canada*, 2nd Edition.

1.2 PRODUCTS SUPPLIED BUT NOT INSTALLED UNDER THIS SECTION

- .1 Supply hardware for decorative steel mesh cabinet swing doors (hinges, handles, locks, related fasteners, as required) to Section 05 73 13 - Decorative Steel Mesh Balustrades for incorporation into the Work during fabrication of the doors.
 - .1 Fabricated steel components to be built into other construction.

1.3 PRODUCTS SUPPLIED BY OTHER SECTIONS AND INSTALLED UNDER THIS SECTION

- .1 Incorporate into the construction decorative steel mesh cabinet swing doors as required supplied by Section 05 73 13 - Decorative Steel Mesh Balustrades.

1.4 AESTHETIC REQUIREMENTS FOR MATERIALS WITH TRANSPARENT FINISH

- .1 Panels, mouldings, trim, baseboards, and other wood components, together within a room, corridor, or lobby, shall be Blueprint Matched.
- .2 Veneer Leaves shall be Slip Matched, with no "football" patches.
- .3 Trim and moulding shall be selected for continuity and uniformity of finished appearance, AWS premium grade, meeting Blueprint Matching criteria.

1.5 SUBMITTALS

- .1 General:
 - .1 Submittals shall meet the requirements of Division 01 General Requirements: Submittal Procedures.
- .2 Samples:
 - .1 Label each sample to indicate Drawing number and room location.

- .2 Submit natural wood samples unfinished and finished for initial colour selection, and also for quality control.
 - .1 For finished samples, apply stain and topcoat as specified, and allow cure before submission.
 - .2 Confirm staining requirements with Departmental Representative prior to ordering materials.
- .3 Finish one side and edge of samples representing items to receive factory finishes
- .4 Submit flitch samples taken from flitches that are anticipated to best meet requirements for colour and matching for each room, lobby, and corridor. Each flitch shall be given its own unique number, and those numbers selected shall be recorded in a woodwork binder, a copy of which shall be provided to the Departmental Representative and affected sub-contractors, manufacturers and suppliers.
- .5 Where variations in wood and finish may occur, a minimum of three variations showing extremes that may be expected of wood finishes specified shall be submitted to the Departmental Representative for approval. Minimum size: 12" x 20" (300 mm X 500 mm).
- .6 Submit samples of veneer leaves representative of, and selected from, flitches being used for transparent finished woodwork, laid up on specified core material, 300 mm x 600 mm, finished on ½ of panel for each species and cut, and containing at least one face veneer seam.
- .7 Submit samples of high-pressure decorative laminate clad panel material laid up on specified core material, 300 mm x 600 mm for each type, colour, pattern, and surface finish.
- .8 Submit samples of each type and colour of quartz surfacing for initial selection, 230 x 230 mm samples for each type and colour.
- .9 Submit samples of low-pressure decorative overlay (Melamine) laid up on specified core material, 305 mm (12") x 610 mm (24") for each type, colour, pattern, and surface finish
- .10 Submit 300 mm x 300 mm samples of each type of solid wood or plywood to receive stain or natural finish.
- .11 Submit three samples 20" (500 mm) minimum length, of all mouldings and/or moulding assemblies to be used for the Project. These shall be full size and finished as specified in the Contract Documents.
- .12 Submit 215 mm x 280 mm samples of panel products for each factory applied finish system.

- .3 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheets.
 - .2 Submit manufacturer's printed installation instructions and details.
 - .3 Submit manufacturer's recommended maintenance instructions.
- .4 Certifications and Reports:
 - .1 Certifications: submit certificates signed by manufacturer certifying materials comply with specified performance characteristics and physical properties.
 - .2 Test and Evaluation Reports: submit certified test reports for composite wood from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
- .5 Shop Drawings:
 - .1 Indicate materials, factory finishes, thicknesses, and hardware. Include plans, elevations, sections, and details at the following drawing scales:
 - .1 Plans and elevations - 1:20.
 - .2 Sections - 1:10.
 - .3 Details - 1:2.
 - .2 Indicate construction details, locations of built in items, connections, attachments, anchorage and location of exposed fastenings, as applicable

1.6 QUALITY ASSURANCE

- .1 Comply with the requirements of Division 01 General Requirements: Quality Control.
- .2 Lumber by grade stamp of agency certified by Canadian Lumber Standards Accreditation Board (CLSAB).
- .3 Plywood, particleboard, OSB and wood based composite panels to CSA and ANSI standards.
- .4 Wood fire rated frames and panels: listed and labelled by an organization accredited by Standards Council of Canada to CAN/ULC S104 and CAN/ULC S105.
- .5 Materials and workmanship shall meet or exceed recommendations and requirements of AWS Manual. Remove and replace work that does not conform to the AWS Manual, Premium Grade.

- .6 Reference to grade in this Section shall be as defined in the AWS Manual.
 - .1 Minimum grade acceptable for this Project: Premium Grade.
- .7 Maintain a copy of the specified AWS Manual at the factory, readily available for duration of work.
- .8 Installer shall be responsible for supplying field dimensions that will affect the work of this Section.
- .9 Source Limitations: Engage a qualified woodworking firm to assume undivided and complete responsibility for the fabrication and installation of interior architectural woodwork and finish carpentry, having completed work similar in material, design, and extent to that indicated, and whose work has resulted in construction with a record of successful in-service performance, as well as sufficient production capacity to produce required work.
- .10 Installer Qualifications: An experienced installer who has completed architectural woodwork similar in material, design, and extent to that indicated and whose work has resulted in construction with a record of successful in service performance.
- .11 Fabricator Qualifications: A firm experienced in producing architectural woodwork similar to that indicated for this Project and with a record of successful in service performance, as well as sufficient production capacity to produce required units.
- .12 Site Supervision: Provide full time site supervision for work of this section; supervisor shall be directly employed by the installer and shall have the authority to receive, represent, and make decisions for work of the Project.

1.7 MOCK-UPS

- .1 Provide mock-ups in accordance with requirements of Division 01 General Requirements: Quality Control.
- .2 Provide two or three pieces of millwork construction for each type of finish, sufficient to evaluate quality.

1.8 PROJECT CONDITIONS

- .1 Maintain a minimum 430 lx (40 f.c.) illumination on surfaces and areas where work is being installed.
- .2 Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings where architectural woodwork is indicated to fit walls and other construction; coordinate fabrication schedule with construction progress to avoid delaying the Work; locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed and indicate measurements on Shop Drawings.
- .3 Established Dimensions: Establish dimensions and proceed with fabricating architectural woodwork without confirmed field measurements where field measurements cannot be made without delaying the Work; coordinate with the construction to ensure that actual dimensions correspond to established dimensions; allow for trimming and fitting.

1.9 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver to site after receiving and storage areas have stable humidity and temperature conditions as recommended in AWS Manual.
- .2 Protect architectural woodwork items against dampness during and after delivery.
- .3 Store architectural woodwork items on level surfaces in ventilated areas, protected from direct sunlight and extreme changes in temperature or humidity.
- .4 Do not deliver materials and products until operations that could damage them have been completed in installation areas.

1.10 COORDINATION

- .1 Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed.
- .2 For architectural woodwork items to be site finished, coordinate with work of Section 09 91 23 - Interior Painting to ensure that back priming of surfaces concealed after installation is performed prior to installation.
- .3 Coordinate installation of the following items during fabrication:
 - .1 Electrical conduit, junction boxes, and fixtures.

.2 Other items to be built-in as indicated.

1.11 EXTENDED WARRANTY

.1 The Contractor agrees to correct any deficiencies of labour or material found in the work performed for a period of 2-years from date of Substantial Performance.

Part 2 Products

2.1 MATERIALS SUPPLIED BY OTHER SECTIONS

.1 Steel mesh cabinet swing doors, supplied by Section 05 73 13 - Decorative Steel Mesh Balustrades; coordinate as required to maintain construction schedule.

2.2 AESTHETIC REQUIREMENTS FOR TRANSPARENT FINISH

- .1 AWS Premium Grade.
- .2 Obtain hardwood plywood and lumber materials of same species from the same supplier.
- .3 Wood components of same species, together within a room, corridor, or lobby, shall be Blueprint Matched.
- .4 Doors along a corridor or within a room shall be Set Matched; pairs of doors, Pair Matched.
- .5 Veneer Leaves shall be Slip Matched.
- .6 Trim and moulding shall be selected for continuity and uniformity of finished appearance, with joined pieces uniform and continuous in appearance, AWS premium grade, meeting Blueprint Matching criteria.

2.3 MATERIALS

- .1 Use clean stock only and comply with AWS for quality grades specified.
- .2 Softwood Lumber: to CAN/CSA O141, kiln dried to maximum moisture content of 7%, dressed 4 sides.
- .3 Hardwood Lumber: to Canadian Hardwood Lumber Association, kiln dried to maximum moisture content of 8%, selected to meet AWS Premium grade, White Maple.
- .4 Panel materials: Provide panel materials meeting requirements for moisture content and grades in accordance with AWS Premium Grade requirements, and as specified below. Manufacture panel products without added urea formaldehyde.

- .5 Exterior Grade Douglas fir, to CSA O121, 'A/A' veneer, cross banded, sanded, G2S, thickness as indicated, or required to suit construction and withstand loads without deflection.
- .6 Baltic Birch Hardwood Plywood: to CSA O115, of thickness indicated, and maximum size sheets application and as follows:
 - .1 AWS premium grade for transparent finish.
 - .2 Grade: B/BB (Face is 'B' grade, Back is 'BB' grade).
 - .1 Minimum 150 mm flitch width.
 - .2 Continuous across face of panel, no end matching allowed.
 - .3 Baltic Birch, rotary-cut, single sheet match and symmetry.
 - .4 Minimum veneer thickness: 1.5 mm.
 - .5 Vertical grain direction.
 - .3 Core Construction: Inner plies shall be 1.5 mm thick solid Baltic Birch veneer, cross-banded, and laminated with exterior grade adhesive.
 - .4 Panel Edge: exposed, sanded and clear-coated.
 - .5 Grade stamp, non-exposed, marked on the edge of each panel, indicating cut, species and grade, and manufacturer's name.
- .7 Particleboard: to ANSI A208.1, Grade M-2-Exterior Glue or better, minimum 720 kg/m³ density and Grade M-3-Exterior Glue, minimum 750 kg/m³ particleboard for countertops and shelves; clearly mark panels with grade mark in visible location; extruded particleboard having loose cores with voids will not be permitted; having no added urea formaldehyde.
- .8 High Pressure Decorative Laminate (PLam, or Plastic Laminate): to ANSI/NEMA LD3; Grades and application in accordance with applicable AWS requirements and as follows:
 - .1 Constructed of multiple layers of phenolic resin-saturated kraft paper in combination with a layer of decorative melamine-saturated paper, all fused together under heat and pressure.
 - .2 Horizontal General Purpose Grade (HGS): thickness of 1.2 mm ±0.12 mm, used on the following:
 - .1 Horizontal surfaces, unless specified otherwise.
 - .3 Vertical General Purpose Grade (VGS): thickness of 0.7 mm ±0.10 mm, used on the following:
 - .1 Vertical surfaces, unless specified otherwise.
 - .2 Exposed portions of case bodies, including ends, divisions and bottoms.

- .3 Exposed shelves.
- .4 Casework Doors: exposed and semi-exposed surfaces.
- .5 Drawer Faces: exposed and semi-exposed surfaces.
- .4 Liner Grade (CLS): thickness of 0.5 mm \pm 0.10 mm, used on the following:
 - .1 Semi-exposed shelves.
 - .2 Interior portions of case bodies.
 - .3 All surfaces of drawer boxes.
- .5 Laminate backer grade (BKL): thickness of 0.5 mm \pm 0.10 mm, used on the following:
 - .1 Concealed surface of casework backs.
 - .2 Concealed surfaces, unless specified otherwise.
- .6 Colours: colours as selected by Departmental Representative from manufacturer's full range; provide colour samples for initial selection.
- .9 Melamine Component Panel (MCP): to ANSI-A208.1:
 - .1 Core: particleboard, grade M-2 or M-3 as required for location and use; no added urea formaldehyde when tested in accordance with ASTM E1333.
 - .2 Thermally fused melamine to ANSI/NEMA LD3, 2 sides, colour and pattern selected by Departmental Representative from manufacturer's full range.
 - .1 Melamine impregnated papers thermally fused under pressure.
 - .2 Thickness: 0.5 mm minimum.
 - .3 Wear Resistance: 400 cycles minimum.
 - .3 Adhesives used to fabricate laminated assemblies containing these products must contain no urea formaldehyde
- .10 Edging:
 - .1 MCP Edging:
 - .1 Solid, high impact, purified, colour-thru, acid resistant, PVC edging.
 - .2 3 mm edging at counter tops, drawers, doors, and splashes.
 - .3 1 mm edging at cabinet boxes, exposed shelving, and concealed shelving.
 - .2 Plastic Laminate Edging:
 - .1 Horizontal General Purpose Grade (HGS): thickness of 1.2 mm \pm 0.12 mm, colour and finish to match surface finish.
 - .2 Post-forming (VGP): maximum thickness of 1 mm, colour and finish to match surface finish

- .11 Adhesives, use commercial grade brush-applied adhesives only:
 - .1 Plastic laminate: polyvinyl acetate or aliphatic resin in accordance with manufacturer's recommendation for curing under pressure for bonding to wood cores, water resistant type.
 - .2 Edge banding: Thermoplastic hot melt, synthetic resin suitable for applying thin veneer wood edge banding and film overlays.
- .12 Sealants: to Section 07 90 00.01 - Interior Joint Sealants.
- .13 Accessories:
 - .1 Nails and staples: to ASTM F1667; hot dip galvanized to CAN/CSA G164 for exterior work, interior humid areas and for treated lumber; plain finish elsewhere.
 - .2 Wood screws: brass, type and size to suit application.
 - .3 Splines: wood.
 - .4 Particleboard screws: low root and high thread, purpose-made for installation in particle board, sized to suit application.
 - .5 Screws into concrete block: Tapcon by Buildex a division of ITW.
 - .6 Screws and bolt caps to cover heads of fasteners used to secure cabinets to walls - pop on screw covers for 6 mm diameter screws - by Spaenaur.
 - .7 Gable connectors - joint connector bolt JCBB0101 Cx2 and joint connector cap JCN010 Cx2 by Richielieu.
 - .8 Door and drawer bumpers: thin self-adhesive bumpers available from various sources.
 - .9 Wall bumpers: bumpers about 6 mm thick from various sources.

2.4 MANUFACTURED UNITS

- .1 Fabricate all casework to AWS premium quality grade. Comply with details on Drawings.
- .2 Incorporate into the fabrication and construction, steel mesh cabinet swing doors supplied by Section 05 73 13 - Decorative Steel Mesh Balustrades.
- .3 Casework for Built-In Units (Drawing A501):
 - .1 Construction: AWS premium grade.
 - .1 Material: solid wood White Maple, finished all exposed sides, 25 mm thick or as otherwise indicated on Contract Drawings.
 - .2 Case body: glued and dowel joints.

- .3 Shelving: tenon-and-groove joints, same material and finish as case body.
- .4 Install steel mesh doors and related hardware as supplied by Section 05 73 13 - Decorative Steel Mesh Balustrades; coordinate and cooperate as required for a complete installation.
- .5 Factory finish hardwood casework as follows:
 - .1 Finishes shall be applied in accordance with AWS Section 5.
 - .2 Clear Finish:
 - .1 Exposed parts shall have 4 coats of AWS pre-catalyzed lacquer, satin gloss, premium grade lacquer coating.
 - .2 Semi-Exposed parts requiring clear finish shall have AWS pre-catalyzed lacquer finish to match exposed components, including all surfaces of reveals and returns, underside of items and inside. Semi-exposed parts shall match exposed parts for finishing.
 - .3 Wood components shall be fabricated using solid White Maple for clear finish.
- .4 Casework for Kitchen:
 - .1 Generally construct casework of 19 mm MCP, except where high density plastic laminate is indicated for countertop.
 - .2 Toe kicks to be 19 mm exterior grade Douglas Fir plywood, with face base material to match adjacent floor, laminated to plywood backing.
 - .3 Fabrication to be with dowels.
 - .4 Cabinet backs shall be 12 mm MCP, installed as full overlay or 16 mm overlay where the exterior side of the gable is exposed. Secure with #8 x 38 mm particle board screws.
 - .5 Shelves to be 19 mm MCP, with 3 mm PVC edging on front edge and remaining edges to have 0.5 mm edge tape; colour to match MCP as closely as possible
 - .6 Countertops:
 - .1 Post-formed countertops and backsplashes of plastic laminate 0.039" on 19 mm particleboard, with backer sheet on reverse side, no added urea formaldehyde.
 - .2 Nosing to be square.
 - .3 Trim corners of countertops where required so adjacent cabinet doors, when fully open, do not contact the corner of the countertop.

- .4 Adhesives used to fabricate laminated assemblies containing these products must contain no urea formaldehyde.
- .7 Drawers: Fabricate drawers to AWS premium grade supplemented as follows:
 - .1 Sides, front and back of boxes: construct of 12 mm MCP.
 - .2 Bottom: 12 mm MCP.
 - .3 Exposed edges of the box finished and 3 mm PVC, colour to match MCP as closely as possible.
 - .4 Drawer fronts to be securely fastened to drawer boxes.
 - .5 Drawer bottom to be captured in 9 mm standing shoulders on all four sides, or captured in front and two sides with #8 screws at 100 mm c/c on the back edge with staples between, or captured on two sides and secured with screws and staples on front and back.
- .8 Doors and Drawer Fronts:
 - .1 Kitchen casework doors and drawer fronts to be 19 mm thick Baltic Birch hardwood veneer panels, exposed edging, clear lacquer finish.

2.5 CABINET HARDWARE

- .1 Supply and install cabinet hardware as required for normal use, functionality and operation, complete with all screws, bolts, washers, etc., for a complete installation.
- .2 Hardware: Bolts, nuts, washers, screws, cup washers for removal panels, etc., all hot dip heavy zinc-coated.
- .3 Draw Bolt Fasteners
 - .1 Acceptable Materials:
 - .1 K&V 516 by Knape & Vogt Canada.
- .4 Spacers: Rigid PVC to size and profile indicated.
- .5 Access Panel Connectors
 - .1 Acceptable Materials:
 - .1 Richelieu Type JCBA0101C2 complete with Tee-Nut 261.12.
- .6 Wire Pulls: stainless steel wire pulls with nominal 100 mm centres and back plates to prevent pull out:
 - .1 Acceptable Materials:
 - .1 CBH 220-101
 - .2 Häfele America Co. 115.61.601

- .3 Hettich Canada LP Columbus 41, 1170 122 40é320
- .4 Richelieu, Collection BP33205170
- .5 Stanley 4484 x 101
- .7 Drawer Slides:
 - .1 Heavy duty drawer slides: 68 kg capacity, full extension:
 - .1 Acceptable materials:
 - .1 Accuride 4032
 - .2 Hettich Canada LP KA555
 - .3 Knappe and Vogt 8500
- .8 Hinges:
 - .1 Typical Cabinet Doors: Concealed, euro-style hinge with cover caps; fully adjustable for overlay, depth, height and closing force; opening angle of 110°; self-closing feature; nickel plated steel construction; overlay and half overlay mounting, size and profile to suit cabinet construction:
 - .1 Acceptable materials:
 - .1 Julius Blum Canada Ltd., Modul and Expando Series
 - .2 Hettich Canada LP, Intermat Soft 9943 Series
 - .3 Häfele America Co., H-Series
- .9 Door Latches:
 - .1 Magnetic Catch:
 - .1 Basis-of-Design Materials: Richelieu BP504510
- .10 Shelf Supports:
 - .1 Flush mounted pilaster with shelf rests sized for shelf depth, nickel finish.
 - .1 Acceptable Materials:
 - .1 Knappe & Vogt.

2.6 FACTORY FINISHING - BUILT-IN CASEWORK

- .1 Hardwood lumber materials shall be shop-finished transparent natural finish.
 - .1 Basecoat of catalyzed sealing lacquer.
 - .2 Two finish coats of catalyzed topcoat lacquer.
 - .1 Acceptable Materials:
 - .1 ML Campbell.
 - .2 Sadolin.

- .3 Sand between coats per lacquer manufacturer's printed directions.

2.7 FABRICATION

- .1 Flush overlay cabinet doors and drawer fronts as detailed.
- .2 Fabricate gables and edges meeting walls oversize to allow for scribing to fit on site.
- .3 Assemble Work with flush butt hairline corners and joints. Cut-outs for services to be done on site during installation. No hairline cracks will be allowed in the face area of cabinet work modules unless approved in writing by Departmental Representative.
- .4 Carefully fit, cope or mitre and well glue-up Joints. There shall be no end wood visible on finished surfaces.
- .5 Glue, dowel, mortise, lock joint or dado all cabinet work and cabinet work. Do not use staples. Nailing and screws are acceptable.
- .6 Set nail heads in finished surfaces. Countersink screws and bolts, except those detailed to be exposed, and fill holes with edge grain wood plugs to match colour and grain.
- .7 Blocking, framing, web frames to be solid lumber.
- .8 Provide solid wood edge strips in all doors and cases to receive hardware. Rebate and pressure glue to core.
- .9 Cut and adapt all Work to receive hardware.
 - .1 Drill and prepare end gables for insert type shelf standards on gables.
 - .2 Install all finishing hardware and fittings in shop.
 - .3 Fittings which may be susceptible to damage during shipping and installation may be installed after millwork installed on site.
- .10 Ensure adjacent part of continuous work match in colour and pattern.

2.8 FABRICATION - PLASTIC LAMINATE

- .1 AWS Quality Grade Premium.
- .2 Install high pressure and low pressure laminate as indicated; colours per Schedules.
- .3 Comply with NEMA LD3, Annex 'A', and Manufacturer's Technical Data Sheets and fabrication guidelines.
- .4 Obtain governing dimensions before fabricating items that are to accommodate or abut appliances, equipment and other materials.

- .5 Ensure adjacent parts of continuous laminate work match in colour and pattern.
- .6 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 2400 mm. Keep joints 600 mm from sink cutouts.
- .7 Drill oversized holes for screws or bolts. Screws or bolts to be slightly countersunk into the face side of a laminate-clad substrate.
- .8 Provide cores of not less than 19 mm nominal thickness.
- .9 All inside corners to have a minimum of 1/8" (3.18 mm) radius, and all edges to be routed smooth.
- .10 Apply backing sheet to laminated flatwork. Supply uniform coating of sealer on exposed edges. Provide backing sheet of sufficient thickness to compensate stresses caused by facing sheet.
- .11 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 edges.
- .12 Locate joints at 2400 mm to 3000 mm oc. At 'L' shaped corners mitre plastic laminate to outside corners. Accurately fit member together to provide tight and flush butt joints, in true planes. Provide 6 mm blind spline and approved type draw bolts. Provide 1 draw bolt for widths up to 150 mm. For width exceeding 150 mm, provide draw bolts at maximum 250 mm centres. Colour match adjoining units.
- .13 Provide cut outs as required for inserts, fixtures and fittings. Use radiused corners and chamfer edges around cut outs to avoid chipping laminate.
- .14 Doors: apply matching laminated plastic to both outside and inside faces of door panels.
- .15 At other locations, apply laminate backing sheet to reverse side of core of plastic laminate work.
- .16 Apply laminated plastic liner sheet to interior of cabinetry.
- .17 Post form laminate work to details indicated. Provide same core and laminate profiles to provide continuous support and bond for entire surface.
- .18 Assemble work, true and square. Arrange adjacent parts of continuous laminate work to match in colour and pattern.

- .19 Use hot-pressing method for adhering plastic laminate to substrate to greatest extent possible to minimize field application. Use only brush-applied adhesives suitable to the surfaces to be bonded.

Part 3 Execution

3.1 COMPLIANCE

- .1 Comply with product manufacturer's printed installation instructions, data sheets and details.

3.2 JOB CONDITIONS

- .1 Job Conditions for installation of architectural woodwork shall be in accordance with applicable AWS requirements (Premium grade).

3.3 INSPECTION

- .1 Verify condition and dimensions of previously installed work upon which this Section depends. Report defects to Departmental Representative. Commencement of Work means acceptance of existing conditions.

3.4 PREPARATION

- .1 Obtain measurements from site.
- .2 Check access to ensure large pieces of work can be safely handled to their place of final installation.
- .3 Protect finished surfaces and materials of other trades from damage.
- .4 Ensure services and roughing-in that affect, or are connected to or through this work, are complete and acceptable.
- .5 Back prime Casework immediately after delivery to site.

3.5 INSTALLATION

- .1 Install work to applicable AWS and Quality Assurance requirements.
- .2 Quality Standard: AWS premium grade.
- .3 Finishes to be 100% bonded to substrates, with 100% coating of bonding surfaces with brush-applied adhesives.
- .4 Install Casework in its indicated locations, plumb, level, and true.

- .5 Anchor to floor, walls, or ceiling using fastening devices and hardware consistent with the building materials encountered. Do not use wood plugs. Do not use plastic plugs for ceilings or walls. Provide wall strapping as required.
- .6 Anchor Casework and millwork to building structure. Shim level and set square in relation to adjoining surfaces. Scribe to adjacent Work. Provide allowance for finish flooring installation to base.
- .7 Casework:
 - .1 Fasten to framing using zinc-coated bolts, countersunk and plugged with matching wood plugs.
 - .2 Set Casework in place, on base, anchoring securely to building structure and to adjoining Casework. Use approved connector type fasteners between items of Casework to hold adjoining pieces tightly together.
 - .3 Scribe to smooth snug fit with adjoining surfaces and materials to align work. Mitre corners.
 - .4 Perform cutting, fitting, repairing in woodwork as required by other trades where their work is connected to or part of this work.
 - .5 Cut out openings for mechanical, electrical, and communications fittings and fixtures. Coordinate and cooperate in the connection and installation of mechanical, electrical, and communications work.
 - .6 Apply sealant between countertops and adjoining walls and Casework. Seal edges of cut-out core material before fixtures installed.
 - .7 Install finishing hardware shipped loose.
- .8 Plastic Laminate:
 - .1 Manufacturer's Instructions:
 - .1 Comply with manufacturer's data sheets, printed installation requirements, standard details, and specifications.
 - .2 Install work plumb, true and square, neatly scribed to adjoining surfaces.
 - .3 Make allowances around perimeter where fixed objects pass through or project into laminated plastic work to permit normal movement without restriction.
 - .4 Use draw bolts and splines in countertop joints. Maximum spacing 450 mm on centre, 75 mm from edge. Make flush hairline joints.
 - .5 Provide cut-outs for inserts, grilles, appliances, outlet boxes and other penetrations. Round internal corners, chamfer edges and seal exposed core.

- .6 At junction of laminated plastic counter back splash and adjacent wall finish, apply small bead of sealant.
- .7 Protection:
 - .1 Cover finished laminated plastic veneered surfaces with heavy Kraft paper or put in cartons during shipment. Protect installed laminated surfaces by approved means. Do not remove until immediately before final inspection.
- .8 Cleaning:
 - .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
 - .2 Perform care and cleaning with NEMA LD3, Annex B.
 - .3 Remove traces of primer, caulking, epoxy and filler materials; clean doors and frames.
- .9 Supply and install hardware required for the completion of architectural woodwork, including, without limitations, adjustable shelf supports and cabinet hinges, catches, pulls, drawer accessories, bumpers, drawer slides and closet hanger bars, and similar items. Install millwork hardware in the shop wherever possible. Install millwork hardware secure, plumb, level, true to line, and in accordance with the hardware manufacturers' printed instructions. Cut and fit to millwork for proper installation and operation. Provide smoothly operating units free from binding. Clean and adjust hardware for proper operation.

3.6 ADJUSTING

- .1 During and after installation, adjust hardware and operating parts as necessary to ensure smooth, fluid and proper operation.
- .2 If permissible to Departmental Representative, repair minor marks, scratches or marring, otherwise remove and replace damaged, marked, or stained finish carpentry.

3.7 CLEANING

- .1 Progress Cleaning: clean in accordance with Division 01 General Requirements: Cleaning. Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Division 01 General Requirements: Cleaning. Perform cleaning after installation to remove construction and accumulated environmental dirt.

- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Division 01 General Requirements: Construction/Demolition Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.8 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section includes insulation requirements for 2nd floor ceilings.

1.2 RELATED SECTIONS

- .1 Section 06 10 00.01 - Interior Rough Carpentry.
- .2 Section 07 27 14.01 - Interior Vapour Retarders.
- .3 Section 09 25 00 - Gypsum Board.

1.3 REFERENCES

- .1 Canadian Gas Association (CGA).
 - .1 CAN/CGA B149.1-10, Natural Gas and Propane Installation Code.
 - .2 CAN/CGA B149.2-10, Propane Storage and Handling Code.
- .2 Underwriters Laboratories of Canada (ULC).
 - .1 CAN/ULC S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC S604-M91, Standard for Factory Built Type A Chimneys.

1.1 REGULATORY REQUIREMENTS

- .1 Work shall meet or exceed the following regulatory requirements; comply with the Specifications; in cases of perceived conflict, the more stringent requirement applies.
 - .1 Ontario Building Code 2012 and Amendments.
 - .2 All Federal, Provincial, Regional and Municipal laws, regulations, ordinances and by-laws pertaining to the Work shall apply for the duration of the project.
 - .3 *Standards and Guidelines for Conservation of Historic Places in Canada*, 2nd Edition.

1.2 PRE-INSTALLATION MEETINGS

- .1 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section and on-site installation, with contractor's representative and Departmental Representative in accordance with Division 01 General Requirements: Construction Schedule to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Coordination with other building trades.

.4 Review manufacturer's installation instructions.

1.3 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Division 01 General Requirements: Submittal Procedures.

.2 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions.

.3 Submit warranties.

1.4 QUALITY ASSURANCE

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

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics, criteria, and physical requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Storage and Handling Requirements:

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

.2 Protect insulation as follows:

.1 Do not expose to sunlight, except to extent necessary for period of installation and concealment.

.2 Protect against ignition at all times. Do not deliver insulating materials to Project site before installation time.

.3 Complete installation and concealment of materials as rapidly as possible in each area of construction.

.4 Care for insulation in accordance with PIMA technical bulletin 109.

Part 2 Products

2.1 SOURCE QUALITY CONTROL

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

2.2 INSULATION

- .1 Semi-Rigid Stone Wool Batt Insulation: preformed semi-rigid fibrous mineral board insulation in accordance with CAN/ULC S702, and meeting or exceeding the following standards, physical properties and performance characteristics:
 - .1 CAN/ULC S702 Type 1.
 - .2 Thermal Resistance, @ 140 mm thick = RSI 4.23 minimum, to ASTM C518; wood stud construction.
 - .3 Combustion Characteristics: non-combustible in accordance with CAN/ULC S114.
 - .4 Flame Spread Index, to CAN/ULC S102: 0.
 - .5 Smoke Developed Index, to CAN/ULC S102: 0.
 - .6 Density, to ASTM C167: > 32 kg/m³.
 - .7 Edges: square.
 - .8 Sizes: as required; largest sizes practicable to fully fill cavity 100%.
 - .9 Basis-of-Design:
 - .1 Roxul Comfortbatt Commercial Thermal Insulation, or similar by Knauf Insulation, or Eurima.

2.3 ACCESSORIES

- .1 Mechanical fasteners in accordance with insulation manufacturer's written recommendations.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's printed installation instructions, technical datasheets, details, and guide specifications.

3.2 EXAMINATION

- .1 Examine substrates and immediately inform Departmental Representative in writing of defects.
- .2 Prior to commencement of work, ensure:
 - .1 Substrates are firm, straight, smooth, dry, free of snow, ice or frost, and clean of dust and debris.

3.3 INSULATION

- .1 Install insulation in accordance with manufacturer's written recommendations.
- .2 Install insulation in dry conditions and in contact with dry substrates.
- .3 Install insulation to maintain continuity of thermal protection to building elements and spaces.
- .4 Do not compress insulation to fit into spaces.
- .5 Fit insulation tight around electrical boxes, plumbing and heating pipes and ducts, around exterior doors and windows and other protrusions.
- .6 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 and CAN/CGA B149.1 and CAN/CGA B149.2 type B and L vents.
- .7 Use only insulation boards free from chipped or broken edges that are dry, and unsoiled.
- .8 Use largest possible dimensions to reduce number of joints.
- .9 Do not enclose insulation until it has been reviewed by Departmental Representative.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Division 01 General Requirements: Cleaning. Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Division 01 General Requirements: Cleaning.
- .3 Waste Management: Separate waste materials for reuse and recycling in accordance with Division 01 General Requirements: Construction/Demolition Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

- .1 Protect installed products and accessories from damage during construction.
- .2 Repair damage to adjacent materials caused by insulation installation.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 06 10 00.01 - Interior Rough Carpentry.
- .2 Section 09 25 00 - Gypsum Board.
- .3 Section 07 21 13.01 - Interior Fibrous Insulation.
- .4 Section 07 90 00.01 - Interior Joint Sealants.

1.2 REFERENCES

- .1 ASTM International (ASTM)
 - .1 ASTM E96/E96M-13, Standard Test Methods for Water Vapor Transmission of Materials.
 - .2 ASTM E283-04 (2012), Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 37-GP-56M AMEND., Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing.
 - .2 CAN/CGSB-51.34-M86 AMEND., Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

1.1 REGULATORY REQUIREMENTS

- .1 Work shall meet or exceed the following regulatory requirements; comply with the Specifications; in cases of perceived conflict, the more stringent requirement applies.
 - .1 Ontario Building Code 2012 and Amendments.
 - .2 All Federal, Provincial, Regional and Municipal laws, regulations, ordinances and by-laws pertaining to the Work shall apply for the duration of the project.
 - .3 *Standards and Guidelines for Conservation of Historic Places in Canada*, 2nd Edition.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination:
 - .1 Select products to be compatible with adjoining membranes previously installed under related Sections.
 - .2 Select products from a single manufacturer, or products that are compatible from different manufacturers.

- .3 Coordination between all installers of each component of vapour and air retarder system is essential to ensure continuity of system and that junctions between the various components are effectively sealed.
- .4 Verify with manufacturers and all tradesmen involved with installation procedures of building products incorporated into air barrier elements including, but not limited to, various membranes, coating and sealants as well as continuity with roofing membrane.
- .2 Pre-installation Meeting:
 - .1 Convene one week before commencing Work of this Section.
 - .2 Arrange for manufacturer's factory-trained agent to be on site at beginning of installation to provide training and supervision of personnel who will install membrane. Agent shall also provide frequent inspection visits thereafter to assure quality and competence of membrane installations.
- .3 Sequencing:
 - .1 Sequence work in accordance with Construction Progress Schedule.
 - .2 Sequence work to permit installation of materials in conjunction with related materials and seals.
 - .3 Overlap (shingle) materials to direct water down and away from the structure.

1.3 SUBMITTALS

- .1 Submit product data in accordance with Division 01 General Requirements: Submittal Procedures:
 - .1 Submit manufacturer's printed product literature, specifications, and datasheets, and include product characteristics, performance criteria, physical size, finish, and limitations.
 - .2 Submit statement from manufacturer(s), indicating products supplied under this Section are compatible with one another and with products previously installed under the work of related Sections.
- .2 Submit samples in accordance with Division 01 General Requirements: Submittal Procedures:
 - .1 Provide duplicate 200 mm x 200 mm samples of membrane adhered to all project substrates, including adjoining membranes specified in other Sections.

- .3 Quality Assurance Submittals: submit following in accordance with Division 01 General Requirements: Quality Control.
 - .1 Existing Substrate Condition: report deviations, as described in PART 3 -EXAMINATION in writing to Departmental Representative.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures.

1.4 **QUALITY ASSURANCE**

- .1 Applicator: company specializing in performing work of this section with minimum 3-years documented experience with installation of air/vapour barrier systems.
 - .1 Completed installation must be approved by the material manufacturer.
- .2 Applicator: company:
 - .1 Currently licensed by National Air Barrier Association certifying organization.
 - .2 Must maintain their license throughout the duration of the project.

1.5 **MOCK-UP**

- .1 Construct mock-up in accordance with Division 01 General Requirements: Quality Control.
- .2 Construct typical exterior wall panel, 3 m long by 4 m wide, incorporating window and frame and sill, insulation, building corner condition, and junction with roof system; illustrating materials interface and seals.
- .3 Locate where directed.
- .4 Mock-up may remain as part of finished work.
- .5 Allow review of mock-up by Departmental Representative before proceeding with air/vapour barrier Work. Accepted mock-up will demonstrate minimum standard of quality required for this project.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Division 01 General Requirements: Common Product Requirements.
- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

1.7 AMBIENT CONDITIONS

- .1 Install solvent curing sealants and vapour release adhesive materials in open spaces with ventilation.
- .2 Ventilate enclosed spaces in accordance with Division 01 General Requirements: Temporary Utilities.
- .3 Maintain temperature and humidity recommended by materials manufacturer before, during and after installation.

1.8 WARRANTIES

- .1 Contractor agrees to correct any deficiencies of labour or material found in the work performed for a period of 2-years from date of Substantial Performance.

Part 2 Products

2.1 VAPOUR RETARDER: INTERIOR APPLICATION

- .1 Vapour Retarder: polyimide film vapour retarder for use with unfaced, vapor-permeable glass fiber and mineral wool insulation in wall and ceiling cavities, meeting or exceeding the following minimum requirements:
 - .1 Water Vapour Permeance, to ASTM E86:
 - .1 Dry cup method: 1.0 perms (57 ng/Pa•s•m²).
 - .2 Wet cup method: 10.0 perms (1144 ng/Pa•s•m²).
 - .2 Class A for flame spread and smoke developed.
 - .3 Acceptable Materials:
 - .1 Certainteed MemBrain.
 - .2 INTELLO Plus, by Pro Clima International.

2.2 FOAM-IN-PLACE INSULATION

- .1 Insulation: One component rigid urethane foam with the following minimum physical properties and performance characteristics:

Density (ASTM D1622):	30.3 kg/m ³
Compressive Strength (ASTM D1621):	57.5 kPa
Compressive Modulus (10% deflection):	848 kPa
Tensile Strength (ASTM D1623):	133.5 kPa
Flatwise Shear (ASTM C273):	58.5 kPa
Thermal Resistance:	1.41 RSI/25 mm thickness
Water Absorption (ASTM D2842):	3.0 kg/H20/m ²
Water Vapour Transmission (ASTM E96):	2.327 perms

- .1 Acceptable Materials:
- .1 Abisko Manufacturing Inc.
 - .2 Demilec Inc.
 - .3 Hilti (Canada) Ltd.
 - .4 Icynene
 - .5 Insta-Foam Products Inc.
 - .6 RHH Foam Systems Inc.
 - .7 The Dow Chemical Company.
- .2 Primers: in accordance with manufacturer's recommendations for surface conditions.
- .3 Thermal Barrier: spray-applied fire-retardant overcoat meeting applicable requirements of the Ontario Building Code 2012 and Amendments for thermal barrier of foamed plastic.

2.3 ACCESSORIES

- .1 Accessories: supply manufacturer's recommended seam tape, sealants, adhesives, prefabricated sill pan flashings, termination mastics, and other accessories as required for a complete installation.
- .2 Moulded box vapour retarder: factory-moulded polyethylene box, purpose-made for use with recessed electric switch and outlet device boxes.
- .3 Fasteners: supply stainless steel screws, plastic clips and other fasteners as recommended by manufacturer required for complete installation of work.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturers' printed installation instructions, typical details, and data sheets.

3.2 COORDINATION

- .1 Coordinate with other trades as required to ensure continuity of air barrier and vapour retarder performance at entire enclosure perimeter. Tie-in to adjacent systems as required, and seal transitions.

3.3 EXAMINATION AND PREPARATION

- .1 Verify that surfaces and conditions are ready to accept work of this section.
- .2 Ensure surfaces are clean, dry, sound, smooth, continuous, and comply with manufacturer's requirements.
- .3 Remove loose or foreign matter that might impair performance of materials.
- .4 Ensure substrates are clean of oil or excess dust; masonry joints struck flush, and open joints filled; concrete surfaces free of large voids, spalled areas or sharp protrusions
- .5 Do not install materials during rain or snowfall.
- .6 Report unsatisfactory conditions to Departmental Representative in writing.
- .7 Do not start work until deficiencies have been corrected.
 - .1 Beginning of Work implies acceptance of conditions.

3.4 INTERIOR VAPOUR RETARDER

- .1 Verify that services are installed and have been accepted by the Departmental Representative and Authorities Having Jurisdiction prior to installation of vapour barrier.
- .2 Install sheet vapour barrier on warm side of exterior wall and ceiling assemblies prior to installation of gypsum board to form continuous retarder in accordance with manufacturer's written instructions.
- .3 Use sheets of largest practical size to minimize joints.
- .4 Install materials in a manner that maintains continuity; repair punctures and tears with sealing tape before work is concealed.
- .5 Openings:

- .1 Cut sheet vapour barrier to form openings and lap and seal to window and door frames in accordance with good building envelope practice.
- .6 Seal perimeter of sheet vapour retarder as follows:
 - .1 Apply continuous bead of sealant to substrate at perimeter of sheets.
 - .2 Lap sheet over sealant and press into sealant bead.
 - .3 Adhere sheets using sealant bead at each steel framing member and at top and bottom tracks.
 - .4 Install sealant bead with no gaps; smooth out folds and ripples occurring in sheet over sealant.
- .7 Seal lap joints of sheet vapour retarder as follows:
 - .1 Attach first sheet to substrate.
 - .2 Apply continuous bead of sealant over solid backing at joint.
 - .3 Lap adjoining sheet minimum 150 mm and press into sealant bead.
 - .4 Adhere sheets using sealant bead at each steel framing member and at top and bottom tracks.
 - .5 Install sealant bead with no gaps; smooth out folds and ripples occurring in sheet over sealant.
- .8 Seal electrical switch and outlet device boxes that penetrate vapour retarder as follows:
 - .1 Install moulded box vapour retarder:
 - .2 Apply sealant to seal edges of flange to main vapour retarder and seal wiring penetrations through box cover.

3.5 FOAM-IN-PLACE INSULATION

- .1 Install Foam-in-Place insulation as required at penetrations and gaps to maintain continuity of air barrier.

3.6 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits

for inspection of product installation in accordance with manufacturer's instructions.

- .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.
- .2 The Departmental Representative shall inspect installed membrane for continuity of air barrier prior to placement of insulation.

3.7 **CLEANING**

- .1 Progress Cleaning: clean in accordance with Division 01 General Requirements: Cleaning. Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Division 01 General Requirements: Cleaning.
- .3 Waste Management: Separate waste materials for reuse and recycling in accordance with Division 01 General Requirements: Construction/Demolition Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility..

3.8 **PROTECTION OF WORK**

- .1 Protect finished work from penetrations.
- .2 Do not permit adjacent work to damage work of this section.
- .3 Ensure finished work is protected from climatic conditions.
- .4 Repair to manufacturers written instructions.

END OF SECTION

1 GENERAL

1.01 DESCRIPTION OF THE WORK

- .1 The work of this section covers the requirements for the first class installation of wood shingling and siding on the building as called for on the Drawings and as specified herein.

1.02 RELATED WORK

- .1 Section 06 10 11 - Rough Carpentry.
- .2 Section 06 20 00 - Finish Carpentry.
- .3 Section 07 62 00 - Flashings and Sheet Metal.

1.03 QUALIFICATION

- .1 The siding and roofing applicator and his personnel shall be of recognized standing in the industry, with a proven record of satisfactory installations.

1.04 SAMPLES

- .1 Provide typical "mock-up" panel of siding and wood shingle courses for approval by the Departmental Representative prior to installation.

1.05 STORAGE

- .1 Provide a platform so that the first layer of bundles or loose shingles or siding will not be in contact with the ground.
- .2 Use boards to cover the top of the pile to keep out rain and prevent over-drying of the siding or bundles or loose shingles of the top layer.

1.06 PROTECTION

- .1 Workmen to wear soft-soled shoes while applying shingles and under no circumstances wear hob-nailed or caulked footwear.
- .2 Walking on finished work shall be kept to a minimum. During installation if it is essential to access the shingled areas for any purpose, those areas shall be protected so that no damage occurs to the new installation.
- .3 Scaffolding, toe holds, shingling stools, applicators' platforms and other apparatus employed by the applicator should, when removed, leave no trace of its presence and in no way compromise the weather tightness of the roof.
- .4 Protect the roof from damage during construction and the interior from precipitation during construction with full system of "tarps", etc. to the satisfaction of the Departmental Representative.

1.07 WARRANTY

- .1 Furnish a three (3) year warranty on all wood shingles installed under this contract. Undertake to repair all defects becoming evident during the period of this warranty in a prompt and thorough manner.

1.8 MEASUREMENT AND PAYMENT

- .1 No measurement for payment will be made for the Wood Shingle Roofing, all costs shall be included in the Contract Lump Sum price. Payment shall include all costs for labour, materials and equipment necessary to complete the work of wood shingle application including all underlayment preparation to the roof all in accordance with the drawings and these specifications.
- .2 No measurement for payment shall be made for the item "Wood Siding". All costs shall be included in the Contract Lump Sum price. Payment shall include all costs for labour, materials and equipment including the application of vapour and moisture barriers, insulation, strapping and blocking.

2 PRODUCTS

2.01 WOOD SHINGLES

- .1 Shall be Western Red Cedar Certigrade shingles No. 1 Blue Label Shingles i.e. 100% heartwood, 100% clear, 100% edge grain.
- .2 Shall be 1.5 mm (1/16") at the point and 10 mm (2/5") at the butt.
- .3 Shall be of random widths with a minimum width of 100 mm (4") and a max. width of 250 mm (10").
- .4 Shall be 450 mm (18") in length.
- .5 The quality control of the shingles is of utmost concern. All packages of shingles must arrive at the site with labels intact and be obvious that they meet the requirements for grading and quality. The contractor shall complete preliminary quality control and ensure that the shingles are uniform and of premium quality rejected those shingles that do not conform. During installation the contractor will continue to monitor shingle quality and reject non-conforming shingles.
- .6 The Departmental Representative will complete spot checks of the contractor's quality control system and can reject shingles or sections that do not conform or where shingles have been incorporated into the work. All shingles required to remove those non-conforming shingles will be removed and also may be rejected.

2.02 CEDAR SIDING

- .1 Clear Cedar Bevel Siding: Western Red Cedar, clear V.G. Heart grade, to NLGA Standard Grading Rules and WCLIB Grading Standards.
- .2 Approved equal: Refer to Section 01 62 00.

- .3 Bevel Size: 14 mm thick butt, 5 mm tip, 203 mm high nominal board with 50 mm lap.
- .4 Exposure: As above and to accommodate features such as windows and doors.
- .5 Surface Texture: Sanded.

2.03 AIR-FLOW BATTENS

- .1 Note an intricate mesh of battens and spacers are required over the entire roofing area to allow air flow.

2.04 EAVE PROTECTION AND CRITICAL AREAS

- .1 'ICE AND WATER SHIELD' By Grace Construction Products at eaves and all other critical areas, i.e. flashing areas including ridges and corner pinnacles and, other locations as indicated on the drawings.

2.05 ROOFING FASTENERS

- .1 Stainless steel roofing nails min. 32 mm (min.) (1-1/4") length. Nails and spikes shall be in accordance with CSA B111 - 1974. Splitting of battens must be avoided.
- .2 If screws are used in lieu of nails, these shall be stainless steel as well and their use is subject to review by the Departmental Representative. All such screws shall be approved by the Engineer.

2.06 SIDING FASTENERS

- .1 Siding Nails: Hot dipped galvanized ring shank nail type; non-staining. Note where flashings are attached to or adjacent to the siding then the stainless nails for the flashing must be used.
- .2 Air Barrier: Bakor Air Bloc 07.
- .3 Flashing: as per 07 62 00 - Flashings and Sheet Metal.
- .4 Vents at top and bottom of siding: Stainless steel screening.
- .5 Accessory Components: Facias, soffits and rafter tails of the same material and finish as siding.
- .6 Prime Paint: Latex base primer enamel.
- .7 Finish coats: Colour as selected by Departmental Representative.

2.07 SEALANT

- .1 Polyurethane-based sealant i.e. Sikaflex or Dymeric CGSB 16 M Type.

3 EXECUTION

3.01 PREPARATION

- .1 Check job dimensions and extent of work and notify the Engineer of any discrepancies.
- .2 Co-ordinate installation with Sheet-metal and Carpentry Trades.

3.02 STRIPPING OFF

- .1 Remove existing roofing and siding, flashings and underlay and expose sheathing. Dispose all removals off site in accordance with applicable legislation. Provide temporary covers (tarps) or other means to ensure that water penetration to the interior does not occur.
- .2 Withdraw all existing nails, cleats etc., setting those which break off. Leave surfaces free from dirt and loose material sufficiently to smoothly apply overlay plywood.

3.03 WOOD SHINGLE ROOFING

- .1 Apply Ice and Water Shield as eave protection and to all vulnerable areas including upper roof edge, valleys, hips, ridges, around chimneys and at all flashing locations.
- .2 Install battens and spacers throughout all areas to receive wood shingles.
- .3 Install Tern Coated Stainless Steel drip edge and all other sheet metal elements required to precede shingle installation.
- .4 Install shingles with the following spacing:
 - .1 Provide 6 mm (1/4") joint between shingles over 125 mm (5") wide.
 - .2 Provide 3 mm (1/8") joint between shingles under 125 mm (5") wide.
- .5 Joints:
 - .1 Stagger joints min. 38 mm (1 ½") in succeeding courses.
- .6 Nailing:
 - .1 Use 2 nails per shingle spacing nail 20 mm (3/4") from edge with additional nails 100 mm (4") apart across face of shingle and 38 mm (1-1/2") above butt line of following course.
 - .2 Bottom shingles of the double starter course to have additional line of nailing 12 mm (1/2") back from overhang. Spacing to be similar to that of typical roof course.
 - .3 Extra nailing shall be provided at final course of shingles at ridges.
 - .4 Drive nails flush but do not crush shingles.
- .7 Starter course:
 - .1 Double shingles at eave.
- .8 Typical Course:
 - .1 Install shingles with 140 mm (5-1/2") weather exposure and having a triple thickness of shingles at any given point.
 - .2 Interleave Tern Coated Stainless Steel `soakers' with shingle courses at all vertical projections

- .9 Chimneys:
 - .1 Interleave TCS flashings with shingle courses at chimneys and where slope changes toward the eave.
 - .2 Soak or stream wood shingles if necessary to allow for bending to match existing curve.
- .10 Finishing:
 - .1 Finish to ridges or, other termination lines formed by flashings, mouldings, etc., in uniform "neat" lines as per the drawings and to the satisfaction of the Departmental Representative.

3.04 SIDING

- .1 Examination:
 - .1 Verify existing conditions before starting work.
 - .2 Remove all existing siding and insulation and review existing condition of strapping and corner boards and "original" siding with the Departmental Representative. It must be assumed that all strapping, blocking etc. will be replaced back to the original siding. If it is found in good condition at the sole discretion of the Departmental Representative portion of the blocking will be reviewed. It is more likely that past deterioration or the removals process will dictate that all material is replaced.
- .2 Installation - Siding:
 - .1 Install bevel siding using single course method.
 - .2 Nail at every blocking generally recreating the existing pattern with detail improvement as per the drawings. Fasten siding in place level and plumb. Blind nail except trim. Nail to aligned pattern.
 - .3 Mitre horizontal joints tight at 45 degrees. Mitre external and mitre internal corners.
 - .4 Install siding for natural shed of water.
 - .5 Position ends over bearing surfaces. Sand cut edges smooth and clean.
 - .6 Install corner strips, closures and trim.
 - .7 Install metal flashings at internal and external corners, sills, head of wall openings and at foundation wall.
 - .8 Touch-up prefinished paint surfaces that are disfigured. Unsightly touch-up will require removal and replacement of affected siding.
- .3 Erection Tolerances:
 - .1 Maximum variation from Plumb Level: 6mm/3m.
 - .2 Maximum offset from Joint Alignment: 1.5mm.
- .4 Preparation for Site Finishing:
 - .1 Sand work smooth and set exposed nails.
 - .2 All surfaces are to be primed on all sides before installation.
 - .3 If portions of finish coat is applied before installation produce a full mock-to illustrate the painting of nail heads and touch ups will be invisible.
 - .4 Use all methods to prepare and apply finish paint as specified in Section 09 91 10.

END OF SECTION

1 GENERAL

1.01 DESCRIPTION OF WORK

- .1 Provide all materials and labour for the complete, first class fabrication and installation of zinc/tin coated stainless steel flashings(TCS II), as shown on the Drawings and described herein both at the chimneys and around all windows and siding.
- .2 Provide all materials and labour for the re-furbishing of existing metal door hardware to be salvaged.

1.02 QUALIFICATION

- .1 The sheet metal fabricator and applicator shall be of recognized standing with a proven record of satisfactory installations using traditional materials and installation techniques.

1.03 WARRANTY

- .1 Furnish a three (3) year warranty on all metalwork installed or repaired under this Contract, undertaking to repair all defects becoming evident during the period of this guarantee, in a prompt and thorough manner.

1.04 WORKMANSHIP

- .1 All workmanship shall be of the highest quality conforming to the best traditional practice and be to the approval of the Departmental Representative.

1.05 STORAGE

- .1 All materials will be stored in a location approved by the Departmental Representative.

1.06 RELATED WORK

- .1 Section 07 31 29 - Wood Shingles and Siding.
- .2 Section 08 62 10 - Wooden Windows and Doors.

1.07 MEASUREMENT AND PAYMENT

- .1 No measurement for payment will be made for the item "Flashings". Payment shall be by lump sum. All costs for labour, materials, and equipment, are to be included in the lump sum bid for this item in accordance with the Contract Drawings and these specifications.
- .2 For measurement and payment concerning the supply and installation of copper weather strips and re-furbishing of door, see Section 08 62 10, "Wooden Windows and Doors".

2 PRODUCTS

2.01 MEMBRANE

- .1 Grace Ice and Water shield or approved alternate product Blueskin PE 200HT by Bakor is approved and does not require the use of a 'slip-sheet'.

2.02 SLIP SHEET

- .1 Rosin sized paper as 'slip-sheet' weighing approximately 6lb./per 100 square feet between metal and membrane.

2.03 SHEET METAL

- .1 Terne Coated Stainless Steel. ASTM.240 Type 304 Stainless Steel coated both sides with minimum alloy (50 tin/50 zinc) to a minimum of 20 microns, all flashings and sheet metal, 26 ga. Plus coating (TCS II).

2.04 FASTENERS FOR TCSII

- .1 Nails for metalwork shall be 25 mm large, flat headed Series 300 stainless steel ring shank nail or equal screw type fastener.
- .2 Type 304 stainless steel rivets for sheet to sheet connection.

2.05 EXPANSION SHIELDS

- .1 Shields shall be 100% pure lead shields. Plastic or galvanized fixings are not permitted.

2.06 SOLDER AND FLUX

- .1 Solder to conform to ASTM B-32 and shall be lead free, high tin.
- .2 All flux shall be tin-bearing type specifically for soldering stainless steel.

2.07 BLOCKING

- .1 Blocking shall be in non-resinous wood e.g. pine, preservative treated with zinc naphthanate brush applied. Note: any blocking in direct contact with zinc-tin material must be coated with an approved latex paint.

2.08 MEMBRANE CAP

- .1 Membrane cap to be an EPDM rubber membrane. Skellerap Epiclad by Viking is an acceptable product.

2.09 PAINT FOR SALVAGED HARDWARE AND STEEL FABRICATORS

- .1 Primer 1: System: Organic
- .1 Organic Zinc - Rich Epoxy with a minimum of 85% minimum zinc content in the dry film and to all other requirements of CGSB-1.181. Acceptable Products: Carbozinc 859 by Carboline, or Amercoat 68HS by Amercoat Canada or alternate product as approved by Departmental Representative.

- .2 Intermediate Coat 2:
 - .1 High - Solids Epoxy Acceptable: Carbomastic 15 by Carboline, or Amerlock 400 Aluminum Epoxy by Amercoat Canada or alternate product as approved by Departmental Representative.
- .3 Topcoat 3:
 - .1 Aliphatic Acrylic Polyurethane to CAN/CGSB-1.177-M91. Acceptable Products: Carbothane 133 HB by Carboline Amercoat 450H by Amercoat Canada or alternate product as approved by Departmental Representative.
- .4 All components of the paint system must be from one manufacturer, be compatible and recommended for use together to form one paint system by the manufacturer.
- .5 Colour: Submit Samples to be approved by the Departmental Representative.

3 EXECUTION

3.01 CLEATS

- .1 Cleats are to be fabricated from 50mm x 75mm long metal, spaced not over 300mm unless otherwise specified.
- .2 Secure one end with two nails and fold back over nail heads. Lock free end of cleat into seam or into folded edge of metal sheet.

3.02 SOLDERING

- .1 Remove pre-weather wash coat, around edges to be soldered, either chemically and/or mechanically to produce clean, bright alloy.
- .2 Clinch-locked joints and seams are to be closed gently with a block of wood and mallet, then fluxed and filled with molten solder. The work is to be done with sufficient heat to induce the solder to move by capillarity and create a waterproof joint.
- .3 Perform soldering slowly with well heated materials, so as to heat thoroughly the seam and sweat the solder through its full width.
- .4 All residue at exposed joints are to be neutralized with hot water rinse (60 C +) and removed, wiped clean. All metalwork is to be washed clean with soapy hot water upon completion.
- .5 All soldering shall be done with soldering irons only. Torches or welders are not permitted.

3.03 EDGE AND DRIP STRIPS

- .1 Provide where necessary to secure sheet metal work at locations indicated and elsewhere as may be required.
- .2 Form edge strips of 26 ga. TCSII as required unless otherwise specified.
- .3 Secure with stainless steel screws set at 300mm spacing. Use lead sleeves

to receive screws in masonry.

- .4 Install strips in continuous butted lengths to allow metalwork to be hooked over not less than 20mm.

3.04 SEAMS

- .1 Flat lock seam shall be finished not less than 20mm wide.
- .2 Soldered lap-seams are to be finished not less than 30mm wide and, riveted 50mm on centre.
- .3 Non-soldered lap-seams shall be finished not less than 90mm wide, and rivetted 50mm on centre.
- .4 All seams are to be made in the direction of flow.
- .5 All seams visible from the ground are to be blind-soldered.

3.05 DISSIMILAR METALS

- .1 Dissimilar metals are not to be in direct contact with each other or any other type of metal other than approved lead-plugs or washers, to eliminate galvanic corrosion.
- .2 All concealed fasteners and clips are to be of the same metal as the flashings.
- .3 Where contact between metals cannot be absolutely assured, paint potential contact surface of galvanized metal with bituminous paint.

3.06 FORMING GENERALLY

- .1 All new sheet metal is to be formed on the bending-brake. Shaping, trimming and hand seaming are to be done on the bench as far as possible with the proper sheet metal-working tools.
- .2 Replacement formed work is to be hand formed over wooden moulds matching the original work.
- .3 The angle of bends and the folds of interlocking metal shall be made with full regard for expansion and contraction to avoid buckling or fullness in the metal after it is in service.
- .4 Hem all exposed edges 20mm, raw edges are not permitted.

3.07 JOINING

- .1 All horizontal joints or sloped joints less than 1:5 are to be flat-locked and seam soldered.
- .2 All vertical joints and sloped joints more than 1:5 are to be made watertight by forming with double seam corner locks.
- .3 All mitred corners visible from grade are to be blind soldered.

3.08 PREPARATION OF SURFACES

- .1 Surfaces to which sheet metal is to be applied or reset are to be made smooth, sound, clean, dry and free from any other defects that might adversely affect the installation.
- .2 All masonry adjacent to and covered by metalwork is to be isolated from metal work with a continuous layer of underlayment. Sheets of underlayment are to be laid over the stone, as the metal work proceeds, as a bond breaker.
- .3 Generally install sheet metal over rosin paper slip sheet which is placed over "Ice and Water Shield" (elastomeric membrane). If using Blueskin, the rosin paper can be deleted.

3.09 INSTALLATION STANDARDS

- .1 Install flashings and sheet metal work dead-level, true to line and square. All work is to fit any rebuilt and repaired masonry exactly.
- .2 No exposed fasteners are permitted unless directly called for in these documents and/or approved by the Departmental Representative. All work is to be held in place with cleats or edge strips.

3.10 SALVAGED HARDWARE AND STEEL FABRICATION PAINTING

- .1 All fabrications and salvaged hardware shall be cleaned by grit blasting. Prior to blasting, confirm by visual inspection that no element is too sensitive, i.e. overly thin by corrosion to be treated in this manner. Any such area shall be treated with corrosion passivation instead of being blasted.
- .2 Initially assume a fine grit size with dry compressed air at maximum of 70 p.s.i.
- .3 Prior to general cleaning, run test of above method on small section of salvaged hardware. Begin testing at 40 p.s.i. Notify Departmental Representative minimum of 24 hours before commencement of test. Modifications to methodology e.g., determination of operator distance, will be established at that time.
- .4 Grit blast salvaged hardware to remove all dirt, rust and tight mill scale. Following blasting assess with Departmental Representative full extent of corrosion damage.
- .5 Wipe off all dust and oil and prime all hardware within 24 hours of exposure with zinc rich primer. Ensure that shop temperature is above 10 deg. C for priming and painting. (All sections removed off-site can be painted, except for the final coat prior to reinstallation.) Finish with minimum of epoxy undercoat and 2 coats of urethane paint or as per manufacturer
- .6 Reinstate hardware on site using original attachment locations.
- .7 Steel fabrications are much more robust than salvaged hardware and more aggressive blasting techniques can be used. The level of cleaning of fabrications shall be equivalent to Steel Structure Painting Course (SSPC) 10 near white metal.

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TWO STOREY BUILDING
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FLASHINGS AND
SHEET METAL

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END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Refer to fire separation diagrams on Drawings and install firestopping as required by Code.

1.2 RELATED SECTIONS

- .1 Section 09 25 00 - Gypsum Board.
- .2 Other sections as required.

1.3 REFERENCES

- .1 ASTM International (ASTM)
 - .1 ASTM E119-12a, Standard Test Methods for Fire Tests of Building Construction and Materials.
 - .2 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .3 ASTM A1008/A1008M-12, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
 - .4 ASTM E1966-07(2011), Standard Test Method for Fire-Resistive Joint Systems.
 - .5 ASTM E2174-10a e1, Standard Practice for On-Site Inspection of Installed Fire Stops.
 - .6 ASTM E2307-10, Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus.
 - .7 ASTM E2393-10a, Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers.
- .2 Firestop Contractors International Association (FCIA)
 - .1 FCIA Firestop Manual of Practice (MOP).
 - .2 FM 4991, Standard for the Approval of Firestop Contractors.
- .3 International Firestop Council (IFC)
 - .1 Recommended IFC Guidelines for Evaluating Firestop Systems in Engineering Judgments (EJs).
- .4 Underwriter's Laboratories of Canada (ULC)
 - .1 ULC Guide No. 40 U19-1998, Firestop Systems.
 - .2 CAN/ULC S101-07, Standard Methods of Fire Endurance Tests of Building Construction and Materials.

- .3 CAN/ULC S102-10, Standard Method of Tests for Surface Burning Characteristics of Building Materials and Assemblies.
- .4 CAN4 S114-05, Standard Method of Test for Determination of Non-Combustibility in Building Materials.
- .5 CAN/ULC S115-11, Standard Method of Fire Tests of Fire stop Systems.
- .6 CAN/ULC S702-09, Standard for Thermal Insulation Mineral Fibre for Buildings.
- .7 ULC S702.2-10, Mineral Fibre Thermal Insulation for Buildings, Part 2: Application Guidelines.
- .8 List of Equipment and Materials.
- .5 Underwriters Laboratories Inc. (UL)
 - .1 ANSI/UL 1479, Standard for Fire Test of Through-Penetration Firestops.
- .6 National Fire Protection Agency (NFPA)
 - .1 NFPA 251, Standard Methods of Tests of Fire Endurance of Building Construction and Materials, 2006 Edition.

1.4 REGULATORY REQUIREMENTS

- .1 Work shall meet or exceed the following regulatory requirements; comply with the Specifications; in cases of perceived conflict, the more stringent requirement applies.
 - .1 Ontario Building Code 2012 and Amendments.
 - .2 All Federal, Provincial, Regional and Municipal laws, regulations, ordinances and by-laws pertaining to the Work shall apply for the duration of the project.
 - .3 *Standards and Guidelines for Conservation of Historic Places in Canada*, 2nd Edition.

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section, with contractor's representative and Departmental Representative in accordance with Division 01 General Requirements: Construction Schedule to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Coordination with other building trades.
 - .4 Review manufacturer's installation instructions, and warranty requirements.

1.6 SUBMITTALS

- .1 Provide submittals in accordance with Division 01 General Requirements: Submittal Procedures.
 - .1 Not later than 30 working days following Award of Contract, submit a schedule and shop drawings, including room numbers from the Contract Drawings. Indicate ULC assembly number for each condition, required temperature rise and flame rating, hose stream rating, thickness, installation methods and materials of firestopping and smoke seals, damming materials, reinforcements, anchorages and fastenings, size of opening, adjacent materials and number of penetrations. Include manufacturer's printed instructions for each type of penetration.
 - .2 Where possible determine thickness to be applied from tests of assemblies identical to the assembly to be protected, conducted in accordance with CAN/ULC S101.
 - .3 Engineering Judgements: where a UL / ULC / c-UL Design (assembly number) has not been issued, obtain an engineering judgement from the system manufacturer for a solution relevant to the job conditions involved, and obtain approval of the Authorities Having Jurisdiction.
 - .1 Determine system from available engineering studies, or correspondence with the labelling agency indicating the effect of the differences on the fire separation of the assembly. Confirm acceptance of system by Authorities Having Jurisdiction in writing.
 - .2 Obtain and submit fire stop system manufacturer's engineering judgement(s) meeting the requirements of Authorities Having Jurisdiction.
 - .3 Engineering judgements shall comply with "Recommended IFC Guidelines for Evaluating Firestop Systems in Engineering Judgments (EJs)."
- .2 Submit product data in accordance with Division 01 General Requirements: Submittal Procedures:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

- .3 Quality assurance submittals: submit following in accordance with Division 01 General Requirements: Quality Control.
 - .1 Contractor shall obtain a training letter from the firestop system manufacturer, and submit it to Departmental Representative prior to firestop installation.
 - .2 Submit copies of engineering judgments approved by local authorities having jurisdiction to Departmental Representative prior to installation.
 - .3 The firestopping system manufacturer shall submit a letter of certification to the Contractor, certifying that all firestopping has been installed in compliance with the approved ULC design specifications for each type of penetration. Forward one copy to Departmental Representative, and include one copy in each maintenance manual specified in Section 01 78 20.
 - .1 The 'Certificate of Substantial Performance' shall not be issued until Departmental Representative has received the manufacturer's letter of certification from the Contractor indicating that all fire-stopping applications comply with the tested assemblies of the manufacturer.
 - .4 Submit the manufacturer's engineering judgment identification number(s) and Shop Drawing details when no ULC or cUL system is available for an application. Engineering judgments must include the Contract name and number, and the Contractor's name.
 - .5 For those firestop applications that exist, for which no ULC or cUL tested system is available through a manufacturer, a manufacturer's engineering judgment derived from similar ULC or cUL system designs or other tests shall be submitted to local Authorities Having Jurisdiction, with a copy to Departmental Representative, for their review prior to installation. Engineering judgment Drawings must follow the requirements set forth by the IFC.

1.7 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer:
 - .1 Company or person specializing in fire stopping installations, and approved by the manufacturer with minimum 5 years documented experience.
 - .2 Company or person shall be a member in good standing of the Firestop Contractors International Association (FCIA).
 - .2 Work of this Section shall comply with the FCIA Firestop Manual of Practice (MOP), the Ontario Building Code - 2012 (OBC), and the Ontario Fire Code - 2012 (OFC), including errata and amendments.
 - .3 Use materials and methods of determining required thickness of application that have the full acceptance of Authority Having Jurisdiction.
 - .4 Use materials tested to CAN/ULC S115. Assemblies containing the materials shall be in accordance with assemblies tested and approved by agencies acceptable to Authority Having Jurisdiction.
 - .5 Single Source Responsibility:
 - .1 Obtain through-penetration firestop and joint systems for each kind of penetration and construction condition indicated from a single source of manufacture and installation responsibility.
 - .6 The manufacturer's direct technical representative (not distributor or agent) shall be on-site during the initial installation of the firestop systems to provide training to the installer's personnel in the proper product selection and installation procedures.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling, and unloading:
 - .1 Deliver, store and handle materials in accordance with Division 01 General Requirements: 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, and 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 Use stock before its expiration date.

1.9 PROJECT CONDITIONS

- .1 Install firestopping and smoke seals materials only when the areas in which they are scheduled are closed-in and protected from dampness.
- .2 Environmental Limitations: Install firestopping and smoke seals systems when ambient or substrate temperatures are within temperature and moisture limits permitted by firestopping and smoke seals system manufacturers or when substrates are not wet due to rain, frost, condensation, or other causes.
- .3 Ventilate firestopping and smoke seals systems in accordance with manufacturer's written instructions by natural means or forced air circulation where natural means are not adequate.

Part 2 Products

2.1 PERFORMANCE/DESIGN CRITERIA

- .1 Delegated Design Requirements: Design firestopping and smoke seals required by the Contract Documents to meet fire ratings indicated, and in accordance with requirements of the Ontario Building Code 2012 and Amendments.
- .2 Performance Requirements: Manufacturer shall design proprietary assemblies to withstand the listed ratings in accordance with the Ontario Building Code 2012 and Amendments, Underwriters Laboratories Canada, and authorities having jurisdiction, and as follows:
 - .1 Provide through-penetration firestop and joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire resistance rating of assembly penetrated:
 - .1 Fire resistance rated load bearing walls, including partitions, with fire protection rated openings.

- .2 Fire resistance rated non-load bearing walls, including partitions, with fire protection rated openings.
- .3 Fire resistance rated floor assemblies.
- .2 F-Rated Systems: Provide through penetration firestop systems with F-ratings indicated, as determined by ULC S115, but not less than that equalling or exceeding fire resistance rating of constructions penetrated.
- .3 T-Rated Systems: For the following conditions, provide through penetration firestop systems with T-ratings indicated, as well as F-ratings, as determined per by ULC S115, where systems protect penetrating items exposed to potential contact with adjacent materials:
 - .1 Penetrations located outside wall cavities.
 - .2 Penetrations located outside fire resistive shaft enclosures.
 - .3 Penetrations located in construction containing fire protection rated openings.
 - .4 Penetrating items larger than 100 mm diameter nominal pipe or 100 cm² in overall cross sectional area.
- .4 Firestopping and Smoke seals Systems Exposed To View: Systems exposed to view, traffic, moisture, and physical damage; provide products that after curing do not deteriorate when exposed to these conditions both during and after construction, and as follows:
 - .1 Provide moisture resistant through penetration firestop systems for piping penetrations for plumbing and wet pipe sprinkler systems.
 - .2 Provide firestopping and smoke seals systems capable of supporting floor loads involved either by installing floor plates or by other means for floor penetrations with annular spaces exceeding 100 mm in width and exposed to possible loading and traffic.
 - .3 Provide firestopping and smoke seals systems not requiring removal of insulation for penetrations involving insulated piping.
 - .4 Provide products with flame spread ratings of less than 25 and smoke developed ratings of less than 50 for firestopping and smoke seals and joint systems exposed to view.
- .5 Fire Resistance of Joint Systems: Assembly ratings and movement capabilities indicated, but with assembly ratings not less than that equalling or exceeding fire resistance rating of constructions in which joints are located.

2.2 FIRESTOPPING AND SMOKESEALS: GENERAL

- .1 Compatibility: Provide firestopping and smoke seals systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating firestopping and smoke seals systems, under conditions of service and application, as demonstrated by firestopping and smoke seals system manufacturer based on testing and field experience, and as follows:
 - .1 Service penetration assemblies: certified by ULC in accordance with ULC S115 and listed in ULC Guide No. 40 U19.
 - .2 Service penetration firestopping and smoke seals components: certified by ULC in accordance with ULC S115 and listed in ULC Guide No. 40 U19.13, under the Label Service of ULC.
 - .3 Fire resistance rating of installed firestopping and smoke seals assembly not less than the fire resistance rating of surrounding floor and wall assembly.
 - .4 Firestopping and Smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal; do not use cementitious or rigid seal at such locations.
 - .5 Firestopping and Smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal; do not use a cementitious or rigid seal at such locations. Exemption to fire dampers.
- .2 Accessories: Provide components for each firestopping and smoke seals systems that are needed to install fill materials. Use only components specified by firestopping and smoke seals system manufacturer and approved by the qualified testing and inspecting agency for firestopping and smoke seals systems indicated. Accessories include, but are not limited to, the following items:
 - .1 Permanent forming, damming and backing materials, including the following:
 - .1 Slag or rock wool fibre insulation.
 - .2 Sealants used in combination with other forming, damming or backing materials to prevent leakage of fill materials in liquid state.
 - .3 Fire-rated form board.
 - .4 Fillers for sealants.
 - .2 Temporary forming materials.
 - .3 Substrate primers.
 - .4 Collars.
 - .5 Steel sleeves.

- .6 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
- .7 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.
- .8 Metal fire stop: Commercial galvanized steel, to ASTM A1008/A1008M, zinc coating 260 g/m², minimum metal core thickness 0.912 mm.
- .9 Steel Deck Moulded Flute Inserts: One piece moulded mineral fibre flute inserts, sized for steel deck profiles, for placement at top of fire rated wall assemblies:
 - .1 Acceptable material: Hilti CP777 Speed Plugs.
- .10 Labels: Peel-and-stick labels printed with the following information:
 - .1 ATTENTION: FIRE RATED ASSEMBLY. DO NOT MODIFY
 - .2 Name of firestopping manufacturer
 - .3 Names of products used
 - .4 Hour Rating of Assembly
 - .5 Manufacturers standard detail number, or Engineered Judgement identifier; ULC or cULus Number
 - .6 Date of installation
 - .7 Name of installing Trade Contractor
 - .8 Contact telephone number for repair or replacement of firestopping materials.

2.3 **FILL MATERIALS**

- .1 General:
 - .1 Provide firestopping and smoke seals systems containing the types of fill materials indicated in the Firestopping and Smoke seals System Schedule below by reference to the types of materials described in this Article. Fill materials are those referred to in directories of the referenced testing and inspecting agencies as fill, void, or cavity materials.
 - .2 Firestopping and smoke seal systems shall be tested in accordance with ULC S115, and be comprised of asbestos-free materials and systems capable of maintaining an effective barrier against flame, smoke and gases, and not to exceed opening sizes for which they are intended for the ratings as indicated on drawings.

- .2 Cast-in-Place Firestopping and Smoke-seals Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- .3 Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
- .4 Firestopping and Smoke-seals Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrating item.
- .5 Cable Penetration Devices: Premanufactured intumescent blocks, consisting of a system of inserts and adjustable cores; or premanufactured fire rated cable pathway systems, the following products are acceptable:
 - .1 EZ-Path Fire Rated Pathway, Specified Technologies Inc.
 - .2 CP 653 Speed Sleeve, Hilti
- .6 Intumescent Composite Sheets: Rigid panels consisting of aluminum foil faced elastomeric sheet bonded to galvanized steel sheet.
- .7 Intumescent Putties: Non-hardening dielectric, water resistant putties containing no solvents, inorganic fibres, or silicone compounds.
- .8 Intumescent Spray Foam: Expanding spray-in-place intumescent foam sealant.
- .9 Intumescent Wrap Strips: Single component intumescent elastomeric sheets with aluminum foil on one side.
- .10 Mortars: Pre-packaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogeneous mortar.
- .11 Silicone Foams: Multi-component, silicone based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.
- .12 Silicone Sealants: Moisture curing, single component, silicone based, neutral curing elastomeric sealants of grade indicated below:
 - .1 Grade for Horizontal Surfaces: Pourable (self-levelling) formulation for openings in floors and other horizontal surfaces.
 - .2 Grade for Vertical Surfaces: non-sag formulation for openings in vertical and other surfaces.

2.4 ACCESSORIES

- .1 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
- .2 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.
- .3 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.
- .4 Metal fire stop: Commercial galvanized steel, to ASTM A1008/A1008M, zinc coating 260 g/m², minimum metal core thickness 0.95 mm (20 ga.).

2.5 MIXING

- .1 For those products requiring mixing before application, comply with firestopping and smoke seals system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

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 EXAMINATION

- .1 Examine surfaces, components, materials to receive firestopping and smoke seals material; report any conditions that would detrimentally affect the application of the material or the proper firestopping and smoke seals of the system.
- .2 Commence Work when conditions of surfaces and the working conditions are suitable.
- .3 Where penetration sealants or caulking are required, ensure all service lines are in place, tested and approved.

- .4 Verify all proper blocking, framing (using non-combustible materials) are properly installed and prepared to receive firestopping and smoke seals. Notify Departmental Representative in writing of any deficiencies affecting the proper performance of the firestopping and smoke seals, do not proceed until deficiencies are corrected.

3.3 PREPARATION

- .1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials. 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 Prime surfaces as required.
- .5 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.4 INSTALLATION

- .1 Install fire stopping and smoke seal material and components in accordance with manufacturer's certified tested system listing.
- .2 Apply firestopping and smoke seals materials/systems to maintain the fire separations in the project as indicated on drawings.
- .3 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.
- .4 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.
- .5 Tool or trowel exposed surfaces to neat finish.
- .6 Remove excess compound promptly as work progresses and upon completion.

3.5 SPECIAL REQUIREMENTS

- .1 Location of special requirements for fire stopping and smoke seal materials at openings and penetrations in fire resistant rated assemblies are as follows:
 - .1 Designed for re-entry, removable at: electrical and communications cable penetrations through partitions.
 - .1 Use Prefabricated Firestop Sleeves or prefabricated Cable Pathways, as approved by Departmental Representative.

3.6 SEQUENCE OF OPERATION

- .1 Proceed with installation only when submittals have been reviewed by Departmental Representative.
- .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.

3.7 FIELD QUALITY CONTROL

- .1 Inspections: notify Departmental Representative when ready for inspection and prior to concealing or enclosing fire stopping materials and service penetration assemblies.
 - .1 Cut tests may be made at random by the Departmental Representative. Frequency of cut tests shall be determined by the Departmental Representative, but will not be more than 1% of total length of firestopping and smoke seals.
 - .2 Make all necessary repairs and correct all deficiencies noted after completion of cut tests.
- .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, twice during progress of Work at 25% and 60% complete.

3.8 CLEANING

- .1 Progress Cleaning: clean in accordance with Division 01 General Requirements: Cleaning. Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Division 01 General Requirements: Cleaning.
- .3 Waste Management: Separate waste materials for reuse and recycling in accordance with Division 01 General Requirements: Construction/Demolition Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.9 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

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 03 31 00.10 - Heritage Concrete.
- .2 Section 05 51 29.01 - Interior Metal Stairs.
- .3 Section 06 10 00.01 - Interior Rough Carpentry.
- .4 Section 06 20 00.01 - Interior Finish Carpentry.
- .5 Section 06 40 00 - Architectural Woodwork.
- .6 Section 07 27 14.01 - Interior Vapour Retarder.
- .7 Section 09 25 00 - Gypsum Board.
- .8 Section 09 30 00 - Tiling.
- .9 Section 09 64 00 - Wood Flooring.
- .10 Section 10 28 10 - Toilet Accessories.

1.2 REFERENCES

- .1 ASTM International (ASTM)
 - .1 ASTM C834-14, Standard Specification for Latex Sealants.
 - .2 ASTM C919-12, Standard Practice for Use of Sealants in Acoustical Applications.
 - .3 ASTM C920-14a, Standard Specification for Elastomeric Joint Sealants.
 - .4 ASTM C1193-16, Standard Guide for Use of Joint Sealants.
 - .5 ASTM C1330-02(2013) Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.
 - .6 ASTM C1521-13 Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.
 - .7 ASTM D2240-15, Standard Test Methods for Rubber Property, Durometer Hardness.
- .2 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.

1.1 REGULATORY REQUIREMENTS

- .1 Work shall meet or exceed the following regulatory requirements; comply with the Specifications; in cases of perceived conflict, the more stringent requirement applies.
 - .1 Ontario Building Code 2012 and Amendments.

- .2 All Federal, Provincial, Regional and Municipal laws, regulations, ordinances and by-laws pertaining to the Work shall apply for the duration of the project.
- .3 *Standards and Guidelines for Conservation of Historic Places in Canada*, 2nd Edition.

1.2 COORDINATION

- .1 Coordinate work of this Section with interfacing and adjoining work for proper sequencing of each installation and to provide positive weather resistance, durability of the work, and protection of materials and finishes.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals shall comply Division 01 - General Requirements: Submittal Requirements.
- .2 Submit manufacturer's product data as follows:
 - .1 Printed product literature describing type, composition recommendations, and directions for surface preparation, material preparation, and material installation.
- .3 Submit manufacturer's installation instructions for each product used.
 - .1 Before performing work of this Section, submit the names of proposed materials.
 - .2 When required by Departmental Representative, submit test certificates from an approved Canadian materials testing laboratory indicating that sealants meet the requirements specified, and that the tests have been conducted in accordance with ASTM D2240.
- .4 Submit samples for initial selection and quality assurance as follows:
 - .1 Samples of back-up material, primer, joint fillers, and of each type and colour of sealant to be used. Cure samples under conditions anticipated at the site during application.
- .5 Reports: submit written pre-installation meeting recommendations, field inspection, and test report results after each inspection.
- .6 Submit Warranty.

1.4 QUALITY ASSURANCE

- .1 Comply with ASTM C1193 guidelines.
- .2 Pre-Installation Meeting:

- .1 Arrange with manufacturer's representative to inspect substrates and to review installation procedures 48-hours in advance of installation.
 - .1 Review conditions under which work will be done.
 - .2 Joint condition and profile.
 - .3 Weather conditions.
- .2 Submit written report of meeting to Departmental Representative.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, handle, store and protect materials in accordance with manufacturer's recommendations and instructions.
- .2 Deliver containers labelled and sealed, complete with written application and maintenance instructions.
- .3 Store materials in a dry, heated enclosure.

1.6 PROJECT CONDITIONS

- .1 Environmental Limitations:
 - .1 Do not proceed with installation of joint sealants under following conditions:
 - .1 When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4 degrees C.
 - .2 When joint substrates are wet.
- .2 Joint-Width Conditions:
 - .1 Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- .3 Joint-Substrate Conditions:
 - .1 Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.
 - .2 Substrate must be clean, dry, and frost free.

1.7 WARRANTY

- .1 Contractor warrants that sealant work will not leak, crack, crumble, melt, shrink, run, lose adhesion or stain adjacent surfaces for not less than two years from the date of Substantial Performance.

Part 2 Products

2.1 SEALANT MATERIALS

- .1 Type S-1: Mildew-Resistant Sealant: to ASTM C920 and GSB 19-GP-22M; meets one or more of the following approvals / specifications: fungi resistant to ASTM G21, FDA Regulation No. 21 CFR 177.2600, National Sanitation Foundation Standard 51, Federal Specifications TT-S-001543A and TT-S-00230C, USDA acceptance for use in meat and poultry processing plants; one-component, mildew-resistant, non-sag, silicone sealant.
 - .1 Acceptable Materials:
 - .1 Dow Corning 786.
 - .2 Pecora 898 NST.
- .2 Type S-2: Silicone Sealant; to CAN/CGSB 19.13-M87, ASTM C1248, and ASTM C920: Type S Grade NS Class 50 use NT, M, G, A, O; medium-modulus, single-component, high-performance, neutral-cure silicone sealant; may be used as a joint sealant on substrates such as aluminum, glass, steel, painted metal, plastic, stone, concrete and brick.
 - .1 Acceptable materials:
 - .1 864NST or 895NST, Pecora Corporation.
 - .2 Dow Corning 795, Dow Corning
 - .3 Spectrum 2, Tremco Sealant & Waterproofing
- .3 Type S-3: Paintable one-component polyurethane sealant; silane end-capped, non-sag, moisture-cure for general construction, low-VOC, to ASTM C920 type S grade NS class 35 or class 25 use NT, M, A, O. Meets ASTM C1248, meets CAN/CGSB 19.13-M87, meets U.S. Federal Specification TT-S-00230C Class A, Type II.
 - .1 Basis-of-Design:
 - .1 Dymonic FC, Tremco Inc.
 - .2 3M™ Polyurethane Sealant 540.
 - .3 Sikaflex® 15 LM.
- .4 Type S-4: Horizontal joint sealant; two-component, self-levelling.
 - .1 To ASTM C920: type M; grade P; class 25; use T, M, O.
 - .2 Acceptable materials:
 - .1 Sikaflex 2c SL, Sika.
 - .2 Sonolastic SL 2, BASF Sonneborn.
 - .3 THC-901, Tremco Inc.
 - .4 Urexpan NR-200, Pecora.

- .5 Type S-5: One-part moisture curing, low modulus polyurethane sealant for sealing joints in level and slightly slope surfaces conforming to ASTM C920, type S, grade P, class 50, use T, M, A, O.
 - .1 Acceptable materials:
 - .1 Sonolastic SL 1, BASF Sonneborn.
 - .2 Vulkem 45 SSL, Tremco Inc.
 - .3 Urexpan NR-201b, Pecora.
- .6 Type S-6: Control joint sealant: two-component, epoxy-urethane, self-levelling, load bearing saw cut or preformed control joints.
 - .1 Acceptable materials:
 - .1 Loadflex, Sika.
 - .2 Dynapoxy EP-800, Pecora.
 - .3 MasterSeal CR 190, BASF Building Systems
- .7 Type S-7: two-component, gun-grade, slump-resistant elastomeric polyurethane sealant, specially formulated for sealing joints in water-immersion conditions, and highly resistant to biodegradation by both aerobic and anaerobic bacteria; to ASTM C920, Type M, Grade NS, Class 25, use T, NT, M, G, A, O; certified to CAN/ULC S115; Canadian Food Inspection Agency accepted.
 - .1 Acceptable Materials:
 - .1 Sikaflex 2c NS EZ Mix, by Sika Canada.
 - .2 Sikaflex 2c NS EZ Mix TG, by Sika Canada (traffic grade option).
- .8 Type S-8: acoustical sealant: non-skinning, non-hardening flexible gun grade synthetic rubber, designed to limit sound transmission; meets or exceeds ASTM C919, ASTM E90, AAMA 809.2, and CAN/CGSB 19.21 M87.
 - .1 Acceptable Materials:
 - .1 Pecora BA-98.
 - .2 Dow Corning Acoustical Sealant.
 - .3 Tremco Acoustical Sealant.
 - .4 Hilti Acoustic Joint Sealant.

2.2 ACCESSORIES

- .1 Preformed compressible and non-compressible back-up materials that are non-staining, compatible with joint substrate, sealants, primers, and other joint fillers, and are approved for applications indicated by sealant manufacturer based on site experience and laboratory testing.

- .1 Rod Type Sealant Backings:
 - .1 ASTM C1330, Type C (closed cell material with a surface skin), Type O (open cell material) or Type B (bi-cellular material with a surface skin).
 - .2 Use any of the preceding types, as approved in writing by joint sealant manufacturer for joint application indicated.
 - .3 Size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
 - .4 Non-adhering to sealant, to maintain two-sided adhesion across joint.
- .2 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.
- .3 Bond Breaker Tape.
 - .1 Polyethylene bond breaker tape which will not bond to sealant.
- .2 Primer: Non-staining type as recommended by sealant manufacturer.
- .3 Joint Cleaner: Non-corrosive solvent type recommended by sealant manufacturer for applicable substrate materials.

2.3 COLOURS

- .1 Colours:
 - .1 Sealants at masonry control joints to match mortar colour.
 - .2 Sealants at other locations to match colour of adjacent exposed material.

2.4 SEALANT SELECTION

- .1 General:
 - .1 Where no specified type of sealant is shown or specified, choose one of the sealants specified in this Section appropriate for its location and conditions as recommended by the sealant manufacturer in accordance with its warranty provisions and technical product datasheet.
 - .2 Make sealant selections consistent with manufacturer's printed guidelines.

- .3 Always clean and prime bonding surfaces prior to applying sealants.
- .2 Type S-1: Mould and mildew resistant, interior sealing applications exposed to high moisture; designed to seal nonporous surfaces around showers, tubs, sinks and plumbing fixtures where conditions of high humidity and temperature extremes exist; sealing around shower-tub enclosures, tubs, sinks, urinals and whirlpools; sealing around bathroom fixtures; Waterproofing rimless sinks.
- .3 Type S-2: Use for metal-to-metal joints where no other specific sealant type is specified.
- .4 Type S-3: Paintable, use one-component polyurethane general construction sealant at joints other than metal-to-metal where no other specific sealant type specified, or where its paintable properties are required.
- .5 Type S-4: Use multi-component sealant for horizontal joint sealant of plaza, floors and decks, exterior areas only, subject to pedestrian and vehicular traffic.
- .6 Type S-5: Use one-part sealant for horizontal joint sealant of plaza, floors and decks, exterior areas only, not subject to pedestrian and vehicular traffic.
- .7 Type S-6: Use control joint sealant as filler for interior, horizontal saw cut or preformed control joints where joints are subject to load bearing conditions.
- .8 Type S-7: Canadian Food Inspection Agency accepted; Use at floor-to-wall joints exposed to frequent floor washing and other joints exposed to frequent wetting; use wet area sealant for horizontal and vertical joints, and perimeter joints, at showers, exterior door threshold plates, and other wet area applications. Use traffic grade (TG) at horizontal floor locations.
- .9 Type S-8: Use at perimeter joints where acoustical performance is required. Application locations shall be where it will be covered by other materials after installation; for example, at gypsum board edges at top and bottom of walls, and where boards meet opening frames. Apply bead onto substrate and cover within 24-hours to prevent tracking and dirt pickup.

Part 3 Execution

3.1 PROTECTION

- .1 Protect installed work of other trades from staining, damage, or contamination.

3.2 EXAMINATION

- .1 Verify condition of previously installed work upon which this Section depends. Report defects to Departmental Representative. Commencement of work means acceptance of existing conditions.
- .2 Ensure joints are suitable to accept and receive the sealants.
- .3 Ensure surfaces are sound, dry, and free from dirt, water, frost, loose scale, corrosion, bitumen, paints, and other contaminants that may adversely affect the performance of the sealing materials.
- .4 Do not apply sealant to masonry until mortar has cured.
- .5 Before any sealing work is commenced, test the materials for indications of staining or poor adhesion.
- .6 Ensure joints and spaces which are to receive sealants are less than 10 mm deep; not less than 6 mm wide; and not more than 19 mm wide.

3.3 SURFACE PREPARATION

- .1 Perform cleaning to the extent required to achieve acceptable joint surfaces, and as approved by sealant manufacturer.
- .2 Protect adjacent finishes from damage.
- .3 Cleaning Procedures:
 - .1 Metal:
 - .1 Blast cleaning: Sandblast or iron shot blast surfaces requiring heavy cleaning down to bright metal. Remove loose matter by compressed air or commercial vacuum cleaner.
 - .2 Power tool cleaning: Clean surfaces by wire brush, impact tools, abrasive wheels or by buffing. Remove loose matter by compressed air or vacuum cleaner.
 - .3 Solvent cleaning: Clean with solvent applied by spray or brush. Wipe with clean, dry wiping cloths. Remove paints with paint remover and wipe with solvent. Remove residue.
 - .2 Concrete, Marble, Stone, Brick:

- .1 Remove friable material with wire brush or by chipping, until surfaces are sound. Remove surface residue with a stiff brush, vacuum cleaner or compressed air.
- .2 Concrete surfaces shall be cured for at least 28 days. Acid etch joint surfaces to remove alkaline salts and neutralize acid with a solution of tri sodium phosphate, followed by rinsing with clean, cold water.
- .3 Allow joints to dry thoroughly.
- .4 Completely remove resinous products used, such as curing compounds and form release agents.
- .3 Glass, Ceramics, and Porcelain: Brush with solvent and wipe with clean, dry wiping cloths. Remove residue.
- .4 Wood: Remove foreign matter such as soil, paint, grease, bitumen, resin with solvents, abrasives and paint removers; remove residue. Provide surfaces that are clean and dry.
- .4 Do not exceed shelf life and pot life of the materials, and installation times, as stated by the manufacturers.
- .5 Be familiar with the work life of the sealant to be used. Do not mix multiple component materials until required for use.
- .6 Thoroughly mix multiple component sealants, and bulk sealants when recommended by manufacturer, using a mechanical mixer capable of mixing at 80-100 rpm without mixing air into the material. Continue mixing until the material is a uniform colour and free from streaks of unmixed material.
- .7 Mask areas adjacent to joints to be sealed. Prevent contamination of adjacent surfaces. Remove masking promptly after the joint sealing has been completed.

3.4 INSTALLATION

- .1 Install materials in compliance with the recommendations of their manufacturer.
- .2 Fill joints with joint backing to produce joint profile with optimum sealant cross section. Provide joint depth of one half the joint width.
- .3 Prime joints to receive sealants as recommended by the sealant manufacturer to prevent staining, to assist the bond and to stabilize pouring surfaces.

- .4 Apply primer with a brush that will permit joint surfaces to be primed. Perform priming immediately before installation of sealants, allowing minimal time between priming and sealing as recommended by the sealant manufacturer.
- .5 Sealants generally shall be of gun grade or knife grade non-sag consistency to suit the joint condition. Use gun nozzles of the proper sizes to suit the joints and the sealant material. Sealants for horizontal joints (other than overhead joints) shall be self-levelling type.
- .6 Install sealant with pressure operated guns.
- .7 Use sufficient pressure to fill all voids and joints solid. Sealant shall bond to the sides of the joint only and shall not adhere to the joint backing material. Provide bond breaker material where necessary.
- .8 Pour or gun self-levelling, low viscosity grades of sealant into horizontal joints. If applied by gun, hold the nozzle to the bottom of the joints to ensure complete filling of the joints.
- .9 Ensure that the correct sealant depth is maintained. Superficial coating with a skin bead will not be accepted.
- .10 Except as otherwise specified, sealant installations shall be a full bead free from air pockets and embedded impurities, providing smooth surfaces, free from ridges, wrinkles, sags, air pockets and imbedded impurities.
- .11 After joints have been completely filled, tool them neatly to a slightly concave surface.
- .12 Tool sealants to achieve airtight joints. Use wet tools as required.
- .13 Insert plastic vent tubes where required or shown, extending from the cavity to exterior face, sloped to the exterior. Seal around the tube and tool for positive adhesion. Insert joint backing for remainder of the joint. Do not plug vent tube during sealing operation.

3.5 **CLEANING**

- .1 Immediately clean adjacent surfaces that have been soiled and leave work in a neat, clean condition. Remove excess materials and droppings using recommended cleaners and solvents.

3.6 **REPAIR**

- .1 Cut out damaged sealant, repeat preparation, prime joints, and install new material as specified, and acceptable to the manufacturer.

3.7 CLEANING

- .1 Progress Cleaning: clean in accordance with Division 01 - General Requirements: 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 Division 01 - General Requirements: Cleaning.
- .3 Waste Management: Separate waste materials for reuse and recycling in accordance with Division 01 - General Requirements: Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.8 PROTECTION OF FINISHED WORK

- .1 Provide approved, non-staining means of protection for the completed joint sealant installations to protect the Work from mechanical, thermal, chemical and other damage by construction operations and traffic.
- .2 Protect Work from damage during construction.

3.9 SCHEDULE

- .1 Interior: provide sealant at the following interior locations, unless joints are covered by trim or unless sealant is specified to be included in the work of other sections:
 - .1 Control joints and expansion joints in non-fire-rated masonry and gypsum board walls.
 - .2 Door frames and adjacent materials.
 - .3 Penetrations in non-fire-rated masonry and gypsum board walls.
 - .4 Top and bottom of non-fire-rated masonry and gypsum board walls, and at perimeter of opening frame-to-wall junctions.
 - .5 Interior sealing shall include both sides of walls and frames.
 - .6 Interior side of exterior windows.
 - .7 Tile and adjacent materials.
 - .8 Vanities, counters, splash backs, lavatories, water closets, and urinals to adjacent wall and floor surface.
 - .9 Floor joints and joints at wall-to-floor transitions.

- .10 Other joint locations to be sealed to prevent sound, air, moisture or water penetration or infiltration, or the development of mould-susceptible environments.
- .2 Joint designation in the preceding paragraphs, and the fact that the Drawings do not show all locations to be sealed, does not limit requirements to seal all locations necessary to create and ensure a continuous air-sealed and water-tight enclosure.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 06 10 00.01 - Interior Rough Carpentry: stud wall framing.
- .2 Section 06 20 00.01 - Interior Finish Carpentry: doorframes and trim.
- .3 Section 10 28 10 - Toilet Accessories: robe hooks on back of washroom doors.
- .4 Section 10 44 00 - Interior Signage: washroom doors.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI A208.1-2009, Particleboard.
- .2 Architectural Woodwork Manufacturers Association of Canada (AWMAC)
 - .1 AWMAC/AWI Architectural Woodwork Standards, 2ndst Edition, 2014.
- .3 Canadian Hardwood Plywood and Veneer Association (CHPVA)
 - .1 CHPVA Official Grading Rules for Rotary Cut Face Veneers.
- .4 Canadian Standards Association (CSA International)
 - .1 CSA O115-M1982(R2001), Hardwood and Decorative Plywood.
 - .2 CAN/CSA O132.2 Series-90 (R1998), Wood Flush Doors.
- .5 National Lumber Grades Authority (NLGA)
 - .1 NLGA Standard Grading Rules for Canadian Lumber 2014.

1.1 REGULATORY REQUIREMENTS

- .1 Work shall meet or exceed the following regulatory requirements; comply with the Specifications; in cases of perceived conflict, the more stringent requirement applies.
 - .1 Ontario Building Code 2012 and Amendments.
 - .2 All Federal, Provincial, Regional and Municipal laws, regulations, ordinances and by-laws pertaining to the Work shall apply for the duration of the project.
 - .3 *Standards and Guidelines for Conservation of Historic Places in Canada*, 2nd Edition.

1.2 SUBMITTALS

- .1 Submit in accordance with Division 01 General Requirements: Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet.
- .3 Shop Drawings:
 - .1 Show construction and materials used in cores, size and species of edge strip, thickness and species of cross-banding, and thickness and species of face veneer.
 - .2 Show details of openings and mouldings for glazing.
 - .3 Indicate locations, sizes, and types of all doors to be supplied, reference to room numbers on Drawings.
 - .4 Indicate elevation of each kind of door, details of construction, location, and extent of hardware blocking, fire ratings, requirements for factory finishing and other pertinent data.
 - .5 Include finishing specifications for doors to receive factory-applied finish.
 - .6 Include certifications as might be required to show compliance with specifications.
- .4 Samples:
 - .1 Submit one 300 x 300 mm corner sample of each type wood door.
 - .2 Show door construction, core, glazing detail and faces.

1.3 QUALITY ASSURANCE

- .1 Fabricate doors in accordance with the AWMAC/AWI Architectural Woodwork Standards, Section 9 - Doors, Premium grade.
- .2 Manufacturer Qualification: Manufacturer specializing in products in this section who have a minimum of five years of documented experience and are a member in good standing of the Architectural Woodwork Manufacturers Association of Canada (AWMAC).
- .3 Regulatory Requirements:
 - .1 Wood fire rated doors: labelled and listed by an organization accredited by Standards Council of Canada.

- .4 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .5 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Delivery and Acceptance Requirements:
 - .1 Deliver doors and panels to minimize storage on site and when site conditions conform to requirements for storage.
- .2 Storage and Protection:
 - .1 Store and handle doors and panels in accordance with AWMAC requirements, and as follows:
 - .1 Protect doors from dampness. Arrange for delivery after work causing abnormal humidity has been completed.
 - .2 Store doors in well-ventilated room, off floor, in accordance with manufacturer's recommendations.
 - .3 Protect doors from scratches, handling marks and other damage.
 - .4 Store doors away from direct sunlight.

1.5 WARRANTY

- .1 Provide warranty stating that doors are warranted against defects in materials and workmanship for the life of the original installation.
- .2 Warranty to include coverage for reasonable amount to remove, replace, refinish, and re-hang doors that do not meet accepted AWMAC tolerances.

Part 2 Products

2.1 FLUSH WOOD DOORS

- .1 Fire Rated Doors:
 - .1 Wood doors: tested in accordance with CAN/ULC S104 or NFPA 252 to achieve rating as scheduled.
 - .1 Face panels: match solid core doors.
 - .2 Metal label secured to hinge edge of door.
 - .3 Finish: as indicated.
- .2 Solid Core Doors:

- .1 Flush wood doors: solid core, to AWMAC custom grade.
- .2 Dry lumber to an average moisture content of between 6 and 12% maximum at time of manufacture.
- .3 Construction:
 - .1 Solid particleboard core having minimum density of 449 kg/m³ in accordance with ANSI A208.1 and as follows:
 - .1 Stiles and Rails: Structural Composite Lumber (SCL) bonded to core and as follows:
 - .1 Side Stiles: 108 mm SCL with 16 mm hardwood edge, to match face veneers; no finger jointed materials permitted.
 - .2 Top and Bottom Rails: 57 mm SCL with 16 mm soft wood cap.
 - .2 Reinforcement: with solid wood lock-blocks.
 - .3 Construction: 5-ply.
 - .4 Use: interior.
 - .2 Door cores to be fully bonded and abrasive planed or sanded prior to laminating faces to core materials.
 - .3 Door Thickness: 45 mm overall.
- .4 Face Panels (for opaque finish):
 - .1 Decorative Wood Veneer: AWMAC custom quality grade and hardwood species, supplied from same source, clear and bright in colour with minimum of pin knots, mineral or sugar streaks, no open defects, heartwood, or wild grain, and minimal colour variation between flitches, meeting the requirements for Hardwood Plywood Veneer Association (HPVA) quality grade and hardwood species as indicated.
 - .1 Grade: custom, with Grade AA faces.
 - .2 Species: Birch.
 - .3 Cut: Plain sliced (flat sliced).
 - .4 Match between Veneer Leaves: Slip match.
 - .5 Finish: Factory finished as indicated below for transparent finishes.
 - .6 Minimum Thickness: 0.50 mm.
 - .5 Adhesive: Type I (waterproof).
- .3 Fabrication:
- .4 Fabricate doors in accordance with AWMAC section 9.
- .5 Vertical edge strips to match face veneer.

- .6 Doors shall be pre-fitted, bevelled and machined at the factory for all mortise hardware items required.
- .7 Bevel vertical edges of single acting doors 3 mm in 50 mm on lock side and 1.5 mm in 50 mm on hinge side.

2.2 GLAZED STILE AND RAIL DOORS

- .1 Stile and rail doors: solid White Maple, to AWMAC premium grade, for transparent finish.
- .2 Factory assembled by doweled construction, hairline joints, water-proof exterior grade Type I adhesive, to AWMAC Section 9 Edition 2.
- .3 Door thickness: 1-3/4 inch thick.
- .4 Stile face: 6 inch width.
- .5 Bottom rail: 10 inches width.
- .6 Top rail face width to match stiles.
- .7 Stiles and rails grooved to receive 1 inch thick insulating glass unit, grooves to be 1/2-inch deep X width of glass, include flat bead stops as well for extra glass stability, same material and finish as door.
- .8 Mortise for appropriate hardware, 2-3/8 inch backset.
- .9 Glass and glazing: to Section 08 81 00 - Glass.
- .10 Door hardware: refer to door hardware groups and door schedule.

2.3 ACCESSORIES

- .1 Wood doorframes: match door face panels, refer to Section 06 20 00 - Finish Carpentry.
 - .1 Fire rated construction as required; refer to Drawings for fire rated locations; ¾ hr.

2.4 FABRICATION

- .1 Fabricate doors in accordance with AWMAC section 9.
- .2 Vertical edge strips to match face veneer.
- .3 Doors shall be pre-fitted, bevelled and machined at the factory for all mortise hardware items required.
- .4 Bevel vertical edges of single acting doors 3 mm in 50 mm on lock side and 1.5 mm in 50 mm on hinge side.

2.5 FINISHES

- .1 Factory-finish doors in accordance with AWMAC Section 5 - Finishing, System 9; opaque semi-gloss, colour as selected by Departmental representative.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's printed installation instructions, data sheets, standard details, and specifications.

3.2 INSTALLATION

- .1 Unwrap and protect doors in accordance with AWMAC Premium grade.
- .2 Install fire rated door assemblies to NFPA Pamphlet 8 and to NFPA (FIRE) 80.
- .3 Coordinate with other trades as required for a complete installation. Refer to notes on Drawings.
- .4 Install doors and hardware in accordance with manufacturer's printed instructions and AWMAC premium standards. Coordinate with Section 08 71 00 - Door Hardware.
- .5 Adjust hardware for correct function.

3.3 ADJUSTMENT

- .1 Re-adjust doors and hardware just prior to completion of building to function freely and properly.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Division 01 General Requirements: Cleaning. Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Division 01 General Requirements: Cleaning.
- .3 Waste Management: Separate waste materials for reuse and recycling in accordance with Division 01 General Requirements: Construction/Demolition Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

1 GENERAL

1.01 DESCRIPTION OF WORK

- .1 Undertake replacement of all to windows and doors (including casings, jambs/frames, sills and, bars on windows and door) as indicated on the Drawings. All windows and doors are to be replaced.
- .2 All replacements of units are to exactly replicate original in material, dimension, profile etc. unless directed otherwise.
- .3 Provide 'sprung' copper weather stripping for all operable units.
- .4 For re-furbishing requirements to the door hardware, see Section 07 62 00,

1.02 RELATED WORK SPECIFIED ELSEWHERE

- .1 Section 09 91 10 - Painting.
- .2 Section 07 62 00 - Flashings and Sheet Metal.

1.03 QUALIFICATION

- .1 All work of this section is to be done by skilled tradesmen having substantial proven experience in this type of work. In this regard, the workers must have had a minimum of 5 years
- .2 One carpenter is to be responsible for the complete repair or replacement of any one particular window unit or door assembly.

1.04 SHOP DRAWINGS

- .1 Based on site-checked measurements, submit detailed shop drawings of replica window and doors and submit to Departmental Representative for approval prior to fabrication. Some variation in size of each window may occur and must be accommodated as no additional adjustments to the original rough openings which result in loss will be allowed.

1.05 MOCK-UP

- .1 Prepare mock-up showing all typical aspects of replicated units, i.e. muntins and rail profiles and joinery.

1.06 BACKPAINTING AND BACKPRIMING

- .1 All new woodwork is to be back painted before installation.

1.07 STORAGE AND HANDLING

- .1 Store all materials in clean, dry location, protected from the weather.

1.08 MEASUREMENT AND PAYMENT

- .1 No measurement for payment will be made for the items "Windows, Doors and Frames",
- .2 All costs for labour, equipment and materials necessary to complete the work of these items shall be included in the lump sum prices bid for these items and including all related fasteners and hardware. Note that all costs for the re-furbishing the door hardware shall be included in the related lump sum item above.

2 PRODUCTS

2.01 GENERAL-LUMBER

- .1 Materials shall be straight, sawn square and true, dressed four sides, properly sized and shaped to correct dimensions based on site check of dimensions shown on the Drawings.
- .2 Use #1, #2, #3 Common pine for rough bucks, grounds, blockings, cants, strapping and the like.
- .3 Use C Select Eastern white pine for all windows and doors and the like unless detailed otherwise. Alternatively, certified reclaimed old growth wood of comparable quality may be substituted.
- .4 Use 'Cabinetmaker' quality white oak for sills.
- .5 Moisture content to be 15% or less. i.e. grade-stamped MC 15 and confirmed by random check with moisture meter.

2.02 GLUE

- .1 Waterproof synthetic resinous glue, resorcinol type.

2.03 ROUGH HARDWARE

- .1 Supply all hardware required for this Section, such as nails, screws, bolts etc. and any other fixing device(s) required not expressly designated to be supplied under another Division.
- .2 Generally, all fixing shall be concealed. Where this is not possible, make fixings as inconspicuous as possible. Employ original fixing methods unless Contractor and Departmental Representative agree the design is flawed to the detriment of the component.
- .3 All fasteners to be stainless steel (316).

2.04 WINDOW HARDWARE

- .1 Reuse existing hardware where possible. Where missing, provide matching replacement. New windows are to have hardware which matches that of the original window indicated as the model window.

2.05 DOOR HARDWARE

- .1 Salvaged, cleaned, repaired and repainted.

2.06 EPOXY FILLER

- .1 Wood Epox II, Abatron Inc.; P.C. Woody or equivalent.

2.07 GENERAL WOOD FILLER

- .1 Premium latex based wood filler such as Elmer's.

2.08 GLAZING

- .1 Glass shall be sheet glass, double diamond weight.
- .2 Putty shall be pure chalk and linseed oil glazier's putty.

2.09 WOOD PRESERVATIVE

- .1 Clear zinc naphthanate.

2.10 DAMP-PROOF MEMBRANE

- .1 Copper Fibrene
- .2 Blueskin PHT 200
- .3 Ice and Water Shield

2.11 COPPER WORK

- .1 Fasteners shall be as called for in Section 07 62 00 - Flashings and Sheet Metal.

3 EXECUTION

3.01 WINDOWS AND DOORS

- .1 Where indicated or as required, ensure that the frame is securely fastened to rough opening.
- .2 Where undertaking replication of unit, site measure each individual opening as variation is quite possible.
- .3 Where replacing full sash unit, rebuild with 'through mortices' wedged and pegged as per the original detail rather than the blind mortice/steel pin treatment on the 1938 replica units (virtually all existing sash).

3.02 PUTTY AND GLAZING REPAIR

- .1 Prime paint joints with 1 paint: 1 thinner.
- .2 Apply 2 mm back putty and bedding putty.

- .3 Install glass, slightly undersized, in center of opening, point (with non-corroding points) and apply face putty bevel.
- .4 Trim putty to match old work and allow to set and oxidize for 2-3 weeks (depending on environmental conditions).
- .5 Provide copper weather-stripping to all operable units.
- .6 Reinstate as close to plumb and level as the opening will allow.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 08 20 00.01 - Interior Wood Doors.
- .2 Section 09 25 00 - Gypsum Board.

1.2 REFERENCES

- .1 ASTM International (ASTM)
 - .1 ASTM C542-05 (2011), Specification for Lock-Strip Gaskets.
 - .2 ASTM D790-10, Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 - .3 ASTM D1003-11, Test Method for Haze and Luminous Transmittance of Plastics.
 - .4 ASTM D1929-11, Test Method for Determining Ignition Temperature of Plastics.
 - .5 ASTM D2240-05(2010), Standard Test Method for Rubber Property - Durometer Hardness.
 - .6 ASTM E84-11a, Test Method for Surface Burning Characteristics of Building Materials.
 - .7 ASTM E330-02(2010), Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
 - .8 ASTM C1503-08, Standard Specification for Silvered Flat Glass Mirror
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.
 - .2 CAN/CGSB-12.3-M91, Flat, Clear Float Glass.
 - .3 CAN/CGSB-12.8-97 AMEND, Insulating Glass Units.
 - .4 CAN/CGSB-12.11-M90, Wired Safety Glass.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA A440-11, NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights, Includes Update No. 1 (2014).
 - .2 CSA A440.2-14/A440.3-14, Fenestration energy performance/User guide to CSA A440.2-14.
 - .3 CAN/CSA A440.4-07 (R2012) - Window, Door, and Skylight Installation
 - .4 CSA Certification Program for Windows and Doors 2000.

- .4 Glazing Association of North America (GANA)
 - .1 GANA Glazing Manual (50th Anniversary Edition).
 - .2 GANA Guide to Architectural Glass (2010).

1.1 REGULATORY REQUIREMENTS

- .1 Work shall meet or exceed the following regulatory requirements; comply with the Specifications; in cases of perceived conflict, the more stringent requirement applies.
 - .1 Ontario Building Code 2012 and Amendments.
 - .2 All Federal, Provincial, Regional and Municipal laws, regulations, ordinances and by-laws pertaining to the Work shall apply for the duration of the project.
 - .3 *Standards and Guidelines for Conservation of Historic Places in Canada*, 2nd Edition.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Convene pre-installation meetings: one week prior to beginning work of this Section.
 - .1 Verify project requirements.
 - .2 Review installation conditions.
 - .3 Coordinate with other building trades.
 - .4 Review manufacturer's instructions and warranty requirements.

1.3 SUBMITTALS

- .1 Submit in accordance with Division 01 General Requirements: Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet.
- .3 Samples:
 - .1 Submit 300 mm x 300 mm size of each glazing type. Departmental Representative reserves the right to change colour of glass after review of submitted samples.
- .4 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.
- .5 Closeout Submittals:
 - .1 Provide maintenance data including cleaning instructions for incorporation into manual specified in Division 01 General Requirements: Closeout Submittals.

1.4 PERFORMANCE/DESIGN CRITERIA

- .1 Provide continuity of building enclosure vapour and air barrier using glass and glazing materials as follow:
 - .1 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.
- .2 Size glass to withstand wind loads, dead loads and positive and negative live loads as measured in accordance with ANSI/ASTM E330.
- .3 Limit glass deflection to 1/200 with full recovery of glazing materials.

1.5 QUALITY ASSURANCE

- .1 Single source requirement: Fire rated glass and framing shall be supplied or recommended by a single manufacturer.
- .2 Manufacturer's technical recommendations:
 - .1 Perform glazing work in accordance with written recommendations from the glass manufacturer or glass fabricator.
 - .2 Certify glass compatibility with glazing materials (i.e. insulating glass sealants, structural sealants and silicones, gaskets, setting blocks, etc.)
 - .3 Designs to be analyzed for thermal stress.
 - .4 Provide shop inspection for glass.
- .3 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
 - .1 Provide testing and analysis of glass under provisions of S Division 01 General Requirements: Quality Control.
 - .2 Provide shop inspection and testing for glass.
- .4 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.6 SITE CONDITIONS

- .1 Environmental 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 WARRANTY

- .1 Provide manufacturers guarantee for the following types of glass listed, against defects in materials and workmanship for the period indicated, commencing from the date of Substantial Performance of Work.
 - .1 Sealed Glass Units: Replace units that exhibit failure of hermetic seal under normal use evidenced by the obstruction of vision by dust, moisture, or film on interior surface of glass: 2-Years.

Part 2 Products

2.1 PERFORMANCE/DESIGN CRITERIA

- .1 Provide continuity of building enclosure vapour and air barrier using glass and glazing materials as follow:
 - .1 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.
- .2 Size glass to withstand wind loads, dead loads and positive and negative live loads as measured in accordance with ANSI/ASTM E330.
- .3 Limit glass deflection to 1/200 with full recovery of glazing materials.

2.2 MATERIALS: FLAT GLASS

- .1 Type GL1: Tempered Glass: to CAN/CGSB-12.1, transparent, glazing quality, 6 mm minimum thickness.
 - .1 Type: 2-tempered laminated.
 - .2 Class: B-float.
 - .3 Category: II - 540 J impact resistance.
 - .4 Edge treatment: Polished.
- .2 Type GL2: Fire Rated Glass: factory-installed in rated frame; comprised of multiple layers of tempered glass ceramic, laminated with transparent intumescent materials, providing distortion free viewing through pane and as follows:
 - .1 Thickness: As required by manufacturer to meet structural requirements for performance and specified.
 - .2 Impact Safety Rating: Category I, 665 J/m in accordance with ANSI Z97.1.
 - .3 Temperature Rise Rating: Not required.
 - .4 Fire Rating: 45 minutes.

- .5 Labelled: Permanent logo listing name of product, manufacturer, testing laboratory, fire rating period and safety requirements.
 - .1 Acceptable Manufacturers:
 - .1 InterEdge Technologies.
 - .2 SAFTI Fire and Safety Rated Glass.
 - .3 Saint-Gobain Glass Solutions.
 - .4 Technical Glass Products.

2.3 MATERIALS: SEALED INSULATING GLASS UNITS

- .1 Type IGU-1: Insulating Glass Units (IGU): meet or exceed requirements of CAN/CGSB-12.8. Units shall be certified by the Insulated Glass Manufacturers Alliance (IGMA). Overall unit thickness shall be 25 mm using 6 mm glass thickness for individual panes. Use two-stage seal method of manufacture, as follows:
 - .1 Primary Seal: polyisobutylene sealing compound between glass and metal spacer/separator, super spacer bar or TDSE Intercept.
 - .2 Secondary Seal: polyurethane, silicone or polysulphide base sealant, filling gap between the two panes of glass at the edge up to the spacer/separator and primary seal.
 - .3 Outboard pane: Type GL1, tempered glass, clear, 6 mm thick.
 - .4 Inter-cavity space: 13 mm space with low conductivity spacers.
 - .5 Inert gas fill: ≥95% argon filled.
 - .6 Inboard glass: Type GL1, tempered glass, clear, 6 mm thick.

2.4 MATERIAL: FRAMES FOR FIRE RATED GLASS

- .1 Supplied by this Section to dimensions required and indicated, coordinate with other trades as required to ensure a full and complete installation meeting OBS 2012.
- .2 Factory-supplied by same manufacturer of fire rated glass.
- .3 Fire rating: match that of fire rated glass, meeting CAN/ULC S106.
- .4 Assemblies shall be labeled as required by OBC 2012.
- .5 Assemblies shall be furnished factory-assembled with glass properly installed in accordance with OBC 2012.
- .6 Fabrication Dimensions: Fabricate to approved dimensions. The Contractor shall guarantee site-required dimensions within required tolerance, and coordinate rough opening

size as required. Obtain approved shop drawings prior to fabrication.

2.5 ACCESSORIES

- .1 Joint Sealants: to Section 07 90 00.01 - Interior Joint Sealants.
- .2 Glazing Sealant: Type as recommended by glazing manufacturer as required to meet or exceed performance requirements. Verify compatibility with insulating glass unit secondary sealant.
- .3 Heel bead: DC 795 by Dow Corp or Silpruf SCS 2000 Series by G.E Silicones, or similar as required to meet performance requirements.
- .4 Setting blocks: Neoprene, 80-90 Shore A durometer hardness to ASTM D2240, to suit glazing method, glass light weight and area.
- .5 Spacer shims: Neoprene, 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.
- .6 Glazing tape:
 - .1 Preformed butyl compound with integral resilient tube spacing device, 10-15 Shore A durometer hardness to ASTM D2240; coiled on release paper; black colour.
 - .2 Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume 2%, designed for compression of 25%, to effect an air and vapour seal.
- .7 Glazing fire-rated glazing materials: factory-glazed by fire rated glass manufacturer.
- .8 Other Glazing Accessories: to CAN/CSA A440.
- .9 Screws, bolts and fasteners: ASTM F738M; Type 304 stainless steel.
- .10 Glass presence markers: easily removable, non-residue depositing.

2.6 FABRICATION

- .1 Verify glazing dimensions on Site.
- .2 Clearly label each glass light with maker's name, weight, quality, type and certification number. Do not remove labels until after work has been reviewed by Departmental Representative.

- .3 Accurately size glass to fit openings allowing the clearances shown on the following tables:

- .1 Minimum glass clearances:

Thickness	Edge Clearance	Face Clearance
2 mm	3 mm*	1.5 mm
3 mm	3 mm*	3 mm
4 mm	3 mm*	3 mm
5 mm	3 mm*	3 mm
6 mm	5 mm	3 mm
6 mm	6 mm	3 mm
over 6 mm	6 mm or 3/4 times the glass thickness, whichever is greater	

* = where any dimension of glass exceeds 760 mm increase minimum edge clearance by 1.5 mm.

- .4 Bite of glass edge on stop: 13 mm minimum.
- .5 Fire rated glass and frame to be factory-fabricated and assembled, and shipped to site ready to install. Coordinate with other trades as required.

Part 3 Execution

3.1 COMPLIANCE

- .1 Install work in accordance with the Quality Management provisions specified in this section and manufacturer's written instructions.
- .2 Size glass to Ontario Building Code 2012 requirements and verify glass for openings are correctly sized and are within allowable tolerances. Install glass with full contact and adhesion at perimeter. Maintain edge clearance recommended by glass manufacturer.
- .3 Perform work in accordance with GANA Glazing Manual for glazing installation methods.

3.2 EXAMINATION

- .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 Commencement of work means acceptance of existing conditions.

3.3 PREPARATION

- .1 Ensure all glazing rebates smooth and true, free of projections nails, screws, fastenings properly set to prevent contact with glass.
- .2 Ensure all stops, splines, glazing accessories provided by others accurately cut to length and proper size and type for specific glazing.
- .3 Clean contact surfaces with solvent and wipe dry.
- .4 Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- .5 Prime surfaces scheduled to receive sealant.

3.4 INTERIOR GLAZING - NON-FIRE RATED GLASS

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

3.5 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services: Upon Departmental Representative's written request, provide periodic site visit by manufacturer's field service representative.

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Division 01 General Requirements: Cleaning. Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Division 01 General Requirements: Cleaning. Perform cleaning after installation to remove construction and accumulated environmental dirt.

- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Division 01 General Requirements: Construction/Demolition Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 PROTECTION

- .1 After installation, mark light with an "X" by using removable plastic tape or paste. Do not mark heat absorbing or reflective glass units.
- .2 Protect installed products and components from damage during construction.
- .3 Repair damage to adjacent materials caused by Work of this Section

3.8 SCHEDULE

- .1 Type IGU-1: refer to Door Schedule, and as indicated.
 - .1 Type GL1: incorporated into Type IGU-1 insulating glass units; not used independently of insulating glass units.
- .2 Type GL2: Fire Rated Glass: partition window at reception room #104.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 06 10 00.01 - Interior Rough Carpentry: framing and blocking
- .2 Section 07 21 13.01 - Interior Fibrous Insulation: ceiling insulation at 2nd floor.
- .3 Section 07 84 00 - Firestopping: refer to Fire Separation Diagrams on Drawings.
- .4 Section 07 90 00.01 - Interior Joint Sealants.
- .5 Section 09 30 00 - Tiling.
- .6 Section 09 91 23 - Interior Painting.
- .7 Section 10 28 10 - Toilet Accessories: to coordinate installation of blocking and backing within walls as required.

1.2 REFERENCES

- .1 Aluminum Association (AA)
 - .1 AA DAF-45, Designation System for Aluminum Finishes.
- .2 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C475/C475M-12, Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - .2 ASTM C514-04(2009)e1, Specification for Nails for the Application of Gypsum Board.
 - .3 ASTM C557-03(2009)e1, Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
 - .4 ASTM C840-11, Specification for Application and Finishing of Gypsum Board.
 - .5 ASTM C919-12, Standard Practice for Use of Sealants in Acoustical Applications.
 - .6 ASTM C954-11, 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.
 - .7 ASTM C1002-07, Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - .8 ASTM C1047-10a, Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
 - .9 ASTM C1278/C1278M-07a(2011), Standard Specification for Fiber-Reinforced Gypsum Panel.

- .10 ASTM C1280-12a, Specification for Application of Gypsum Sheathing Board.
- .11 ASTM C1177/C1177-08, Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- .12 ASTM C1178/C1178M-11, Specification for Glass Mat Water-Resistant Gypsum Backing Board.
- .13 ASTM C1280 13a, Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing.
- .14 ASTM C1658/C1658M-12, Standard Specification for Glass Mat Gypsum Panels.
- .15 ASTM C1396/C1396M-11, Standard Specification for Gypsum Board.
- .3 Association of the Wall and Ceilings Industries International (AWCI)
- .4 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC S102-10, Surface Burning Characteristics of Building Materials and Assemblies.

1.1 REGULATORY REQUIREMENTS

- .1 Work shall meet or exceed the following regulatory requirements; comply with the Specifications; in cases of perceived conflict, the more stringent requirement applies.
 - .1 Ontario Building Code 2012 and Amendments.
 - .2 All Federal, Provincial, Regional and Municipal laws, regulations, ordinances and by-laws pertaining to the Work shall apply for the duration of the project.
 - .3 *Standards and Guidelines for Conservation of Historic Places in Canada*, 2nd Edition.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit product data in accordance with Division 01 General Requirements: Submittal Procedures:
 - .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 Division 01 General Requirements: Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

- .3 Storage and Handling Requirements:
 - .1 Store gypsum board assembly materials level off ground in dry location, and in accordance with manufacturer's recommendations.
 - .2 Store and protect gypsum board assemblies from damage.
 - .3 Protect from weather, elements and damage from construction operations.
 - .4 Handle gypsum boards to prevent damage to edges, ends or surfaces.
 - .5 Protect prefinished aluminum surfaces with strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.
 - .6 Replace defective or damaged materials with new.

1.4 AMBIENT CONDITIONS

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

Part 2 Products

2.1 GYPSUM MATERIALS

- .1 Standard Board: to ASTM C1396/C1396M and as follows:
 - .1 Type: regular and fire-resistant, as required (refer to Fire Separation Diagrams on Drawings).
 - .2 Size: 1200 mm x maximum practical length.
 - .3 Thickness: as indicated.
 - .4 Ends: square cut.
 - .5 Edges: tapered.
- .2 Moisture-Resistant Board: fibreglass mat faced interior gypsum board with moisture-resistant core: non-combustible to CAN/ULC S114; manufactured to meet ASTM C1658, ASTM C1396 Section 7, and ASTM C1177.
 - .1 Type: regular and fire-resistant, as required (refer to Fire Separation Diagrams on Drawings).
 - .2 Size: 1200 mm x maximum practical length.

- .3 Thickness: as indicated.
- .4 Ends: square cut.
- .5 Edges: tapered.
- .6 Basis-of-Design:
 - .1 GP DensArmor Plus, DensArmor Plus Fireguard, as required.
 - .2 USG Sheetrock Brand Glass-Mat Panel Mold Tough.
- .3 Sag-Resistant Board: to ASTM C1396/C1396M and as follows:
 - .1 Type: regular.
 - .2 Thickness: as indicated on Drawings.
- .4 Cementitious Backer Board: to ASTM C1325 and as follows:
 - .1 Substrate for ceramic tiles.
 - .2 Size: 1200 mm x maximum practical length.
 - .3 Thickness: as indicated on Drawings.
 - .4 Acceptable materials:
 - .1 Durock, CGC Inc.
 - .2 Wonderboard, Custom Building Products Ltd.

2.2 FRAMING MATERIALS

- .1 Refer to Section 06 10 00.01 - Interior Rough Carpentry.

2.3 PARTITION WALL INSULATION MATERIALS

- .1 Fibrous Acoustical Insulation For Fire and Smoke Rated Assemblies: Un-faced preformed GreenGuard™ or formaldehyde free binder fibrous insulation meeting the requirements of ULC S702; having maximum flame spread and smoke developed of 20/20 in accordance with CAN/ULC S102 and being non-combustible in accordance with CAN/ULC S114 and as follows:
 - .1 Type: 1.
 - .2 Width: to friction fit in stud spaces.
 - .3 STC Ratings: as indicated on Drawings.
 - .4 Thickness: to fill a minimum of 90% of the cavity thickness.
 - .5 Nominal density: 40 kg/m³.
- .2 Fibrous Glass Acoustical Insulation For Non-rated Assemblies: Un-faced, preformed GreenGuard™ or formaldehyde free binder fibrous insulation meeting the requirements of ASTM C423, ASTM E90, ASTM E413 and ULC S702 and as follows:
 - .1 Type: 1.
 - .2 Width: to friction fit in stud spaces.
 - .3 STC Ratings: as indicated on Drawings.

- .4 Thickness: to fill a minimum of 90% of the cavity thickness.

2.4 CEILING/WALL ACCESS DOORS

- .1 Architectural, flush mounting access panels for gypsum board installation, thickness, and fire rating to match wall assembly, manufacturer's standard sizes selected to suit access requirements, complete with extruded aluminum frame, concealed hinge and a removable door panel, airtight gasket and screwdriver slot latch mechanism.
 - .1 Acceptable materials:
 - .1 Bauco Products Incorporated, Bauco Plus.

2.5 SOUND ISOLATION CLIPS

- .1 Resilient Sound Isolation Clips:
 - .1 Rubber Isolator:
 - .1 Natural organic rubber compound, blended with fire-inhibiting compounds.
 - .2 Molded to isolate ferrule from clip.
 - .3 Minimum of 12 micro-vibration controlling pedestals at point of contact with framing member.
 - .4 Manufactured to ASTM D2000, M2 AA 510 A13, which includes:
 - .1 Hardness, ASTM D2240, Shore A: 47.
 - .2 Modulus 300 Percent, ASTM D412, Die C: 5.3 MPa.
 - .3 Tensile Strength, ASTM D412, Die C: 11.2 MPa.
 - .4 Elongation at Break, ASTM D573: 54 percent.
 - .2 Clip: Galvanized or aluminum-zinc coated steel, 16 gauge.
 - .3 Ferrule: Zinc-electroplated steel.
 - .4 Projection: 1-5/8 inches from supporting structure, when 7/8-inch gypsum board furring channels are used.
- .2 Gypsum Board Furring Channels (Hat Track):
 - .1 Material: Cold-formed galvanized steel.
 - .2 Conformance:
 - .1 AISI Specifications for Design of Cold-Formed Steel Structural Members.
 - .2 ASTM C645.
 - .3 ASTM C754.
 - .3 Designation: 25 gauge.

- .1 Size: 0.0179 inch (0.53 mm) thick, 7/8 inch (22.2 mm) height, 2-11/16 inches (68 mm) width.
- .2 Hemmed edge detail.
- .4 Designation: 22 gauge.
 - .1 Size: 0.0269 inch (0.68 mm) thick, 7/8 inch (22.2 mm) height, 2-11/16 inches (68 mm) width.
 - .2 Hemmed edge detail.
- .3 Mechanical Fasteners:
 - .1 Type: Self-drilling, self-tapping screws. Steel, ASTM C 1002. Galvanized coating, plated, or oil-phosphate coated, ASTM B 633, as needed for required corrosion resistance.
 - .2 Resilient Sound Isolation Clip Connections:
 - .1 To Wood Framing Members: Screws 2-1/2 inches (63 mm) minimum length, #8 minimum shank, Type W (course thread), bugle- or hex-head screws of equal or greater size.
 - .1 Minimum Pullout and Shear: 108 pounds.
 - .2 To Steel Framing Members (Less than 20 Gauge): Screws 1-1/2 inches (38 mm) minimum length; #8 minimum shank; Type S (fine thread); bugle-, wafer-, or hex-head screws of equal or greater size.
 - .1 Minimum Pullout and Shear: 108 pounds.
 - .3 To Steel Framing Members (20 Gauge through 12 Gauge): Screws 1-1/2 inches (38 mm) minimum length; #8 minimum shank; Type S (fine thread); self-drilling tip; bugle-, wafer-, or hex-head screws of equal or greater size.
 - .1 Minimum Pullout and Shear: 108 pounds.
 - .4 To Concrete: Anchors 1-3/4 inches (44 mm) minimum length, 3/16-inch to 1/4-inch diameter. Mushroom head or screw-in type anchor in accordance with fastener manufacturer's instructions. Powers Fasteners or approved equal.
 - .1 Minimum Pullout and Shear: 108 pounds.
 - .5 To Concrete Masonry Units: Anchors 2-1/4 inches (57 mm) minimum length, 1/4-inch diameter. Designed for use in concrete masonry units in accordance with fastener manufacturer's instructions. Powers Fasteners or approved equal.
 - .1 Minimum Pullout and Shear: 108 pounds.

- .6 Drywall Furring Channel Lap Joint Connection, Steel to Steel: Framing screws, button head, 7/16 inch (11 mm) minimum length, #6 minimum shank, needle point, Phillips drive or greater, or double-wire tie with 18 gauge tie wire.
- .3 Tie Wire: 18 gauge, annealed, galvanized steel.
- .4 Acoustical Sealant: professional-grade for commercial use, flexible, non-hardening.
- .5 Fire/Smoke Sealant: Flexible, non-hardening. Classified as an acoustical sealant, to Section 07 84 00.
- .6 Moulded box vapour retarder: factory-moulded polyethylene box, purpose-made for use with recessed electric switch and outlet device boxes.

2.6 ACCESSORIES

- .1 Nails: to ASTM C514.
- .2 Thin Set Interior Wall: Dry set mortar meeting or exceeding the requirements of ANSI A118.1 formulated for thin set applications of ceramic biscuit tile, factory sanded mortar consisting of Portland cement, sand and additives requiring only potable water to be added for installation complete with ANSI A118.4 bond enhancing latex additives.
- .3 Steel drill screws: to ASTM C1002.
- .4 Stud adhesive: to CAN/CGSB-71.25.
- .5 Laminating compound: as recommended by manufacturer, asbestos-free.
- .6 Casing beads, corner beads, control joints, and edge trim: to ASTM C1047, metal, zinc-coated by hot-dip process, 0.5 mm base thickness, perforated flanges, one-piece length per location.
 - .1 Gypsum board corner bead vertical corners shall be 3/4" round. Provide transition caps at the base and head, by Trim-Tex or similar.
- .7 Cornice cap: 12.7 mm deep x partition width, of 1.6 mm base thickness galvanized sheet steel, prime painted or extruded aluminum, minimum 2.5 mm thick, clear anodized. Include splice plates for joints.
- .8 Strippable Edge Trim: Extruded PVC with pre-masked L-shaped tape on trim with tear away protective serrated strip for removal after compound and paint is applied, for use at areas where gypsum butts aluminum frames and where gypsum butts concrete or concrete block.

- .9 Sealants: in accordance with Section 07 90 00.01 - Interior Joint Sealants.
- .10 Acoustic sealant: professional-grade, designed for commercial application, non hardening, non skinning, permanently flexible and having VOC content less than the VOC limits of State of California's South Coast Air Quality Management District Rule #1168.
- .11 Insulating Strip / Acoustic Strip: rubberized, moisture-resistant, 3 mm thick closed cell neoprene strip, or 8 mm thick open cellular rubber reinforced with solid rubber particles bonded to cellulose, minimum 28 mm (1-1/2 inch) wide, with self-sticking permanent adhesive on one face, lengths as required.
- .12 Joint Treatment Materials: Provide joint compound and accessory materials in accordance with ASTM C475 and as follows:
 - .1 Joint Tape: fibreglass mesh tape or as otherwise recommended by board manufacturer.
 - .2 Joint Compound for Interior Gypsum Board: Vinyl based, non-asbestos, low-dusting type compatible with other compounds applied on previous or for successive coats, and as follows:
 - .1 Pre-filling: Setting type taping compound.
 - .2 Embedding and First Coat: Drying type compound.
 - .3 Fill Coat: Drying type compound.
 - .4 Finish Coat: Drying type, sandable topping compound.
 - .5 Skim Coat: Drying type, sandable topping compound.
 - .3 Joint Compound for Interior Mould Resistant Gypsum Board and Glass Mat Faced Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - .1 Pre-filling: Setting type joint compound.
 - .2 Embedding and First Coat: Setting type joint compound.
 - .3 Fill Coat: Setting type, sandable topping compound.
 - .4 Skim Coat: Setting type joint compound, sandable topping compound.

2.7 FINISHES

- .1 Painting: in accordance with Section 09 91 23 - Interior Painting.

- .2 Tiling: in accordance with Section 09 30 00 - Tiling.

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 assembly installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION OF RESILIENT SOUND ISOLATION CLIP ASSEMBLIES

- .1 Install resilient sound isolation clips and drywall furring channels in accordance with manufacturer's instructions.
- .2 Mechanically fasten resilient sound isolation clips to structure with screws, bolts, or expansion anchors, dependent upon structure.
- .3 Fire-Resistive Design Assemblies:
 - .1 Install as specified in ULc Fire Resistance Directory, where required.
 - .2 Do not arbitrarily add resilient sound isolation clips to fire-rated assemblies.
- .4 Space resilient sound isolation clips at maximum of 24 inches (600 mm) by 48 inches (1,200 mm) on center for walls and ceilings.
- .5 Do not exceed design load (pull and shear) of 36 pounds per isolation clip.
- .6 Stagger isolation clip installation, so dead load is supported by all support members.
- .7 Splicing Drywall Furring Channels:
 - .1 Splice drywall furring channels with minimum of 6-inch (150-mm) laps.
 - .2 Secure laps with 2 framing screws or 18 gauge tie wire double wrapped.
 - .3 Locate splices between resilient sound isolation clips.

- .4 Do not locate splices on resilient sound isolation clips.
- .8 Install resilient sound isolation clips on 1 side of wall assembly, unless otherwise indicated on the drawings.
- .9 Flanking Noise:
 - .1 Review installation details to prevent structure-borne flanking noise.
 - .2 Do not allow drywall furring channels or gypsum board to contact foreign materials, including floors, ceilings, or wall framing members.
- .10 Ensure metal ferrule of resilient sound isolation clips is in firm contact with structural member.
- .11 Gypsum Board:
 - .1 Install gypsum board in vertical or horizontal position with 1/8-inch (3 mm) to 1/4-inch (6 mm) gap around perimeter for acoustical sealant application.
 - .2 Install gypsum board in accordance with ASTM C840 and the requirements of this Section.
- .12 Acoustical Sealant:
 - .1 Seal potential air leaks with acoustical sealant to achieve best Field Sound Transmission Class (FSTC).
 - .2 Seal electrical outlets and penetrations with acoustical sealant.
 - .3 Apply fire-rated acoustical sealant at locations where fire-rated assembly is required.
- .13 Moulded box vapour retarder: factory-moulded polyethylene box, purpose-made for use with recessed electric switch and outlet device boxes.
- .14 Install drywall furring channels perpendicular to framing members.
- .15 Space drywall furring channels maximum of 24 inches (600 mm) on center.
- .16 Locate first drywall furring channel parallel to floor and maximum of 3 inches (75 mm) above floor and 1 drywall furring channel maximum of 6 inches (150 mm) from ceiling.

3.3 ERECTION

- .1 Do application and finishing of gypsum board in accordance with ASTM C840 except where specified otherwise.
- .2 Do application of gypsum sheathing in accordance with ASTM C1280.

- .3 Support light fixtures by providing additional ceiling support within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
- .4 Install work level to tolerance of 1:1200.
- .5 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles.
- .6 Install furring channels parallel to, and at exact locations of, stud partition header track.
- .7 Furr gypsum board faced vertical bulkheads within and at termination of ceilings.
- .8 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.
- .9 Install wall furring for gypsum board wall finishes in accordance with ASTM C840, except where specified otherwise.
- .10 Furr openings and around built-in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.
- .11 Furr duct shafts, beams, columns, pipes and exposed services where indicated.
- .12 Erect drywall resilient furring transversely across studs and joists spaced maximum 600 mm on centre and not more than 150 mm from ceiling/wall juncture. Secure to each support with 25 mm drywall screw.
- .13 Install 150 mm continuous strip of 12.7 mm gypsum board along base of partitions where resilient furring installed.
- .14 Install trim, shadow mould and reveals as indicated.

3.4 APPLICATION

- .1 Do not apply gypsum board until bucks, anchors, blocking, sound attenuation, electrical and mechanical work are approved.
- .2 Apply single or double layer gypsum board to wood and metal furring or framing using screw fasteners for first layer, screw fasteners 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 in accordance with ASTM C840.
 - .2 Apply gypsum board vertically or horizontally, providing sheet lengths that will minimize 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 mould-resistant gypsum board adjacent to sinks, wet areas, and where indicated. Apply mould-resistant sealant to edges, ends, cut-outs that expose gypsum core and to fastener heads.
- .4 Moisture-Resistant Board: Apply mould-resistant sealant to edges, ends, cut-outs that expose gypsum core, and to fastener heads. Do not apply joint treatment on areas to receive tile finish.
- .5 Apply acoustical sealants to ASTM C919, and as follows:
 - .1 Apply 12 mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, ducts, in partitions where perimeter sealed with acoustic sealant.
- .6 Install ceiling boards in direction that will minimize number of end-butt joints. Stagger end joints at least 250 mm.
- .7 Install gypsum board on walls vertically to avoid end-butt joints. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs, except where local codes or fire-rated assemblies require vertical application.
- .8 Install gypsum board with face side out.
- .9 Do not install damaged or damp boards.
- .10 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

3.5 INSTALLATION

- .1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm on centre.
- .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 preformed units 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 where indicated, and at changes in substrate construction at approximate 10 m spacing on long corridor runs at approximate 15 m spacing on ceilings.
- .9 Install control joints straight and true.
- .10 Construct expansion joints at building expansion and construction joints. Provide continuous dust barrier.
- .11 Install expansion joint straight and true.
- .12 Install cornice cap where gypsum board partitions do not extend to ceiling.
- .13 Fit cornice cap over partition, secure to partition track with two rows of sheet metal screws staggered at 300 mm on centre.
- .14 Splice corners and intersections together and secure to each member with 3 screws.
- .15 Install access doors to electrical and mechanical fixtures specified in respective sections.
 - .1 Rigidly secure frames to furring or framing systems.
- .16 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.

- .17 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with Association of the Wall and Ceiling Industries (AWCI) International Recommended Specification on Levels of Gypsum Board Finish:
- .1 Levels of joint finish:
 - .1 Level 0: No taping, finishing or accessories required for areas of temporary construction.
 - .2 Level 1: Embed tape for joints and interior angles in joint compound. Surfaces to be free of excess joint compound; tool marks and ridges are acceptable and for plenum areas above ceilings, in attics or in concealed spaces.
 - .3 Level 2: Embed tape for joints and interior angles in joint compound and apply one separate coat of joint compound over joints, angles, fastener heads and accessories; surfaces free of excess joint compound; tool marks and ridges are acceptable and when gypsum is used as a substrate for tile.
 - .4 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 and where areas are to receive a heavy coating of textured material.
 - .5 Level 4: 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; surfaces smooth and free of tool marks and ridges and where light textures or wall coverings are to be applied.
 - .18 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.
 - .19 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.
 - .20 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.
 - .21 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.
 - .22 Mix joint compound slightly thinner than for joint taping.

- .23 Apply thin coat to entire surface using trowel or drywall broadknife to fill surface texture differences, variations or tool marks.
- .24 Allow skim coat to dry completely.
- .25 Remove ridges by light sanding or wiping with damp cloth.
- .26 Provide protection as required to ensure gypsum drywall work will remain without damage or deterioration at time of substantial completion.

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Division 01 General Requirements: 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 Division 01 General Requirements: Cleaning.
 - .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
 - .2 Clean flooring and base surfaces to flooring manufacturer's printed instructions.
- .3 Waste Management: Separate waste materials for reuse and recycling in accordance with Division 01 General Requirements: Construction/Demolition 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 Repair damage to adjacent materials caused by gypsum board assemblies installation.

3.8 BOARD SCHEDULE

- .1 Use Fire Rated Type 'X' or Type 'C' board at fire rated wall and ceiling assemblies as required to meet Ontario Building Code 2012 and Amendments; refer to Drawings for rated assembly locations and required ratings.
- .2 Subject to the above-noted requirement, paragraph 3.8.1, install board as indicated, and as follows:
 - .1 Standard Board: general use, except as follows:
 - .1 Sag-Resistant Board: overhead applications, ceilings.

- .2 Resilient Sound Isolation Clip Locations: All offices, conference room, quiet room, and mechanical room; with the exception of interior face of exterior wall, use regular or regular Type X as required; at interior partition walls, install board using resilient sound isolation clip assembly system, and seal all joints with acoustic sealant.
- .3 Walls receiving tile: Cementitious Backer Board.
- .4 Rooms and walls to receive Moisture-Resistant Board:
 - .1 Staff Mudroom (room 109).
 - .2 Kitchen (room 110).
 - .3 Washrooms (rooms 102 & 103), except at walls receiving tile.
 - .4 Interior face of exterior walls (install at all locations receiving new gypsum board).

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 03 40 10.01 - Heritage Concrete.
- .2 Section 03 54 13 - Gypsum Cement Underlayment.
- .3 Section 09 25 00 - Gypsum Board.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/Ceramic Tile Institute (CTI)
 - .1 ANSI/CTI (Ceramic) A108/A118/A136.1-2008, Specification for the Installation of Ceramic Tile - A Collection of 20 ANSI/CTI A108 Series Standards on Ceramic Tile Installation: A108.1A-C, 108.4 -.13, A118.1-.10, ANSI A136.1.
 - .2 CTI (Ceramic) A118.3-1992, Specifications for Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive (included in ANSI A108.1-1992).
 - .3 CTI (Ceramic) A118.4-1992, Specifications for Latex Portland Cement Mortar (included in ANSI A108.1-1992).
 - .4 CTI (Ceramic) A118.5-1992, Specification for Chemical Resistant Furan Resin Mortars and Grouts for Tile Installation (included in ANSI A108.1).
 - .5 CTI (Ceramic) A118.6-1992, Specification for Ceramic Tile Grouts (included in ANSI A108.1-1992).
- .2 ASTM International (ASTM)
 - .1 ASTM C144-11, Standard Specification for Aggregate for Masonry Mortar.
 - .2 ASTM C207-06(2011), Standard Specification for Hydrated Lime for Masonry Purposes.
 - .3 ASTM C847-12, Standard Specification for Metal Lath.
 - .4 ASTM C979/C979M-10, Standard Specification for Pigments for Integrally Coloured Concrete.
 - .5 ASTM D4263-83(2012), Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.34-M86 AMEND., 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 International (CSA)
 - .1 CSA A3000-08, Cementitious materials compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .5 International Organization for Standardization (ISO)
 - .1 ISO 13007:2004, Classifications for Adhesives and Grouts.
- .6 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.
- .7 Tile Council of North America (TCNA)
 - .1 2013 TCNA Handbook for Ceramic, Glass, and Stone Tile Installation, Version 2013.1.
- .8 Terrazzo Tile and Marble Association of Canada (TTMAC)
 - .1 Tile Specification Guide 09 30 00, 2011-2012, Tile Installation Manual.
 - .2 Tile Maintenance Guide 2012.

1.1 REGULATORY REQUIREMENTS

- .1 Work shall meet or exceed the following regulatory requirements; comply with the Specifications; in cases of perceived conflict, the more stringent requirement applies.
 - .1 Ontario Building Code 2012 and Amendments.
 - .2 All Federal, Provincial, Regional and Municipal laws, regulations, ordinances and by-laws pertaining to the Work shall apply for the duration of the project.
 - .3 *Standards and Guidelines for Conservation of Historic Places in Canada*, 2nd Edition.

1.2 SUBMITTALS

- .1 Submit in accordance with Division 01 General Requirements: Submittal Procedures:
- .2 Product Data:
 - .1 Include manufacturer's information on:
 - .1 Ceramic tile, marked to show each type, size, and shape required.
 - .2 Cementitious backer unit.
 - .3 Dry-set cement mortar and grout.
 - .4 Divider strip.
 - .5 Elastomeric membrane and bond coat.
 - .6 Reinforcing tape.
 - .7 Levelling compound.
 - .8 Latex cement mortar and grout.
 - .9 Commercial cement grout.

- .10 Organic adhesive.
- .11 Slip resistant tile.
- .12 Waterproofing isolation membrane.
- .13 Fasteners.
- .3 Shop Drawings:
 - .1 Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, thresholds, and setting details.
 - .2 Locate and detail movement joints.
- .4 Samples:
 - .1 Tile: Submit actual tile samples illustrating colour, texture, size and pattern for each type of tile specified.
 - .2 Grout: Submit manufacturer's full range of colours available for each type of grout specified.
 - .3 Trim shapes, bullnose cap and cove including bullnose cap and base pieces at internal and external corners of vertical surfaces, each type, colour, and size.
 - .4 Adhere tile samples to 11 mm thick plywood and grout joints to represent project installation.

1.3 **EXTRA MATERIALS**

- .1 Provide maintenance materials in accordance with Division 01 General Requirements: 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.

1.4 **QUALITY ASSURANCE**

- .1 Conform to requirements of Terrazzo, Tile and Marble Association of Canada (TTMAC).
- .2 Obtain each type of tile material required from single source. For colour consistency, ensure the supplier has capacity to provide products from the same production run, dye lot, calibre and batch number.
- .3 Obtain setting and grouting materials from one manufacturer to ensure compatibility.
- .4 Installer Qualifications: Specializing in tile work having minimum of 5 years successful documented experience with work comparable to that required for this project. Installer must be registered as a member in good standing with the Terrazzo, Tile and Marble Association of Canada.

1.5 **DELIVERY, STORAGE AND HANDLING**

- .1 Deliver materials in containers with labels legible and intact and grade-seals unbroken.
- .2 Store materials so as to prevent damage or contamination.
- .3 Store materials in a dry area, protected from freezing, staining and damage.
- .4 Store cementitious materials on a dry surface.

1.6 **SITE CONDITIONS**

- .1 Surfaces for tile installation must be clean, dimensionally stable, cured, level, plumb and free of contaminants such as oil, sealers and curing compounds.
- .2 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. Tile and setting material stored at same conditions 48 hours before and 7 days after application.
- .3 Do not install tiles at temperatures less than 12 degrees C or above 38 degrees C.
- .4 Do not apply epoxy mortar and grouts at temperatures below 15 degrees C or above 25 degrees C.

Part 2 **Products**

2.1 **MATERIALS**

- .1 Basis-of-Design: materials and colours listed below form the Basis-of-Design materials for this project.
- .2 Materials other than named products Basis-of-Design materials may be acceptable to the Departmental Representative; submit information in accordance with Division 01 General Requirements: Product Options and Substitutions, and as follows:
 - .1 Proposed alternates shall match colour range and performance characteristics of indicated materials, and shall not require a change to colour board for Project.
 - .2 Proposed alternates found acceptable by Departmental Representative will be listed in an Addendum.
 - .3 The Departmental Representative is not obliged to accept any materials presented for review and does not need to provide reasons for rejection of proposed alternates.
- .3 Factory blend tile that exhibits colour variations within the ranges selected and package so tile units taken from one package show the same range in colours as those taken from other packages.

- .4 Provide tile products manufactured in accordance with CAN/CGSB 75.1 or ANSI A108.1 as appropriate to the Basis-of-Design Materials.
- .5 Minimum Performance Requirements:
 - .1 Static Coefficient of Friction: Tile installed on walkway surfaces having following values as determined by testing identical products per ASTM C1028:
 - .1 Level Surfaces: Minimum 0.6 dry.
 - .2 Load-Bearing Performance: Provide installations rated for the following load-bearing performance in accordance with ASTM C627 for ceramic tile installed on walkway surfaces:
 - .1 Extra Heavy: Passes cycles 1 through 14.
 - .3 Floor Level Tolerances: Provide materials to attain floor levelness tolerances required by this Section; calculate quantity of materials based on the difference between the specified tolerance and the initial tolerance specified in Section 03 54 13 - Gypsum Cement Underlayment; measurements will be made in the same manner as used in Section 03 54 13. Provide Products used in exits having a flame spread rating of 25 or less when tested in accordance with ASTM E84 or ULC S102.2.

2.2 WALL TILE

- .1 Wall Tile: Porcelain tile: to CAN/CGSB 75.1, 4" x 12" (10 x 30 cm); colour as selected by Departmental Representative.
 - .1 Thickness: 9.5 mm.
 - .2 Finish: as selected by Departmental Representative.
 - .3 Grout: colour as selected by Departmental Representative.
 - .4 Schluter®-JOLLY or similar with same appearance and same or better properties, satin nickel finish; finishing and edge-protection profile for outside corners and tile edges on walls.

2.3 FLOOR TILE

- .1 Floor Tile: Through-body porcelain tile, rectified edges, to ASTM C1027 Class 5 (for floors), Coefficient of friction shall be 0.60 or greater (wet) when tested to ASTM C1028; 12" x 12", colour as selected by Departmental Representative
 - .1 Thickness: 9.5 mm.
 - .2 Finish: matte.
 - .3 Base: cove base, matching series, 4" high (100 mm).

- .4 Grout: colour as selected by Departmental Representative.

2.4 MORTAR, GROUT, AND ADHESIVE MANUFACTURERS

- .1 Acceptable Manufacturers: Subject to compliance with requirements herein, provide products from one of the following manufacturers:
 - .1 Custom Building Products Ltd.
 - .2 Laticrete International Inc.
 - .3 Mapei Corporation Inc.
 - .4 Flextile Ltd.

2.5 MORTAR AND ADHESIVE MATERIALS

- .1 Mortar to be of the following properties unless otherwise specified:
 - .1 Cement: Grey meeting requirements of CSA A3000.
 - .2 Sand: to ASTM C144, passing 16 mesh.
 - .3 Hydrated lime: to ASTM C207, Type S.
 - .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 Floor: Portland Cement Mortar per TTMAC detail 310F-2009/2010:
 - .1 Description: Site mix of portland cement, sand and water.
 - .2 Acceptable Materials:
 - .1 226 Thick Bed Mortar by Laticrete.
 - .2 Topcem Premix by Mapei.
 - .3 Portland Cement: to CSA A3000, white.
 - .4 Sand: to ASTM C144.
 - .5 Hydrated Lime: to ASTM C207, Type S.
 - .6 Waterproofing Compound: to ANSI A118.10.
 - .7 Water: clean and potable.
 - .8 Slurry Bond Coat: under bonded mortar beds.
 - .1 Acceptable Materials:
 - .1 4237 Latex Thin Set Mortar Additive mixed with 211 Crete Powder by Laticrete.
 - .2 Planicrete AC Multi-Purpose Latex Additive mixed with Portland Cement by Mapei.

- .3 Wall: Dry set mortar meeting or exceeding the requirements of ANSI A118.1 formulated for thin set applications of ceramic biscuit tile, factory sanded mortar consisting of Portland cement, sand, and additives requiring only potable water to be added for installation complete with ANSI A118.4 bond enhancing latex additives.
 - .1 Acceptable Materials:
 - .1 Premium Blend Thinset with Acrylic Mortar Admix, by Custom Building Products.
 - .2 #51 Floor and Wall Mix with #43 Acrylic Additive, by Flextile Ltd.
 - .3 317 Thinset Mortar with 3701 Acrylic Mortar Admix, by Laticrete International Inc.
 - .4 Kerabond Floor and Wall Thinset with Kera/Ply, by Mapei Canada Inc.

2.6 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 grouts are not acceptable.
 - .4 Use in Commercial Cement Grout, Dry-Set Grout, and Latex Cement Grout.
- .2 Floor: latex-modified, factory blended, mildew resistant, sanded grout consisting of Portland cements, graded quartz and additives; comply with ANSI A118.7.
 - .1 Latex Additive: Type as recommended by latex mortar manufacturer.
 - .2 Colour: as indicated.
 - .3 Acceptable Materials:
 - .1 Polyblend Sanded Tile Grout by Custom Building Products.
 - .2 Sattillo Grout Mix with Acrylic Mortar Admix 1:1 with water by Custom Building Products.
 - .3 500 Series Sanded Grout Mixed with 1776 Grout Admix Plus by Laticrete.
 - .4 Keracolor S polymer-modified sanded grout by Mapei.

- .3 Wall: latex-modified, factory blended, mildew resistant, non-sanded grout consisting of Portland cement and additives; comply with ANSI A118.6.
 - .1 Latex Additive: Type as recommended by latex mortar manufacturer.
 - .2 Colour: as indicated.
 - .3 Acceptable Materials:
 - .1 Polyblend Non-Sanded Tile Grout by Custom Building Products.
 - .2 White Dry Tile Grout by Custom Building Products.
 - .3 644 White Dry-Set Grout mixed with 17765 Grout Admix Plus by Laticrete.
 - .4 1600 Series Tri-Poly Fortified Non Sanded Grout by Laticrete.
 - .5 Keracolor U polymer-modified unsanded grout by Mapei.

2.7 ACCESSORIES

- .1 Trim shapes:
 - .1 Conform to applicable requirements of adjoining floor and wall tile.
 - .2 Use slip resistant trim shapes for horizontal surfaces of showers, overflow ledges, recessed steps, shower curbs, drying area curbs, and stools.
 - .3 Use trim shapes sizes conforming to size of adjoining field wall tile, including existing spaces, unless specified otherwise.
 - .4 Expansion and Control Joints: Roll-formed stainless steel profiles joined by a thermoplastic rubber insert, with integral perforated anchoring legs for setting the joint into the setting bed:
 - .1 Height: as required to suit application.
 - .2 Colour: as selected by Departmental Representative.
 - .3 Basis-of-Design:
 - .1 Schlüter®-DILEX.
 - .5 Edge-protection transition profile: designed to protect tile edges and provide a smooth transition from tile coverings to floor coverings at lower elevations; 6 mm wide channel beneath sloped flange; ADA-compliant.
 - .1 Basis-of-Design:
 - .1 Schlüter®-RENO-TK.
- .2 Sealant: in accordance with Section 07 92 00 - Sealants.

- .3 Floor sealer and protective coating: to tile and grout manufacturer's recommendations.

2.8 PATCHING AND LEVELLING COMPOUND

- .1 Cement base, acrylic polymer compound, manufactured specifically for resurfacing and leveling concrete floors. Products containing gypsum are not acceptable.
- .2 Have not less than the following physical properties:
 - .1 Compressive strength - 25 MPa.
 - .2 Tensile strength - 7 MPa.
 - .3 Flexural strength - 7 MPa.
 - .4 Density - 1.9.
- .3 Capable of being applied in layers up to 50 mm thick, being brought to feather edge, and being trowelled to smooth finish.
- .4 Ready for use in 48 hours after application.
- .5 Basis-of-Design:
 - .1 Ultraplan Easy by Mapei, or similar with same or better properties.

2.9 CLEANING COMPOUNDS

- .1 Specifically designed for cleaning masonry and concrete and which will not prevent bond of subsequent tile setting materials including patching and leveling compounds and elastomeric waterproofing membrane and coat.
- .2 Materials containing acid or caustic material are not acceptable.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's printed installation requirements, data sheets, specifications, and standard details.

3.2 WORKMANSHIP

- .1 Do tile work in accordance with TTMAC Tile Installation Manual 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 Make internal angles square, external angles rounded.
- .9 Use bullnose edged tiles at termination of wall tile panels, except where panel abuts projecting surface or differing plane.
- .10 Install divider strips at junction of tile flooring and dissimilar materials.
- .11 Allow minimum 24 hours after installation of tiles, before grouting.
- .12 Clean installed tile surfaces after installation and grouting cured.
- .13 Install prefabricated control and movement joints in tile Work in accordance with detail 301EJ from TTMAC Installation Manual to suit installation indicated.
- .14 Locate expansion, control, contraction, and isolation joints, as indicated in the following table, unless specifically indicated otherwise on the Drawings:

Environment	Minimum	Maximum	Joint Width
Interior	4880 mm	6100 mm	6 mm
Interior/Sunlight	3660 mm	4880 mm	6 mm
Exterior/Normal	2440 mm	3660 mm	10 mm
Exterior/Excessive	2440 mm	3050 mm	13 mm

- .15 Fill control joints with sealant in accordance with Section 07 92 00 - Sealants. Keep building expansion joints free of mortar and grout.

3.3 WALL TILE

- .1 Install in accordance with TTMAC detail 305W-2009/2010.

3.4 FLOOR TILE

- .1 Install in accordance with TTMAC detail 310F-2009/2010, except that Ontario Building Code (OBC) 2012 shall apply.

3.5 BASE TILE

- .1 Install in accordance with TTMAC detail 305W-2009/2010.

3.6 FLOOR SEALER AND PROTECTIVE COATING

- .1 Apply in accordance with manufacturer's instructions.

3.7 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
- .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

3.8 CLEANING

- .1 Progress Cleaning: clean in accordance with Division 01 General Requirements: 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 Division 01 General Requirements: Cleaning.
 - .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
 - .2 Clean flooring and base surfaces to flooring manufacturer's printed instructions.
- .3 Waste Management: Separate waste materials for reuse and recycling in accordance with Division 01 General Requirements: Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.9 TRAINING

- .1 Provide training to Park Canada Agency's representatives on proper care and maintenance of tile.

3.10 PROTECTION

- .1 Protect installed work from construction operations damage until Final Completion or Parks Canada Agency occupancy, whichever comes first.
- .2 Repair damage to adjacent materials caused by Work of this Section.
- .3 Prohibit traffic on floor for minimum 48-hours after installation and application of finishes.
- .4 Temporary Floor Protection: 46 Mil (1.2 mm) thick, heavy-duty, non-staining, spill-resistant (protects floor against water, paint, mud, etc.) temporary floor protection.

- .1 Basis-of-Design:
 - .1 Ram Board.

END OF SECTION

Part 1 General

1.1 ASSEMBLY DESCRIPTION

- .1 Total depth of assembly over existing subfloor shall be 3-13/16 inches (97 mm).
- .2 White Maple wood flooring: 3/4-inch (19 mm) wide planks, 3/4-inch (19 mm) thickness, no v-groove, sanded, and finish coated.
- .3 Floating auxiliary subfloor: plywood sheathing or OSB: two layers, offset joints, with each panel 3/8-inch thick to an overall thickness of 3/4-inch (19 mm).
- .4 Noise control underlayment: 5/16-inch (8 mm) thick.
- .5 Lightweight gypsum topping: 2-inches (51 mm) thick.
- .6 Existing subfloor.
- .7 Existing floor joists.

1.2 RELATED SECTIONS

- .1 Section 02 41 20 - Selective Interior Demolition.
- .2 Section 03 54 13 - Gypsum Cement Underlayment.
- .3 Section 03 31 00.10 - Heritage Concrete.
- .4 Section 06 10 00.01 - Interior Rough Carpentry.
- .5 Section 06 20 00.01 - Interior Finish Carpentry.
- .6 Section 07 90 00.01 - Interior Joint Sealants.

1.3 REFERENCES

- .1 ASTM International (ASTM)
 - .1 ASTM F2170-16a, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
- .2 CSA International (CSA)
 - .1 CAN/CSA G164 M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .2 CSA O112 Series M1977 (R2006), CSA Standards for Wood Adhesives.
 - .3 CSA O121 08, Douglas Fir Plywood.
 - .4 CSA O141 05 (R2009), Softwood Lumber.
 - .5 CSA O151 09, Canadian Softwood Plywood.
 - .6 CAN/CSA O325-07, Construction Sheathing.
 - .7 CSA O437 Series 93 (R2011), Standards on OSB and Waferboard.

- .3 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC S102-10, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.1 REGULATORY REQUIREMENTS

- .1 Work shall meet or exceed the following regulatory requirements; comply with the Specifications; in cases of perceived conflict, the more stringent requirement applies.
 - .1 Ontario Building Code 2012 and Amendments.
 - .2 All Federal, Provincial, Regional and Municipal laws, regulations, ordinances and by-laws pertaining to the Work shall apply for the duration of the project.
 - .3 *Standards and Guidelines for Conservation of Historic Places in Canada*, 2nd Edition.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Convene pre-installation meeting one week prior to beginning work of this Section, with Contractor, Departmental Representative, installer, manufacturer's representative to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Coordination with other building trades.
 - .4 Review manufacturer's installation instructions and warranty requirements.

1.3 SUBMITTALS

- .1 Submit in accordance with Division 01 General Requirements: Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet for each product specified.
- .3 Samples:
 - .1 Submit three 300 mm long sample in same thickness colour and finish of materials to be installed. Include sample sets showing the full range of normal color and texture variations expected.
- .4 Closeout Data:
 - .1 Submit maintenance data for wood flooring assemblies and finish systems including a list of materials and equipment required to maintain the floor finish.

1.4 QUALITY ASSURANCE

- .1 Installer: Use only experienced installer who has completed installations similar in material, design, and extent to that indicated for this project and whose work has resulted in installations with a record of successful in service performance for a minimum of 5-years.
- .2 Compatibility: Use only sealers, clear coatings and accessories from a single manufacturer; using only components that are compatible with each other and with surface that coatings are being applied.

1.5 COORDINATION AND SEQUENCING

- .1 Coordinate with other trades for schedule and sequence.
- .2 Coordinate with Section 02 41 20 as required for salvaged materials, observing construction and other conditions, and taking measurements as required.
- .3 Flooring adjacent to new concrete hearth to be installed after removal of concrete forms and scribed tight to hearth, allowing enough joint space for the natural expansion and contraction of the wood flooring.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturers recommendations
- .2 Storage and Handling Requirements: Protect wood from exposure to moisture; moisture generating activities such as drywall, concrete, masonry, painting and grouting must be complete and cured prior to delivery of wood flooring.
- .3 Store materials in original, undamaged containers or wrapping with manufacturer's seals and labels intact.
- .4 Handle units to avoid chipped edges.
- .5 Store in dry, well ventilated storage areas. Never store outdoors. Storage area environments should be kept at 35 - 55% relative humidity and 16 - 21 degrees Celsius.

1.7 ENVIRONMENTAL REQUIREMENTS

- .1 Conditions and Measurements: Visit jobsite to verify installation conditions and floor measurements.
- .2 Ambient Conditions per manufacturer's written recommendations, and as follows:
 - .1 New gypsum cement underlayment: to Section 03 54 13 - Gypsum Cement Underlayment.

- .2 Environmental Limitations: Do not deliver or install until building is enclosed, overhead work is complete, wet work is complete, and HVAC system has been fully operating a minimum (1) one week, consistently maintaining temperature and relative humidity at occupancy levels.
 - .1 Maintain for space and substrate a min. 65 deg F (18 deg C) to maximum 75 deg F (23.9 deg C) temperature prior to, during and after installation.
 - .2 Maintain 35-60 percent RH from time of delivery acclimation, during and after Installation.
 - .3 Allow solid wood flooring to acclimate from 3 to 7 days to the conditions in which it will be installed, at or near occupancy levels.
 - .1 Do not proceed with installation until wood flooring and each accessory product is the same temperature as the space where it is to be installed.
 - .4 Do not proceed with installation until all ambient conditions are met.

1.8 WARRANTY

- .1 Provide 5-year finish warranty, and manufacturer's limited lifetime structural defect warranty.
- .2 Contractor agrees to correct any deficiencies of labour or material found in the work performed for a period of 5-years from date of Substantial Performance.

Part 2 Products

2.1 MATERIALS

- .1 Ground Floor Wood Flooring:
 - .1 Salvaged softwood flooring. Coordinate with Section 02 41 20 - Selective Interior Demolition as required.
 - .2 New wood flooring (softwood) to match salvaged flooring: account for 30% new material in the area indicated on the drawings for reinstallation of salvaged flooring; kiln-dried, matching species, grade and appearance of existing.
- .2 Gypsum cement underlayment: to Section 03 54 13 - Gypsum Cement Underlayment; 2-inch (51 mm) thickness.

- .3 Sound Isolation System: 5/16-inch (8 mm) thickness, pre-manufactured resilient acoustic underlayment with the following minimum properties:
 - .1 Resilient floor underlayment shall have sufficient capacity to be able to withstand minimum load of 1,000 psf (7 MPa) without loss of resilience.
 - .2 Resilient floor underlayment material shall be 5/16-inch (8 mm) thick pre-compressed high density fiberglass board. Fiberglass board shall consist of non-corrosive, non-combustible fiberglass. Resilient floor underlayment material shall not shrink, swell, or decompose under dry or wet conditions.
 - .3 Manufacturer's supplied or recommended perimeter isolation board; required where horizontal joints abut non-isolated building components; 3/8-inch thick (9.5 mm).
 - .4 Manufacturer's supplied or recommended acoustic joint sealant.
- .4 Sheathing Plywood or OSB: two layers, each panel 3/8-inch (9.5 mm) thick to an overall thickness of 3/4-inch (19 mm), in accordance with requirements of Section 06 10 00.01 - Interior Rough Carpentry.
- .5 Second Floor Wood Flooring: 3/4-inch (19 mm) thick tongued & grooved, square edged (no v-groove), kiln-dried White Maple, Grade 2 & Better, random length; Face width: 3-1/4 inch (82 mm); thickness: 3/4-inch (19 mm).
- .6 Perimeter Base: species and finishing to match wood flooring; dimensions and profiles as indicated; colour to match floor.
- .7 Finishing:
 - .1 Sanding Sealer:
 - .1 Professional-grade sanding and floor sealer, compatible with finish coats, and supplied by same manufacturer as finish coats.
 - .2 Finish Coats:
 - .1 Professional-grade, water-based oil-modified finish.
 - .1 Sheen: Gloss 85+ @ 60°.
 - .2 Acceptable Materials:
 - .1 Bona Sport All Court Polyurethane.
 - .2 Minwax Water Based Oil-Modified Polyurethane.
 - .3 Robbins Miracle Finish.

- .4 ZAR® Ultra Max Interior Waterborne Oil Modified Polyurethane.
- .5 Other, with same or better quality, performance characteristics, warranty, wear-resistance, and physical properties.

2.2 ACCESSORIES

- .1 Red Rosin Paper: multi-purpose building paper, single ply sheathing paper manufactured from 100 percent recycled fibers set in alum to resist bleeding.
 - .1 Building paper shall have the following characteristics:
 - .1 Thickness: 9.0 to 11.5 mils.
 - .2 Weight: 3.0 to 3.4 pounds per 100 square feet (141 to 166 g/m²).
 - .2 Acceptable wood sheathing auxiliary subfloor fasteners:
 - .1 Flat head #8 wood screws, Robertson square drive, straight roots, 5/8-inch (16 mm) long, sufficient to penetrate through 3/8-inch (9.5 mm) thick top layer of sheathing into bottom layer of sheathing approximately 1/4-inch (6 mm), countersunk flush with surface (but no deeper); ensure screws do not penetrate through bottom layer of sheathing into acoustic underlayment.
 - .3 Solid wood flooring fasteners:
 - .1 Blind Nails: Standard 2-inch (51mm) steel cleat nails.
 - .2 Top Nails: 15 gauge steel finish nails.
 - .3 Blind Staples: Standard 2-inch (51mm) steel staples.
 - .4 General purpose adhesive: to CSA O112 Series. Maximum allowable VOC limit 70 g/L in accordance with SCAQMD Rule 1168.
 - .5 Joint sealant: to Section 07 90 00.01 - Interior Joint Sealants: Type S-7, tooled to slight coved profile, but not extending at upturns more than 3 mm above finished floor level.

2.3 ASSEMBLY AND FABRICATION

- .1 Expansion / Contraction Movement: Assemble wood products using details that allow for expansion and contraction due to normal changes in ambient conditions for occupied, conditioned spaces.

Part 3 Execution

3.1 MANUFACTURERS' INSTRUCTIONS

- .1 Compliance: comply with manufacturers' printed installation instructions, standard details, data sheets and guide specifications.

3.2 EXAMINATION

- .1 Examine substrates, areas, and conditions, with installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of work.
- .2 Moisture content of the gypsum cement underlayment shall not exceed 85% using ASTM F2170 In-Slab Relative Humidity test.
- .3 Verify substrate is clean and free of laitance, loose material, grease, oil, coatings and other contaminants that will interfere with bonding of adhesive.
- .4 Verify substrate is flat, smooth, free from cracks, holes and ridges and other defects impairing performance or appearance.
- .5 Verify substrate are dry according to test methods recommended by flooring manufacturer.
- .6 Allow substrate to cure a minimum of 28 days.
- .7 Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 COORDINATION AND SEQUENCING

- .1 Coordinate, sequence and execute Work in accordance with article 1.5 this Section.
- .2 Cooperate with other trades as required.

3.4 PREPARATION

- .1 Gypsum cement underlayment: fill cracks and remove residue as required.
- .2 Layout Preparation - Racking: Dry lay out each wood-flooring strip without fastening to account for colour and length variations.

3.5 INSTALLATION - NOISE CONTROL UNDERLAYMENT SYSTEM

- .1 Perimeter Isolation Board:
 - .1 Cut isolation board to a width equal to $\frac{1}{4}$ -inch less than planned floor system height.
 - .2 Apply manufacturer's recommended spray adhesive, following manufacture's directions, to one side of perimeter isolation material (alternatively double-sided tape may be used).
 - .3 Firmly adhere it to any wall or vertical position (including doorframes) surrounding the perimeter of the isolation matt installation area.
 - .4 Adhere isolation board to any protrusions through the floor system including floor drains, columns, pipes, conduit, etc., following steps 1-3 above.
 - .5 Constraint: never attach the perimeter isolation board with nails, screws, or staples.
- .2 Noise Control Underlayment Matt:
 - .1 Lay noise control underlayment matt over designated area, do not use adhesive, do not overlay or leave gaps between the sheets or at perimeter.
 - .2 Do not tape the seams or joints.
 - .3 Keep traffic on noise control underlayment matt to an absolute minimum.
 - .4 Constraint: never attach noise control underlayment matt with nails, screws, or staples.
- .3 Finished Flooring, Sealing, Moulding:
 - .1 Install finish flooring according to manufacturer's directions.
 - .2 Trim perimeter isolation board to top of floor system.
 - .3 Seal the perimeter with a permanently resilient acoustical or elastomeric sealant, to Section 07 90 00.01 - Interior Joint Sealants.
 - .4 Install molding around perimeter of floor while maintaining an $\frac{1}{8}$ inch (3 mm) gap between moulding and finished floor.

3.6 INSTALLATION - FLOATING AUXILIARY SUBFLOOR

- .1 Lay red rosin paper with 6 to 8-inch overlap on top of the noise control underlayment. Do not adhere the red rosin paper to the noise control underlayment.
- .2 Lay down first layer of $\frac{3}{8}$ -inch thick plywood or OSB with joints staggered in relationship to noise control underlayment joints.

- .3 Trowel glue across the top of first layer of plywood or OSB.
- .4 Lay down second layer of 3/8-inch thick plywood or OSB layer oriented 90-degrees and with joints staggered at least 12-inches in relationship to first plywood layer.
- .5 Secure plywood or OSB layers together with specified wood screws spaced within 3-inches of the edges and spaced no greater than 8-inches in the field; do not permit wood screws to penetrate bottom layer of sheathing.

3.7 **INSTALLATION - NEW WOOD FLOORING**

- .1 General: Comply with flooring manufacturer's printed installation instructions, technical datasheets, details and specifications.
- .2 General:
 - .1 Install solid wood floors by secret nailing.
 - .2 Establish a squareness control line set from the longest parallel wall.
 - .1 Establish transfer control line(s) in adjacent room(s) as necessary.
 - .3 Begin installation on the longest parallel wall.
 - .4 Allow for expansion by providing a gap around the floor from 19/32 inch to 25/32 inch (15 mm to 20 mm). Allow for additional expansion across the width during low temperature field conditions.
 - .5 Wood strip end joints shall be staggered as far away from each other as possible, and no closer than 6 inches (150mm).
 - .6 When backfilling use a snug spline or slip tongue as needed.
 - .7 Cut wood strips or planks in a dust controlled separate room or area.
- .3 Installation pattern shall be straight.
 - .1 Fasten through T&G tongue using:
 - .1 Manual cleat nailer.
 - .2 Pneumatic or air assisted flooring cleat nailer.
 - .3 Pneumatic or air assisted flooring stapler.
 - .1 Skip nailing or fastening every other row is not acceptable.
- .4 Sanding and Sealing:
 - .1 After installation of floorboards, sand floors ready to receive sealer applications.

- .2 Perform sanding using only sanders with a dust control vacuum attachment. Provide effective dust containment system.
- .3 After sanding, buff entire floor using 100 grit screen or equal grit sandpaper, with a heavy-duty buffing machine.
- .4 Inspect entire area of floor to ensure the floor presents a smooth surface without drum stop marks, gouges, streaks or shiners.
- .5 Vacuum and tack floor before first coat of seal.
- .6 Ensure floor is clean and completely free of dirt and sanding dust before finish applications.
- .5 Finishing:
 - .1 Apply 2 or more coats of penetrating finish coat. Apply 2nd coat after 1st coat dries; prepare surface of 1st coat as specified by the finish manufacturer prior to 2nd coat application.

3.8 INSTALLATION - SALVAGED ORIGINAL FLOORING

- .1 General: install to match construction, installation and appearance of existing adjacent flooring.
- .2 Install No.15 felt directly below finish flooring.
- .3 Install finish flooring, as indicated, parallel with adjacent existing flooring.
- .4 Use hidden fastening methods. Maintain tight joints and board ends. Provide supplementary framing for floor frame assembly if floor hatch frame, existing or new, is encountered.
- .5 Power sand entire ground floor wood flooring surface smooth and true. Vacuum clean and remove dust.
- .6 Apply two coats of floor finish to match existing flooring as closely as possible Permit to dry thoroughly prior to permitting foot traffic.

3.9 JOINT SEALANT

- .1 Seal perimeter joints where flooring installations meet walls or other upturns in accordance with Section 07 90 00.01 - Interior Joint Sealants: Type S-7, tooled to slight coved profile, but not extending at upturns more than 3 mm above finished floor level.
- .2 Hearth: slab-to-floor sealing, to Section 03 31 10.10 - Heritage Concrete.

3.10 WOOD BASEBOARDS

- .1 Wood baseboards, to Section 06 20 00.01.

3.11 FIELD QUALITY CONTROL

- .1 Site Tests and Inspections: to Division 01 General Requirements: Quality Control, and as follows:
 - .1 Inspect for buckling, cupping, crowning, and tenting, an indication that a subfloor and wood flooring acclimation period and/or moisture testing limits may not have been met, and/or allowances for expansion and contraction were not observed.
 - .2 Inspect for creaking, popping, squishy, bouncy, or sea saw effects, an indication that the subfloor was not properly prepared, and/or meeting the recommended flatness tolerance.
 - .3 Inspect for gapping due to shrinkage, an indication that the wood flooring may not have met moisture content limits and/or was not properly installed per temperature and RH requirements.
- .2 Correct non-conforming work per Division 01 General Requirements: Quality Control, and as follows:
 - .1 Remove, repair and reinstall or restore in place damaged items.
 - .1 Finish touch-up damaged surface finishes.
 - .2 Replace damaged materials or items with New if repair not acceptable to Departmental Representative.

3.12 CLEANING

- .1 Progress Cleaning: clean in accordance with Division 01 General Requirements: 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 Division 01 General Requirements: Cleaning.
 - .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
 - .2 Clean flooring and base surfaces to flooring manufacturer's printed instructions.

.3 Waste Management: Separate waste materials for reuse and recycling in accordance with Division 01 General Requirements: Construction/Demolition Waste Management and Disposal.

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

3.13 TRAINING

.1 Provide training to Park Canada Agency's representatives on proper care and maintenance of wood floor.

3.14 PROTECTION

.1 Protect installed work from construction operations damage until Final Completion or Parks Canada Agency occupancy, whichever comes first.

.2 Repair damage to adjacent materials caused by Work of this Section.

.3 Prohibit traffic on floor for minimum 48-hours after installation and application of finishes.

.4 Temporary Floor Protection: 46 Mil (1.2 mm) thick, heavy-duty, non-staining, spill-resistant (protects floor against water, paint, mud, etc.) temporary floor protection.

.1 Basis-of-Design:

.1 Ram Board.

END OF SECTION

1 GENERAL

1.01 DESCRIPTION OF THE WORK

- .1 Prepare and prime woodwork.

1.02 QUALIFICATIONS

- .1 Provide for all work to be done by skilled and experienced tradesmen specializing in this type of work.

1.03 JOB AND ENVIRONMENTAL CONDITIONS

- .1 Use sufficient drop cloths and protective coverings for the full protection of work not being painted. Protect hardware and all other components of the building which do not require painting from paint spoiling and other soiling during the painting process.
- .2 Provide metal pans or adequate tarpaulin in areas assigned to the mixing of paints.
- .3 Keep waste rags in metal drums containing water and remove at the end of every working shift.
- .4 The painting Contractor shall remove from the building all excess material, left overs and scrap as well as his own equipment at the end of the job.
- .5 DO NOT paint in unclean areas.
- .6 Application and drying of exterior paints shall not proceed at temperatures below 10 deg. C. Shop priming shall be used on all pieces. It is not the intent to require the Contractor to house and heat to allowing painting.
- .7 Exterior painting shall not proceed when the substrate surface is damp with morning dew.
- .8 Exterior painting shall not proceed during periods of rain and shall not resume until the wetted surface has fully dried.
- .9 Moisture content of wood must not exceed 15% prior to applying paint.

2 PRODUCTS

2.01 EXTERIOR PAINT

- .1 Para Ultra Exterior Paint (oil/alkyd): Primer 1150.

2.02 LUMBER

- .1 Use 'C' Select Eastern White Pine for all exposed replacements and trim.
- .2 Moisture content to be 15% (i.e. grade stamped MC15).

2.03 FASTENERS FOR WOODWORK

- .1 All fasteners for woodwork to be hot dipped stainless steel.

2.04 GENERAL

- .1 Water: potable, direct from mains.
- .2 Bleach: 10% sodium hypochlorate solution i.e. Javex.
- .3 Tri-sodium phosphate.
- .4 Mineral Spirits or Varsol.
- .5 Heat gun.
- .6 Scrub brushes: natural bristle or soft plastic type only.
- .7 Mechanical scrapers: round all edges.
- .8 Strippers: Environmentally safe strippers such as Back to Nature Multi-Strip.
- .9 Filler: Paste Wood Filler type.

3 EXECUTION

3.01 PAINT PREPARATION

- .1 Apply all work in accordance with the manufacturer's printed directions unless modified by this Specification.
- .2 Apply work with suitable, clean equipment in good condition.
- .3 Apply work in dust free, suitable conditions and on surfaces free from machine, tool or sandpaper marks, insects grease, oil rust, salts and any other condition liable to impair finished work or prevent the production of good results.
- .4 All work shall be even, uniform of sheen, colour and texture, free from marks, well brushed in and free of sags, crawls, runs, joint marks and other defects.
- .5 Use paint unaltered; use same brand of paint for primer, intermediate and finish coats.
- .6 Surfaces soiled by the spillage of paint, paint splattering etc. shall be cleaned by this Trade. If such cleaning operations damage the surface, replacement or making good shall be at the expense of the Contractor.
- .7 All surface preparation must be done using hand tools such as scrapers and brushes supplemented by the heat gun. Hand tools must have rounded edges to prevent unnecessary damage such as gouging and scratching to the substrate.
- .8 Surfaces must be hand-sanded as required.

- .9 Use only approved paint strippers for paint stripping of woodwork.
- .10 Wash woodwork down with tri-sodium phosphate solution in hot water.
- .11 All new wood shall be back-primed prior to installation and any bare wood surfaces primed immediately as it is installed and before exposure.
- .12 Any open joints shall be sealed with caulking compound.
- .13 Weathered wood shall be carefully treated by gently sanding the area by hand until it is relatively smooth and using filler to provide smooth surfaces.
- .14 Carefully sand smooth area between coats.
- .15 Nail heads with the capacity to rust (this includes galvanized nails) shall be sunk below the surface of the wood and the nail hole puttied with oil base putty and putty painted with one coat gum shellac cut in pure alcohol.
- .16 After prime coat, fill nail holes, splits and scratches, using putty coloured to match finish. Re-prime these areas locally.

3.02 APPLICATION

- .1 Painting coats are intended to cover surfaces perfectly; if in the Painter's opinion the formulae specified are inadequate to provide a first-class finished surface, report to the Engineer before commencing work; surfaces imperfectly covered shall receive additional coats at no additional cost.
- .2 All paint is to be applied by hand brushing. Do not use roller or spray methods on the job unless specifically approved by the Engineer.

3.03 EXTERIOR WOODWORK FORMULAE FOR DORMERS IF WOOD IS RETAINED

- .1 All exterior wood work is to be treated in the following manner:
 - .1 Disinfection
 - .2 Scrape all loose, flaking and blistered paint, remove all alligatored paint.
 - .3 Spot prime and filling.
- .2 Wash down all woodwork by scrubbing off any residue and mildew with a bristle brush and rinsing down with water; to be done with a solution of bleach, detergent and tri-sodium phosphate mixed in the following proportions: - Bleach - 1 litre - Detergent - 50 ml - Tri-sodium Phosphate - 200 ml - Water - 3 litres
- .3 Spot prime any bare wood. Apply a prime coat of Exterior Wood Paint, applied liberally until the surface stays wet, paint to be diluted as follows: - 2 parts exterior wood paint: - 1 part mineral spirits (or approved wood primer)
- .4 Fill in all small cracks and fissures with putty tinted to match the finish coat colour.
- .5 Seal joint between wood and masonry with polyurethane based sealant.

**PART 4 MEASUREMENT AND PAYMENT
4.01 MEASUREMENT AND PAYMENT**

- .1 No measurement for payment will be made for Painting. Payment shall be

included in the Contract Lump Sum price.

- .2 Payment for the above items shall include all costs for materials, equipment and labour necessary to complete the work of these items in accordance with the Contract Drawings and these Specifications.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 04 03 06.01 - Interior Heritage Masonry Cleaning.
- .2 Section 05 51 29.01 - Interior Metal Stairs.
- .3 Section 06 20 00.01 - Interior Finish Carpentry.
- .4 Section 06 40 00 - Architectural Woodwork.
- .5 Section 08 20 00.01 - Interior Wood Doors.
- .6 Section 09 25 00 - Gypsum Board.
- .7 Other technical sections as indicated.

1.2 REFERENCES

- .1 American Society of Testing and Materials (ASTM)
 - .1 ASTM D16-12, Standard Terminology for Paint, Related Coatings, Materials, and Applications.
 - .2 ASTM E84-12b, Standard Test Method for Surface Burning Characteristics of Building Materials.
- .2 Green Seal
 - .1 Green Seal Standards GS-11, Paint.
 - .2 Green Seal Standard GC-03, Anti-Corrosive Paints.
- .3 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
- .4 Environmental Protection Agency (EPA)
 - .1 EPA Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 - 1995, (for Surface Coatings).
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .6 Master Painters Institute (MPI)
 - .1 MPI Architectural Painting Specifications Manual.
- .7 National Fire Code of Canada - 2010.
- .8 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1113-04, Architectural Coatings.
- .9 Society for Protective Coatings (SSPC)
 - .1 SSPC Painting Manual, 2011 Edition.

1.1 REGULATORY REQUIREMENTS

- .1 Work shall meet or exceed the following regulatory requirements; comply with the Specifications; in cases of perceived conflict, the more stringent requirement applies.
 - .1 Ontario Building Code 2012 and Amendments.
 - .2 All Federal, Provincial, Regional and Municipal laws, regulations, ordinances and by-laws pertaining to the Work shall apply for the duration of the project.
 - .3 *Standards and Guidelines for Conservation of Historic Places in Canada*, 2nd Edition.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Meeting:
 - .1 Convene pre-installation meeting to Division 01 General Requirements: Project Meetings one week prior to beginning work of this Section and on-site installations in accordance with Construction Progress Schedule.
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Coordination with other building trades.
 - .4 Review manufacturer's installation instructions and warranty requirements.
- .2 Scheduling
 - .1 Submit work schedule for various stages of painting to Departmental Representative for review. Submit schedule minimum of 48-hours in advance of proposed operations.
 - .2 Obtain written authorization from Departmental Representative for changes in work schedule.
 - .3 Schedule painting operations to prevent disruption of and by other trades.
 - .4 Schedule painting operations to prevent disruption of occupants.
- .3 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Health and Safety Requirements.

1.3 SUBMITTALS

- .1 Submit product data in accordance with Division 01 General Requirements: Submittals Procedures.
 - .1 Submit product data and instructions for each paint and coating product to be used.

- .2 Submit product data for the use and application of paint thinner.
- .3 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOCs during application and curing.
- .2 Submit samples in accordance with Division 01 General Requirements: Submittals Procedures.
 - .1 Submit full range colour sample chips to indicate where colour availability is restricted.
 - .2 Submit duplicate 200 x 300 mm sample panels of each paint, stain, clear coating, and special finish with specified paint or coating in colours, gloss/sheen and textures required to MPI Architectural Painting Specification Manual standards submitted on following substrate materials:
 - .1 3 mm plate steel for finishes over metal surfaces.
 - .2 13 mm birch plywood for finishes over wood surfaces.
 - .3 50 mm brick for finishes over brick masonry surfaces.
 - .4 13 mm gypsum board for finishes over gypsum board and other smooth surfaces.
 - .3 Retain reviewed samples on-site to demonstrate acceptable standard of quality for appropriate on-site surface.
- .3 Closeout Submittals: submit maintenance data for incorporation into manual specified in Division 01 General Requirements:: Closeout Submittals include following:
 - .1 Product name, type, and use.
 - .2 Manufacturer's product number.
 - .3 Colour numbers.
 - .4 MPI Environmentally Friendly classification system rating.
- .4 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation and application instructions.

1.4 QUALITY ASSURANCE

- .1 Contractor: minimum of five years proven satisfactory experience. Provide list of last three comparable jobs including, job name and location, specifying authority, and project manager.
- .2 Journeymen: qualified journeymen who have Tradesman Qualification Certificate of Proficiency engaged in painting work.
- .3 Apprentices: working under direct supervision of qualified Journeyman in accordance with trade regulations.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, Shipping, Handling and Unloading:
 - .1 Pack, ship, handle and unload materials in accordance with Division 01 General Requirements: Common Product Requirements and manufacturer's written instructions.
- .2 Acceptance at Site:
 - .1 Identify products and materials with labels indicating:
 - .1 Manufacturer's name and address.
 - .2 Type of paint or coating.
 - .3 Compliance with applicable standard.
 - .4 Colour number in accordance with established colour schedule.
- .3 Remove damaged, opened and rejected materials from site.
- .4 Storage and Protection:
 - .1 Provide and maintain dry, temperature controlled, secure storage.
 - .2 Store materials and supplies away from heat generating devices.
 - .3 Store materials and equipment in well ventilated area with temperature range 7 degrees C to 30 degrees C.
- .5 Store temperature sensitive products above minimum temperature as recommended by manufacturer.
- .6 Keep areas used for storage, cleaning and preparation clean and orderly. After completion of operations, return areas to clean condition.
- .7 Remove paint materials from storage only in quantities required for same day use.
- .8 Fire Safety Requirements:
 - .1 Provide one 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.

- .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
- .3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada requirements.

1.6 SITE CONDITIONS

- .1 Heating, Ventilation and Lighting:
 - .1 Ventilate enclosed spaces.
 - .2 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.
 - .3 Provide continuous ventilation for seven days after completion of application of paint.
 - .4 Coordinate use of existing ventilation system with Departmental Representative and ensure its operation during and after application of paint as required.
 - .5 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.
 - .6 Provide minimum lighting level of 323 Lux on surfaces to be painted.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
 - .1 Unless pre-approved written approval by Departmental Representative 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).
 - .2 15% for wood.
 - .3 12% for plaster and gypsum board.
 - .4 Allow new concrete and masonry to cure minimum of 28 days.
- .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.
- .3 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.
- .4 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 Departmental Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.

Part 2 Products

2.1 MATERIALS

- .1 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 Conform to latest MPI requirements for all painting work including preparation and priming.
- .4 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) in accordance with MPI - Architectural Painting Specification Manual "Approved Product" listing.
- .5 Linseed oil, shellac, and turpentine: highest quality product from approved manufacturer listed in MPI Architectural Painting Specification Manual, compatible with other coating materials as required.
- .6 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids:
 - .1 Use water-based coatings where available unless otherwise specified.
 - .2 Non-flammable.
 - .3 Manufactured without compounds that contribute to ozone depletion in the upper atmosphere.
 - .4 Manufactured without compounds that contribute to smog in the lower atmosphere.
 - .5 Do not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.
- .7 Formulate and manufacture water-borne surface coatings with no aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.
- .8 Flash point: 61.0 degrees C or greater for water-borne surface coatings and recycled water-borne surface coatings.
- .9 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.
- .10 Recycled water-borne surface coatings shall 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 Hexavalent 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 Colours: refer to Drawings and Finishes Schedule on Drawings. Submit colour samples for initial selection to Departmental Representative and confirm selections with Departmental Representative prior to ordering products.
- .2 Second coat in three-coat system to be tinted slightly lighter colour than topcoat to show visible difference between coats.
- .3 Minimum coating system: MPI Premium Grade: primer, intermediate coat, topcoat(s) as required to achieve uniform, opaque finish.

2.3 MIXING AND TINTING

- .1 Unless otherwise specified or pre-approved, all paint shall be ready-mixed and pre-tinted. Re-mix all paint in contained prior to and during application to ensure break-up of lumps, completed dispersion of settled pigment, and colour and gloss uniformity.
- .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.

2.4 GLOSS/SHEEN RATINGS

- .1 Paint gloss is defined as sheen rating of applied paint, in accordance with following values:

	Gloss @ 60 degrees	Sheen @ 85 degrees
G1 - Matte (flat)	Max. 5	Max. 10
G2 - Velvet-Like	Max.10	10 to 35
G3 - Eggshell	10 to 25	10 to 35
G4 - Satin-Like	20 to 35	min. 35
G5 - Semi-Gloss	35 to 70	
G6 - Gloss	70 to 85	
G7 - High Gloss	More than 85	

- .2 Gloss level ratings of painted surfaces as indicated or as otherwise direct by Departmental Representative.

2.5 INTERIOR PAINTING

- .1 Unless otherwise specified, interior painting work shall be in accordance with MPI Multi-Coat Premium Grade finish requirements; i.e., all applications include primer, intermediate and finish coats as a minimum.
- .2 Refer to Drawings for finish guidance, and refer questions regarding finish selection to Departmental Representative prior to ordering and applying finishes.
- .3 Existing Painted Chimneys:
 - .1 RIN 4.1L High performance architectural latex velvet-like finish.
- .4 Structural Steel and Metal Fabrications: exposed columns, beams, joists, and miscellaneous metal:
 - .1 INT 5.1R High performance architectural latex, gloss finish.
 - .2 Where clear finish is required (exposed metal at stairs, balustrades and wire mesh swing doors at built-in casework):
 - .1 Preparation: Prepare steel surfaces to SSPC-SP3 minimum, and apply acetone to all exposed surfaces. Ensure adequate ventilation, vented to exterior. (coordinate with exterior work so all workers are adequately protected as required). Ensure workers wear eye, head, and face protection, protective gloves, and use respirator to CAN/CSA-Z94.4.

- .1 Immediately after acetone has evaporated, apply finish coat material.
- .2 Finish coat: apply 1 coat of clear aliphatic urethane finish coating at 4-5 mills WFT, low VOC, two-component, high-performance, UV-resistant, purpose-made for unprimed direct adhesion: Flex-Clear, by US Coating Solutions, or similar with same or better performance and product characteristics, and recommended uses. Comply with manufacturer's printed preparation and application instructions, and technical datasheet.
- .5 Galvanized Metal:
 - .1 INT 5.3M High performance architectural latex, gloss finish.
- .6 Dimension Lumber: (columns, beams, exposed joists, underside of decking, etc.): finish as indicated, selecting from the following as appropriate and approved by Departmental Representative:
 - .1 INT 6.2J - Polyurethane varnish, high gloss finish (over stain).
- .7 Dressed Lumber: doors, door and window frames, casings, mouldings, etc.: finish as indicated, selecting from the following as appropriate and approved by Departmental Representative:
 - .1 Refer to Section 06 40 00 - Architectural Woodwork: match casework finish for built-in casework, to item 2.4.3.5 of Section.
- .8 Wood Floors and Interior Metal Stairs (Wood Treads and Landings):
 - .1 Refer to Section 09 63 00 - Wood Flooring: finishing.
- .9 Plaster and gypsum board: gypsum wallboard, drywall, "sheet rock" type material, and textured finishes:
 - .1 INT 9.2B - High-performance architectural latex; G3 finish.
- .10 Acoustic panels and tiles (touch up paint):
 - .1 INT 9.3A - Latex G1 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 that 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 manufacturers' printed recommendations and specifications, including product technical bulletins, handling, storage, preparation and application instructions, and technical datasheets.

3.2 GENERAL

- .1 Perform preparation and operations for painting in accordance with MPI - Architectural Painting Specifications Manual, Premium Grade.
- .2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.3 EXAMINATION

- .1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Departmental Representative damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.
- .2 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "cover patch test". Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.
- .3 Maximum moisture content as follows:
 - .1 Metal: 0%.

- .2 Stucco, plaster and gypsum board: 12%.
- .3 Concrete: 12%.
- .4 Brickwork: 12%.
- .5 Wood: 15%.
- .4 Prior to commencement of repainting work, thoroughly examine (and test as required) all interior conditions and surfaces scheduled to be repainted and report in writing to the Departmental Representative any conditions or surfaces that adversely affect work of this section.
- .5 The degree of surface deterioration (DSD) shall be assessed as follows:

Condition	Description
DSD-0	Sound Surface (may include visual (aesthetic) defects that do not affect film's protective properties).
DSD-1	Slightly Deteriorated Surface (may show fading; gloss reduction, slight surface contamination, minor pin holes scratches, etc.) / Minor cosmetic defects (runs, sags, etc.).
DSD-2	Moderately Deteriorated Surface (small areas of peeling, flaking, slight cracking, staining, etc.).
DSD-3	Severely Deteriorated Surface (heavy peeling, flaking, cracking, checking, scratches, scuffs, abrasion, small holes and gouges).
DSD-4	Substrate Damage (repair or replacement of surface required by others).

- .6 Correct defects DSD-0 through DSD-4 as required, ready to be painted. Coordinate with other trades as needed.

3.4 PREPARATION - REPAINTING

- .1 Prepare all interior surfaces for repainting in accordance with MPI Repainting Manual requirements.
- .2 Sand, clean, dry, etch, neutralize and/or test all surfaces under adequate illumination, ventilation and temperature requirements.
- .3 Remove and securely store all miscellaneous hardware and surface fittings and fastenings (e.g. electrical plates, mechanical louvers, door and window hardware (e.g. hinges, knobs, locks, trim, frame stops), removable labels, washroom accessories, light fixture trim, etc. from wall and ceiling surfaces, doors and frames, prior to repainting and replace upon completion. Carefully clean and replace all such items upon completion of repainting work in each area. Do not use solvent or reactive cleaning agents on items that will mar or remove finishes (e.g. lacquer finishes). Doors shall be removed before repainting to paint bottom and top edges and then re-hung.

- .4 Protect all adjacent interior surfaces and areas, including rating and instruction labels on doors, frames, equipment, piping, etc., from repainting operations and damage by drop cloths, shields, masking, templates, or other suitable protective means and make good any damage caused by failure to provide such protection.

3.5 PREPARATION - NEW WORK

- .1 Protection:
 - .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Departmental Representative.
 - .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
 - .3 Protect factory finished products and equipment.
 - .4 Protect passing pedestrians, building occupants, and general public in and about the building.
- .2 Surface Preparation:
 - .1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.
 - .2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
 - .3 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Departmental Representative.
- .3 Clean and prepare surfaces in accordance with MPI - Architectural Painting Specification Manual requirements and coating manufacturer's recommendations. 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 clothes 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 pre-treatment 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 vinyl 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 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 or vacuum cleaning.
 - .8 Prepare existing brick surfaces to be painted to firm substrate by removing dirt, dust, loose, un-adhered and flaking paint, oil, grease and other foreign substances in accordance with MPI requirements. Remove all products from surfaces, pockets, and corners to be painted by brushing with clean brushes or vacuum cleaning.
 - .9 Touch up of shop primers with primer as specified.
 - .10 Do not apply paint until prepared surfaces have been accepted by Departmental Representative.

3.6 APPLICATION

- .1 Method of application shall be as approved by Departmental Representative and AVRSB Project Manager. Apply paint by brush, roller, air sprayer or airless sprayer. 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, 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, 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 period as recommended by manufacturer.

- .7 Sand and dust between each coat to provide an anchor for next coat and to remove defects in previous coat (runs, sags, etc.) visible from a distance up to 1000 mm (39").
- .8 To avoid air entrapment in applied coats, apply materials in accordance with manufacturer's spread rates and application requirements.
- .9 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.
- .10 Finish inside of cupboards and cabinets as specified for outside surfaces.
- .11 Finish closets and alcoves as specified for adjoining rooms.
- .12 Finish top, bottom, edges, and cut-outs of doors after fitting as specified for door surfaces.

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 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.
- .5 Do not paint over nameplates.
- .6 Keep sprinkler heads free of paint.
- .7 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matt black paint.
- .8 Paint fire protection piping red.
- .9 Paint disconnect switches for fire alarm system and exit light systems in red enamel.
- .10 Paint natural gas piping yellow.

- .11 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.
- .12 Do not paint interior transformers and substation equipment.

3.8 FIELD QUALITY CONTROL

- .1 Where "special" painting, coating or decorating system applications (i.e. elastomeric coatings) or non-MPI listed products or systems are to be used, paint or coating manufacturer shall provide as part of this work, certification of surfaces and conditions for specific paint or coating system application as well as on site supervision, inspection and approval of their paint or coating system application as required at no additional cost to Owner
- .2 Advise Departmental Representative when surfaces and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.
- .3 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Departmental Representative.
- .4 Painted interior surfaces shall be considered to lack uniformity and soundness if any of the following defects are apparent to the Departmental Representative:
 - .1 brush / roller marks, streaks, laps, runs, sags, drips, heavy stippling, hiding or shadowing by inefficient application methods, skipped or missed areas, and foreign materials in paint coatings.
 - .2 evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles.
 - .3 damage due to touching before paint is sufficiently dry or any other contributory cause.
 - .4 damage due to application on moist surfaces or caused by inadequate protection from the weather.
 - .5 damage and/or contamination of paint due to blown contaminants (dust, spray paint, etc.).
- .5 Painted interior surfaces shall be considered unacceptable if any of the following are evident under final lighting source conditions:

- .1 visible defects are evident on vertical surfaces when viewed at 90 degrees to the surface from a distance of 1000 mm (39").
- .2 visible defects are evident on horizontal surfaces when viewed at 45 degrees to the surface from a distance of 1000 mm (39").
- .3 visible defects are evident on ceiling surfaces when viewed at 45 degrees to the surface.
- .4 when the final coat on any surface exhibits a lack of uniformity of sheen across full surface area.
- .6 Painted surfaces rejected by the Departmental Representative shall be made good at the expense of the Contractor. Small affected areas may be touched up; large affected areas or areas without sufficient dry film thickness of paint shall be repainted. Runs, sags of damaged paint shall be removed by scraper or by sanding prior to application of paint.

3.9 CLEANING

- .1 Progress Cleaning: clean in accordance with Division 01 General Requirements: Cleaning. Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Division 01 General Requirements: Cleaning. Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Division 01 General Requirements: Construction/Demolition Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.10 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 06 10 10.01 - Interior Rough Carpentry.
- .2 Section 09 25 00 - Gypsum Board.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM A153/A153M-09, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - .2 ASTM A167-99(2009), Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - .3 ASTM A653/A653M-13, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .4 ASTM A666-10, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - .5 ASTM A924/A924M-13, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
 - .6 ASTM A1008/A1008M-13, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
 - .7 ASTM B16/B16M - 10, Standard Specifications for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines.
 - .8 ASTM B19 - 10, Standard Specification for Cartridge Brass Sheet, Strip, Plate, Bar, and Disks.
 - .9 ASTM B456-11, Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
- .2 Canadian Standards Association (CSA)
 - .1 CSA-B651-12, Accessible Design for the Built Environment.
 - .2 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

1.1 REGULATORY REQUIREMENTS

- .1 Work shall meet or exceed the following regulatory requirements; comply with the Specifications; in cases of perceived conflict, the more stringent requirement applies.
 - .1 Ontario Building Code 2012 and Amendments.
 - .2 All Federal, Provincial, Regional and Municipal laws, regulations, ordinances and by-laws pertaining to the Work shall apply for the duration of the project.
 - .3 *Standards and Guidelines for Conservation of Historic Places in Canada*, 2nd Edition.

1.2 SUBMITTALS

- .1 Submit in accordance with Division 01 General Requirements: Submittal Procedures:
- .2 Product Data
 - .1 Submit manufacturer's printed product literature, specifications, and datasheet.
- .3 Shop Drawings:
 - .1 Indicate size and description of components, base material, and surface finish inside and out, hardware and locks, attachment devices, description of rough-in-frame, building-in details of anchors for grab bars.
- .4 Samples:
 - .1 Samples to be returned for inclusion into work.
- .5 Submit closeout data in accordance with Division 01 General Requirements: Closeout Submittals:
 - .1 Provide maintenance data for toilet and bath accessories for incorporation into manual specified in Division 01 General Requirements: Closeout Submittals.
 - .2 Include list of sources for disposable supplies, replacement parts and service recommendations.

1.3 EXTRA MATERIALS

- .1 Provide special tools required for accessing, assembly/disassembly or removal for toilet and bath accessories in accordance with requirements specified in Division 01 General Requirements: Closeout Submittals.
- .2 Deliver special tools to Departmental Representative.

Part 2 Products

2.1 SINGLE SOURCE REQUIREMENT

- .1 Provide products from a single manufacturer for all washroom locations and all components.
- .2 Proposed substitutions shall be from a manufacturer that can provide all of the products specified, and shall demonstrate the same or better physical properties, performance characteristics, design aesthetic, warranty, and overall quality of the Basis-of-Design products.

2.2 MATERIALS

- .1 Sheet steel: to ASTM A653/A653M cold rolled, commercial quality, 0.912 mm minimum nominal thickness, with ZF001 designation zinc coating.
- .2 Stainless steel sheet metal: to ASTM A666, Type 304, finish as indicated in component list in 1.519 mm minimum nominal thickness.
- .3 Stainless steel tubing: Type 304, commercial grade, seamless welded, 1.2 mm wall thickness.
- .4 Fasteners: concealed screws and bolts hot dip galvanized after fabrication, tamper and theft resistant exposed fasteners to match material of unit. Expansion shields fibre, lead or rubber as recommended by accessory manufacturer for component and its intended use.

2.3 COMPONENTS

- .1 Toilet tissue dispenser: holds twin jumbo rolls, surface mounted, stainless steel construction, equipped with tumbler lock, accommodates two rolls of 228 mm diameter minimum with satin finish.
 - .1 Basis-of-Design:
 - .1 B-2892, Bobrick.
- .2 Combination towel dispenser/waste receptacle: recessed wall unit, approximately 330 mm wide, 1400 mm high, 152 mm deep of stainless steel construction with satin finish. Suitable for dispensing multi-fold, C-fold or single fold paper towels. Removable galvanized steel waste receptacle, lockable access door with continuous full height stainless steel hinge.
 - .1 Basis-of-Design:
 - .1 B-38032, Bobrick.
- .3 Soap dispenser: liquid push-in valve, self-contained 1.14 L tank, stainless steel piston and valve assembly, refillable

from top, tamper proof keyed lock, horizontal surface mounted, stainless steel with satin finish.

- .1 Basis-of-Design:
 - .1 B-2112, Bobrick.
- .4 Feminine napkin disposal bin: stainless steel, surface mounting unit, continuous hinged door, self closing with leak proof plastic receptacle and 10 disposable liners for initial stocking purpose for each unit.
 - .1 Basis-of-Design:
 - .1 B-270, Bobrick.
- .5 Grab Bar: straight 1200 mm long x 38 mm dia x 1.2 mm thick of stainless steel with satin finish, concealed mounting flanges, screw attachment, flanges welded to tubular bar, provided with steel back plates and all accessories. Knurl bar at area of hand grips. Grab bar material and anchorage to withstand downward pull of 2.2 kN.
 - .1 Basis-of-Design:
 - .1 B-6806.99x48, Bobrick.
- .6 Grab Bar: Left or right, 90° angle, 32 mm diameter, stainless steel, peened grip; satin finish at end bar and flange; 75 mm diameter concealed mounting plate, with flange secured by set screws; 38 mm from wall finish.
 - .1 Basis-of-Design:
 - .1 Bobrick B-5856.99 or B-5846.99.
- .7 Framed Mirror (Room 102): One-piece angle framed mirror, type 304 stainless steel, satin finish; secured to concealed wall hanger with theft-resistant locking screws; 450 mm wide x 850 mm high. 450x850
 - .1 Basis-of-Design:
 - .1 Bobrick B-290 1830.
- .8 Framed Tilt Mirror (Room 103): Frame of type 304 stainless steel satin finish; mirror to extend 100 mm at top and taper to 25 mm at bottom; No. 1 quality 6 mm select float glass mirror; 450 mm wide x 750 mm high.
 - .1 Basis-of-Design:
 - .1 Bobrick B-293 1830.
- .9 Coat Hook: One-piece brass casting with satin nickel plated finish; concealed mounting plate. Heavy-duty for 300 lb. downward pull.
 - .1 Basis-of-Design:
 - .1 Bobrick B-2116.

2.4 FABRICATION

- .1 Weld and grind joints of fabricated components flush and smooth. Use mechanical fasteners only where approved.
- .2 Wherever possible form exposed surfaces from one sheet of stock, free of joints.
- .3 Brake form sheet metal work with 1.5 mm radius bends.
- .4 Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.
- .5 Back paint components where contact is made with building finishes to prevent electrolysis.
- .6 Hot-dip galvanize concealed ferrous metal anchors and fastening devices to CSA G164.
- .7 Shop-assemble components and package complete with anchors and fittings.
- .8 Deliver inserts and rough-in frames to job site at appropriate time for building-in. Provide templates, details and instructions for building in anchors and inserts.
- .9 Provide steel anchor plates and components for installation on studding and building framing.

2.5 FINISHES

- .1 Chrome and nickel plating: to ASTM B456, satin finish.
- .2 Labels: exposed faces, provide maximum 38 mm diameter stamped manufacturer logo.

Part 3 Execution

3.1 PREPARATION

- .1 Verify wall thickness and construction that will accept recessed accessories.
- .2 Verify that solid blocking for support and anchoring of washroom accessories is installed where required. Confirm exact height and location with Departmental Representative and Manufacturer's Instructions.
- .3 Verify that frames and anchors provided, whether by this Section or others, are correctly and securely installed ready to accept the accessory scheduled for the specific location.
- .4 Verify that painting is complete and dry in area of installation before accessories are installed.

3.2 INSTALLATION

- .1 Install and secure accessories rigidly in place as follows:
 - .1 Stud walls: install steel back-plate to stud prior to plaster or drywall finish. Provide plate with threaded studs or plugs.
 - .2 Hollow masonry units or existing plaster/drywall: use toggle bolts drilled into cell/wall cavity.
 - .3 Solid masonry, marble, stone or concrete: use bolt with lead expansion sleeve set into drilled hole.
 - .4 Toilet/shower compartments: use male/female through bolts.
- .2 Install grab bars on built-in anchors provided by bar manufacturer.
- .3 Use tamper proof screws/bolts for fasteners.
- .4 Fill units with necessary supplies shortly before final acceptance of building.
- .5 Install mirrors in accordance with Section 08 80 50 - Glazing.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Division 01 General Requirements: 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 Division 01 General Requirements: Cleaning.
 - .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .3 Waste Management: Separate waste materials for reuse and recycling in accordance with Division 01 General Requirements: Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 SCHEDULE

- .1 Locate accessories where indicated on Drawings, and to CSA B651. Exact locations determined by Departmental Representative.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section specifies washroom door signage for Rooms 102 and 103.

1.2 RELATED SECTIONS

- .1 Section 08 20 00.01 - Interior Wood Doors.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA B651-12, Accessible Design for the Built Environment.
- .2 International Organization for Standardization (ISO)
 - .1 ISO 7001:2007(2013), Graphical symbols - public information symbols.

1.1 REGULATORY REQUIREMENTS

- .1 Work shall meet or exceed the following regulatory requirements; comply with the Specifications; in cases of perceived conflict, the more stringent requirement applies.
 - .1 Ontario Building Code 2012 and Amendments.
 - .2 All Federal, Provincial, Regional and Municipal laws, regulations, ordinances and by-laws pertaining to the Work shall apply for the duration of the project.
 - .3 *Standards and Guidelines for Conservation of Historic Places in Canada*, 2nd Edition.

1.2 SUBMITTALS

- .1 Submit in accordance with Division 01 General Requirements: Submittal Procedures:
- .2 Product Data:
 - .1 Submit construction details, material descriptions, dimensions of individual component and profiles, and finishes for each sign type
- .3 Samples:
 - .1 Provide a single unit sample of each sign type to verify colours, dimensions, profiles, and finishes.
 - .2 Submitted samples may be incorporated into the Work.

- .4 Shop Drawings:
 - .1 Include sign types, graphics, colors, sign dimensions and profiles. Show mounting methods, locations, accessories and installation guidelines.

Part 2 Products

2.1 MATERIALS

- .1 Raised character (cut-out) letters, numbers, and pictographs shall be 3 mm acrylic adhered to 5 mm opaque acrylic using a solvent adhesive, square corners, and non glare finish; colour-contrast required. Adhesive shall not be permitted to squeeze out around the letters, to avoid damage to the acrylic surface.
- .2 Mounted with tamper-resistant stainless steel screws, countersunk.
- .3 Self-stick tape: VHB tape for sign purposes, with synthetic self-stick adhesive on both sides. Width: to suite sign size.
- .4 Number plates shall be sized to accommodate number location on the door frame.

2.2 ACCESSORIES

- .1 Accessories: provide manufacturers recommended fasteners for anchoring signage to walls.
- .2 Mechanical Fasteners: screws, plugs, or expanding wall anchors.

2.3 GENERAL FABRICATION REQUIREMENTS

- .1 Fabricate signs in accordance with details, specifications and shop drawings.
- .2 Build units square, true, accurate to size, free from visual or performance defects.
- .3 Accurately fit and securely join sections to obtain tight, closed joints.
- .4 Allow for thermal movement without distortion of components.

2.4 SIGN GRAPHICS

- .1 Sign graphics shall be well defined, arranged for balanced appearance, and properly work and letter spaced.
- .2 Sign lettering to be 'sans serif' font.

2.5 WALL PICTOGRAPHS

- .1 Fabricate from 5 mm thick opaque coloured acrylic sheet.
- .2 Sign graphics: apply 3 mm thick white acrylic; use international symbols.
- .3 Fixed mounting: use stainless steel countersunk screws or self-stick foam tape in combination with liquid silicone.
- .4 Washroom pictographs: cut-out figures without backgrounds.

Part 3 Execution

3.1 EXAMINATION

- .1 Examine wall surfaces, substrate areas and conditions with the Installer present, for compliance with the requirements for installation guidelines, tolerances and other conditions affecting the performance of work.
- .2 Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with the authorities having jurisdiction and are free from dirt and other deleterious matter.
- .3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- .1 Comply with manufacturer's printed installation instructions, data sheet, and standard details.
- .2 General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with the manufacturer's written instructions.
 - .1 Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.
- .3 Wall Mounted Panel Signs: Attach panel signs to wall surfaces using the methods indicated.
 - .1 Mechanical Fasteners: Use non-removable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended by the sign manufacturer.
 - .2 Silicone Adhesive Mounting: Use liquid silicone adhesive recommended by manufacturer to attach signs to irregular, porous or vinyl covered surfaces. Use double-sided foam tape to hold sign in place while adhesive cures.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Division 01 General Requirements: Cleaning. Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Division 01 General Requirements: Cleaning.
- .3 Waste Management: Separate waste materials for reuse and recycling in accordance with Division 01 General Requirements: Construction/Demolition Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 SIGN SCHEDULE

- .1 Interior signage to be designed and mounted in accordance with CSA B651. International symbols and pictograms, to ISO 7001:2007. Signs shall be 150 mm x 150 mm, with 12 mm square corners and edges. Include braille on all signs.
- .2 Colours, pictograms, pictogram size, font, font size shall be same for all signs.
- .3 Identification devices:
 - .1 Provide 'Gender Neutral Washroom' signage with 3 cut-out figures at single occupancy washrooms. Add accessibility symbol where washroom is barrier-free. Add baby change table symbol where washroom has baby change table.
- .4 Example of gender neutral sign with braille (generic sample for general guide purposes only, 'Restroom' should read 'Washroom'):



END OF SECTION

1 GENERAL

1.01 SUMMARY

- .1 Section Includes:
 - .1 Common work results for Division 23.
 - .2 Sustainable requirements for construction and verification.
 - .1 None.
- .2 Related Sections:
 - .1 None.

1.02 SUBMITTALS

- .1 Shop drawings; submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
- .2 Submit for approval [at time of bid] [within 48 hours] [within 10 days] after Award of Contract.
- .3 Shop drawings to show:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
- .4 Shop drawings and product data accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Acoustical sound power data, where applicable.
 - .3 Points of operation on performance curves.
 - .4 Manufacturer to certify current model production.
 - .5 Certification of compliance to applicable codes.
- .5 Use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.
- .6 Closeout Submittals:
 - .1 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative or designate before final inspection.
 - .2 Operation data to include:
 - .1 Control schematics for systems including environmental controls.
 - .2 Description of systems and their controls.
 - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
 - .4 Operation instruction for systems and component.
 - .5 Description of actions to be taken in event of equipment failure.
 - .6 Valves schedule and flow diagram.
 - .7 Colour coding chart.
 - .3 Maintenance data to include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.

- .4 Performance data to include:
 - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified.
 - .4 Testing, adjusting and balancing reports as specified in Section [23 05 93].
- .5 Approvals:
 - .1 Submit [2] copies of draft Operation and Maintenance Manual to Departmental Representative or designate or designate for approval. Submission of individual data will not be accepted unless directed by Departmental Representative or designate or designate.
 - .2 Make changes as required and re-submit as directed by Departmental Representative or designate or designate.
- .6 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .7 Site records:
 - .1 Departmental Representative or designate or designate will provide [1] set of reproducible mechanical drawings. Provide sets of [white] prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
 - .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
 - .3 Use different colour waterproof ink for each service.
 - .4 Make available for reference purposes and inspection.
- .8 As-built drawings and specifications:
 - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
 - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (date).
 - .3 Submit to Departmental Representative or designate or designate for approval and make corrections as directed.
 - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings and specifications.
 - .5 Submit completed reproducible as-built drawings and specifications with Operating and Maintenance Manuals.
- .10 Submit copies of as-built drawings and specifications for inclusion in final TAB report.

1.03 HALOCARBONS

- .1 Comply with Federal Halocarbon Regulations 2003 under the Canadian Environmental Protection Act 1999, EPAM and PWGSC Ontario Region Halocarbon Information Sheet dated March 2010.

2 PRODUCTS

2.01 MATERIALS

- .1 Complete list of equipment and materials to be used on this project and forming part of bid documents by adding manufacturer's name, model number and details of materials, and submit for approval.

3 EXECUTION

3.01 REPAIRS/RESTORATION

- .1 To Section [09 91 23].
- .2 Prime and touch up marred finished paintwork to match original.
- .3 Restore to new condition, finishes which have been damaged extensively for priming and touch-up.

3.02 CLEANING

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

3.03 FIELD QUALITY CONTROL

- .1 Site Tests: conduct following tests and submit report as described in PART 1 - SUBMITTALS.
 - .1 None.
- .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 Verification requirements include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Certified wood.
 - .8 Low-emitting materials.

3.04 DEMONSTRATION

- .1 Departmental Representative or designate will use equipment and systems for

test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

- .2 Trial usage to apply to following equipment and systems:
 - .1 None.
- .3 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .4 Where specified elsewhere in Division 23 manufacturers to provide demonstrations and instructions.
- .5 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.
- .6 Instruction duration time requirements as specified in appropriate sections.
- .7 Departmental Representative or designate will record these demonstrations on video tape for future reference.

3.05 PROTECTION

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

- .1 Submit shop drawings/product data sheets to regulatory authority for review and approval prior to submitting to Departmental Representative or designate. Conform to following requirements:
 - .1 submit shop drawings/product data sheets for all products specified in this Section except pipe and fittings;
 - .2 submit complete CAD layout drawings indicating source of water supply with test flow and pressure, "head-end" equipment piping schematic, pipe routing and sizing, and zones, all signed and sealed by a qualified professional mechanical engineer registered in jurisdiction of the work as specified below;
 - .3 submit copies of all calculations, including hydraulic calculations, stamped and signed by same engineer who signs layout drawings, and a listing of all design data used in preparing the calculations, system layout and sizing, including occupancy-hazard design requirements;
 - .4 in addition to submitting shop drawings to regulatory authority as specified above, shop drawings must be approved by Owner's insurer prior to being submitted to Departmental Representative or designate or for review.
- .2 Submit a complete sprinkler system test certificate as specified in Part 3 of this Section.
- .3 Sprinklers are to be identified on drawings and product submittals, and be specifically identified by manufacturer's listed model or series designation. Trade names and other abbreviated listings are unacceptable.

1.02 QUALITY ASSURANCE

- .1 Fire protection sprinkler system work is to be in accordance with following Codes and Standards:
 - .1 NFPA 13, Standard for the Installation of Sprinkler Systems;
 - .2 CSA B137.2, Polyvinylchloride (PVC) Injection-Moulded Gasketed Fittings for Pressure Applications;
 - .3 CSA B137.3, Rigid Polyvinylchloride (PVC) Pipe for Pressure Applications;
 - .4 ASTM A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless;
 - .5 ASTM A135, Standard Specification for Electric-Resistance-Welded Steel Pipe;

- .6 ASTM A234, Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service;
 - .7 ASTM A536, Standard Specification for Ductile Castings;
 - .8 ASTM A795, Standard Specification for Black and Hot-Dipped Zinc Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use;
 - .9 ANSI/ASME B16.4, Grey Iron Threaded Fittings (Classes 125 and 250);
 - .10 CAN/CSA B64.10, Backflow Preventers and Vacuum Breakers.
 - .11 Standards and Guidelines for Conservation of Historic Place in Canada 2nd Edition.
- .2 Fire protection sprinkler work is to be performed by a sprinkler company who is a member in good standing of the Canadian Automatic Sprinkler Association. Site personnel are to be licensed in jurisdiction of the work and under the continuous supervision of a foreman who is an experienced fire protection system installer and a journeyman pipe fitter licensed in jurisdiction of the work.
 - .3 Check and verify dimensions and conditions at site and ensure work can be performed as indicated. Coordinate work with trades at site and accept responsibility for and cost of making adjustments to piping and/or spacing to avoid interference with other building components.
 - .4 System components must be ULC listed and labelled.
 - .5 Grooved couplings, and fittings, valves and specialties are to be products of a single manufacturer. Grooving tools are to be of same manufacturer as grooved components.
 - .6 Castings used for coupling housings, fittings, valve bodies, etc., are to be date stamped for quality assurance and traceability.

1.03 DESIGN REQUIREMENTS

- .1 Fire protection sprinkler work is to be designed in accordance with NFPA 13 and Provincial Standards, and, where required, local building and fire department requirements and standards of Owner's Insurer. If water supply flow and pressure test data is not available, conduct Municipal main water flow and pressure tests at nearest fire hydrant to obtain criteria to be used in system design. Include hydrant location and flow and pressure test data with system design calculations.
- .2 Include for a qualified mechanical professional engineer registered and licensed in the jurisdiction of the work to design the fire protection standpipe work. Refer to Section entitled Mechanical Work General Instructions for requirements regarding Contractor retained engineers.
- .3 Sprinkler /System Occupancy - Hazard Design requirements: In accordance with NFPA 13 occupancy-hazard density requirements, unless otherwise specified.

2 PRODUCTS

2.01 PIPE, FITTINGS AND JOINTS

- .1 Pipe, fittings and joints are to be as follows, with exceptions as specified in Part 3 of this Section:
 - .1 PVC
 - .1 Class 200, DR14, rigid, hub and spigot pattern PVC pipe and CSA certified fittings to CAN/CSA B137.2 and B137.3 and complete with gasketed joints.
 - .2 Schedule 40 Steel - Grooved Coupling Joints
 - .1 Schedule 40 mild black carbon steel, ASTM A53, Grade B, complete with grooved ends and mechanical fittings and couplings equal to Victaulic "FireLock" fittings and Victaulic Style 009N, 107H, and 107N QuickVic and 005 rigid coupling joints. Strap type outlet fittings such as Victaulic "Snap-Let" are not acceptable.
 - .3 Schedule 40 Steel - Screwed and Welded Joints
 - .1 Schedule 40 mild black carbon steel, ASTM A53, Grade B. Screwed piping complete with Class 125 cast iron screwed fittings to ANSI/ASME B16.4. Welded piping complete with factory made seamless carbon steel butt welding fittings to ASTM A234, Grade WPB, long sweep pattern wherever possible.
 - .4 Schedule 10 Steel - Grooved Coupling Joints
 - .1 Schedule 10 mild black carbon steel, ASTM A53, Grade B, complete with grooved ends and fittings and couplings equal to Victaulic "FireLock" fittings and Victaulic Style 009N, 107H, and 107N QuickVic and 005 rigid coupling joints.
 - .5 Schedule 10 Steel - Screwed Joints
 - .1 Schedule 10 mild black carbon steel, ASTM A53, Grade B, complete with mill or site threaded ends, Class 125 cast iron screwed fittings to ANSI/ASME B16.4, and screwed joints.
 - .6 "Lightwall" Steel - Grooved Coupling Joints
 - .1 Commercial quality. "Lightwall" rolled mild carbon steel pipe to ASTM A135, Grade A, complete with a galvanized exterior, grooved ends, and fittings and couplings equal to Victaulic "Fire Lock" grooved fittings and Victaulic Style 009N QuickVic or 005 rigid coupling joints.
 - .7 "Lightwall" Steel - Screwed Joints
 - .1 Commercial quality, "Lightwall" rolled mild carbon steel pipe to ASTM A135, Grade A, ULC listed, mill or site threaded, complete with galvanized exterior, Class 125 cast iron screwed fittings to ANSI/ASME B16.4, and screwed joints.

- .8 Flexible Pipe - Equal to Victaulic "VicFlex"
- .1 Drop system is to consist of a braided type 304 stainless steel flexible tube, zinc plated steel 25 mm (1") NPT male threaded nipple for connection to branch-line piping, and a zinc plated steel reducer with a 12 mm (1/2") or 20 mm (3/4") NPT female thread for connection to sprinkler head.
 - .2 Drop is to include a cULus/FM approved Series AH2 braided hose with a bend radius to 50 mm (2") to allow for proper installation in confined spaces.
 - .3 Hose is to be listed for following number of 50 mm (2") radius 90° bends:
 - .1 4 bends at 0.79 m (31") length;
 - .2 5 bends at 0.91 m (36") length;
 - .3 8 bends at 1.2 m (48") length;
 - .4 10 bends at 1.5 m (60") length;
 - .5 12 bends at 1.8 m (72") length.
 - .4 Union joints are to be provided for ease of installation, prevention of hose torque stresses and on site changing of factory 146 mm (5.75") straight reducing nipple in reduced spaces under obstructions.
 - .5 On T-bar ceiling grid with drop in tile application, flexible drop is to attach to ceiling grid using a one-piece open gate Series AB1 bracket. Bracket is to allow installation before ceiling tile is in place.
 - .6 On T-bar ceiling grid designed for hard lid drywall application, flexible drop is to attach to ceiling grid using a one-piece open gate Series AB2 bracket. Bracket is to allow for vertical adjustment of reducer/head from below drywall, post-drywall installation.
 - .7 On hat furring channel grid with hard lid drywall application, flexible drop is to attach to ceiling grid using a one-piece open gate Series AB4 bracket. Bracket is to allow for vertical adjustment of reducer/head from below drywall, post-drywall installation.
 - .8 Braided drop system is to be cULus listed for sprinkler services to 1206 kPa (175 psi).
- .9 Standard Mechanical Couplings: Equal to Victaulic

- .1 Manufactured in two segments of cast ductile iron, conforming to ASTM A-536, Grade 65-45-12. Gaskets are to be pressure-responsive synthetic rubber, grade to suit intended service, conforming to ASTM D-2000. Mechanical coupling bolts are to be zinc plated (ASTM B-633) heat treated carbon steel track head conforming to ASTM A-449 and ASTM A-183. Couplings are to comply with ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.
- .2 Rigid Type: Coupling housings with offsetting, angle-pattern bolt pads are to be used to provide system rigidity and support and hanging in accordance NFPA-13. Couplings are to be fully installed at visual pad-to-pad offset contact. Couplings that require exact gapping of bolt pads at specific torque ratings are not permitted.
- .3 Flexible Type: Use in locations where vibration attenuation and stress relief are required; Victaulic Style 177 (Quick-Vic™) flexible coupling.

2.02 SERVICE MAIN DOUBLE CHECK VALVE ASSEMBLY

- .1 Minimum 1205 kPa (175 psi) rated dual check valve backflow preventer assembly to CAN/CSA B64, complete with tight-closing resilient seated shut-off valves, test cocks and strainer.
- .2 Acceptable manufacturers are:
 - .1 Watts Industries Canada;
 - .2 Zurn/Wilkins;
 - .3 Apollo Valves (Conbraco Industries).

2.03 SHUT-OFF VALVES

- .1 Minimum 2070 kPa (300 psi) rated full port brass or bronze body screwed ball valves and lug body or grooved end type butterfly valves.
 - .1 Butterfly valves are to include a pressure responsive seat, and stem is to be offset from disc centerline to provide complete 360° circumferential seating.
 - .2 Standard of Acceptance: Victaulic Style 705.
 - .3 Supervised closed applications standard of acceptance Victaulic Series 707C supervised closed butterfly valve.
- .2 OS&Y Gate Valves: 1725 kPa (250 psi), grooved ends with ductile iron body, yoke, and handwheel conforming to ASTM A-536, EPDM coated ASTM A-126-B cast iron disc, ASTM B16 brass rising stem, flanged and epoxy coated ductile iron bonnet, EPDM O-ring stem seals and body gasket. Equal to Victaulic Series 771H (Grooved ends) and Series 771F (Grooved x Flanged).

2.04 CHECK VALVES

- .1 Minimum 1725 kPa (250 psi) resilient seat check valves, suitable for vertical or horizontal installations. Standard of Acceptance: Victaulic Series 717.
- .2 Check valves associated with Fire Department connections and fire pump test connection are to be tapped for site installation of a 20 mm (¾") diameter ball drip.

2.05 BALL DRIPS

- .1 Equal to National Fire Equipment Ltd. Model #A58, 20 mm (¾") diameter automatic ball drip.

2.06 SHUT-OFF VALVE SUPERVISORY SWITCHES

- .1 Tamper-proof supervisory switches, each arranged to activate a fire alarm system trouble alarm condition if the valve is closed or tampered with, each suitable in all respects for the application, and each complete with all required mounting and connection hardware.
- .2 Actuator housings are to be weatherproof.

2.07 WATER FLOW ALARM SWITCH

- .1 Pipe mounting water flow alarm switch, minimum 1725 kPa (250 psi) rated, designed to actuate 2, 7 ampere rated (at 125/250 VAC) SPDT snap action switches when water flow exceeds 0.758 L/sec. (10 Imperial gpm), complete with a tamper-proof cover with conduit connection opening, a piping saddle and U-bolt, and an automatic rest pneumatic retard device with field adjustable (0 to 70 second) switch actuation delay to reduce false alarms caused by a single or series of transient water flow surges.

2.08 ALARM CHECK VALVE

- .1 Enamelled cast iron check valve assembly designed for either vertical or horizontal mounting and to actuate alarms when wet type sprinkler system is activated. Assembly is to be minimum 1205 kPa (175 psi) cold water rated with all moving parts constructed of brass, bronze, stainless steel or EPDM, and is to be complete with:
 - .1 pipe, fittings and accessories for site connection of an excess pressure pump;
 - .2 basic trim including piping materials and check valve for an external by-pass, potable water supply and system water supply pressure gauges with gauge test ports and shut-off valves, an angle type main drain valve, and fittings for mounting an alarm test by-pass;
 - .3 alarm test by-pass piping with ball valve to permit alarm testing without operation of alarm valve;
 - .4 alarm trim with pipe and fittings for connection to a water motor alarm, and an adjustable pressure switch for electrical connection to an alarm system upon flow through valve.

2.09 EXCESS PRESSURE PUMP

- .1 Close coupled, 1750 RPM, all bronze gear pump sized to maintain sufficient pressure in fire protection main to prevent alarm check valve(s) from initiating flow alarms during fluctuations in pressure of Municipal water supply. Pump is to be complete with:
 - .1 stainless steel shaft with maintenance free seal;
 - .2 lifetime lubricated carbon bearings;
 - .3 TEFC motor conforming to requirements specified in Section entitled Basic Mechanical Materials and Methods, and secured to a mounting base;
 - .4 accessory package consisting of flexible suction and discharge connection hoses, a Monel inlet strainer, relief valve factory set at 862 kPa (120 psi), and a steel mounting plate designed to mount pump to alarm check valve flange;
 - .5 power and control panel.
- .2 Factory pre-wired power and control panel, CSA certified, designed to automatically start and stop pump in response to water pressure variations in the main and consisting of a surface wall mounting NEMA 2 enamelled steel panel with hinged front door equipped with Corbin catch, and following:
 - .1 door interlock fused disconnect with HRC fuses;
 - .2 protected type pump starter;
 - .3 door mounted H-O-A rotary selector switch;
 - .4 fused control transformer;
 - .5 115 volt adjustable pressure switch to suit the application;
 - .6 set of NO/NC dry contacts for connection of lack of power availability alarm;
 - .7 door mounted "POWER ON" LED.

2.10 WATER MOTOR ALARM

- .1 Surface wall mounting water motor driven alarm device consisting of a water motor assembly with 20 mm ($\frac{3}{4}$ ") diameter inlet and 25 mm (1") or 32 mm (1- $\frac{1}{4}$ ") diameter drain connections, inlet strainer, a red enamelled steel exterior wall mounting strike and gong assembly, a drive shaft sleeve with drive shaft to connect water motor and gong assembly and, at the exterior gong, identification to read "SPRINKLER FIRE ALARM - WHEN BELL RINGS CALL FIRE DEPARTMENT OR POLICE".

2.11 ZONE CONTROL RISER MODULES

- .1 Equal to Victaulic Co. "FireLock" Series 747M factory assembled zone control riser modules, each complete with a painted cast ductile iron grooved end body, a ball type shut-off valve, a test and drain combination with properly sized orifice, a flow alarm switch, a pressure gauge with cock, and a pressure relief valve kit.

2.12 SPRINKLER HEADS

- .1 Sprinkler heads, unless otherwise specified, are to be as scheduled in Part 3 of this Section.
- .2 Sprinkler body is to be die-cast, with a hex-shaped wrench boss integrally cast into sprinkler body to reduce risk of damage during installation. Wrenches are to be provided by sprinkler manufacturer that directly engages wrench boss.
- .3 For locations where corrosive resistant coatings are required, body is to be coated with ULC listed and FM approved anti-corrosion VC-250 coating (silver colouring).
- .4 Recessed sprinkler heads in finished areas are to be chrome plated unless otherwise specified. Concealed sprinkler head ceiling plates are to match ceiling colour.
- .5 Where exposed pendent heads occurs in areas with suspended ceilings, they are to be complete with chrome plated escutcheon plates. Similarly, sidewall heads with concealed piping are to be complete with chrome plated escutcheon plates.
- .6 Sprinkler heads which are exposed in areas where they may be subject to damage are to be complete with wire guards, chrome plated where in finished areas.
- .7 Escutcheons and guards are to be listed, supplied, and approved for use with sprinkler by sprinkler manufacturer.
- .8 Sprinkler heads located in areas or over equipment where high ambient temperature is present are to be, unless otherwise specified, 74°C (165°F) heads. All other heads, unless otherwise specified or required, are to be 57°C (135°F) rated.
- .9 Acceptable manufacturers are:
 - .1 Victaulic Co.;
 - .2 Tyco Fire Suppression & Building Products;
 - .3 The Viking Corporation;
 - .4 The Reliable Automatic Sprinkler Co.

2.13 SPARE SPRINKLER HEAD CABINET

- .1 Surface wall mounting, red enamelled steel, identified cabinet with hinged door, shelves with holes for mounting sprinkler heads, a wrench or wrenches suitable for each type of sprinkler head, and a full complement of spare sprinkler heads.
- .2 Cabinet is to be sized to accommodate a minimum of 4 spare heads for each type of head used on the project, however, each cabinet is to be full of spare heads.

3 EXECUTION

3.01 DEMOLITION

- .1 Refer to demolition requirements specified in Section entitled Demolition and Revision Work.

3.02 PIPING INSTALLATION REQUIREMENTS

- .1 Provide required sprinkler system piping.
- .2 Perform piping work in accordance with requirements of NFPA 13, governing regulations, and "Reviewed" shop drawings.
- .3 Piping, unless otherwise specified, is as follows:
 - .1 for underground piping inside or outside building - Class 200, DR14 rigid PVC, braced and secured at bends and tees with concrete blocks in accordance with Municipal standards and details;
 - .2 for piping inside building and above ground except as noted below - Schedule 40 grooved end black steel with Victaulic or equal fittings and coupling joints, or, for piping to and including 50 mm (2") diameter, screwed fittings and joints, or, for piping 65 mm (2-½") diameter and larger, welding fittings and welded joints;
 - .3 for piping downstream of "head end" alarm valve(s) and equipment - Schedule 10 or "Lightwall" black steel pipe with Victaulic or equal fittings and coupling joints or screwed fittings and joints;
 - .4 for branch piping to heads in suspended ceilings, etc. - at your option, flexible piping installed in accordance with manufacturer's instructions;
- .4 Exceptions to piping requirements specified above are as follows:
 - .1 wet zone steel piping, fittings, unions, couplings and flanges for sprinkler work exposed to weather either inside or outside building (including parking garages), are to be galvanized;
 - .2 PVC piping is not to be used above grade;
 - .3 ferrous pipe hangers, supports, and similar hardware used for galvanized steel piping are to be electro-galvanized.

- .5 Pipe sizes, pipe routing, sprinkler head quantities and locations, and layout of work shown on drawings are to assist during tendering period. Ensure adequate head coverage, head quantities and pipe sizing as specified in Part 1 of this Section. Do not reduce size of sprinkler main or re-route main unless reviewed with and approved by Consultant.
- .6 Install grooved joints in accordance with manufacturer's latest installation instructions. Grooved ends are to be clean and free from indentations, projections and roll marks. Gaskets are to be moulded and produced by coupling manufacturer, and verified as suitable for intended service. Have factory-trained representative from mechanical joint manufacturer provide on-site training in proper use of grooving tools and installation of grooved piping products. Have factory-trained representative periodically review product installation and ensure best practices are being followed. Remove and replace any improperly installed products.
- .7 Clean pipe, fittings, couplings, flanges and similar components after erection is complete. Wire brush clean any ferrous pipe, fitting, coupling, flange, hanger, support and similar component which exhibit rust and carefully coat with suitably coloured primer.
- .8 When sprinkler work is complete, test system components and overall system(s) and submit completed test certificate and other documentation in accordance with Chapter 8 of NFPA 13.

3.03 INSTALLATION OF DOUBLE CHECK VALVE ASSEMBLY

- .1 Provide a double check valve assembly in sprinkler main inside the building.
- .2 Equip assembly with inlet and outlet shut-off valves with supervisory switches as specified below.
- .3 Support each end of assembly from floor by means of flanged pipe supports with saddles.

3.04 INSTALLATION OF SHUT-OFF VALVES AND CHECK VALVES

- .1 Provide shut-off valves and check valves in piping where shown and wherever else required.
- .2 Locate valves for easy operation and maintenance.
- .3 Confirm exact locations prior to roughing-in.

3.05 INSTALLATION OF SHUT-OFF VALVE SUPERVISORY SWITCHES

- .1 Equip each shut-off valve with a supervisory switch.
- .2 Identify each supervised valve with a 150 mm (6") square, engraved, laminated red-white plastic tag to correspond with supervised valve numbering specified and/or shown as part of the electrical work fire alarm system.
- .3 At low point near each fire department connection, install a 90° elbow with drain connection to allow for system drainage to prevent freezing.

3.06 INSTALLATION OF FLOW ALARM SWITCHES

- .1 Provide water flow alarm switches in accessible locations in zone piping.
- .2 Adjust to suit site water pressure conditions. Check and test operation.
- .3 Identify each switch with a 150 mm (6") square red-white laminated engraved plastic tag. Confirm wording prior to engraving.

3.07 INSTALLATION OF ALARM CHECK VALVES

- .1 Provide alarm check valves, complete with trim, for wet zone fire protection sprinkler piping.
- .2 Check and test operation of each valve and adjust as required to suit site water pressure conditions.
- .3 Identify each valve with a 150 mm (6") square red-white laminated engraved plastic tag. Confirm wording prior to engraving.

3.08 INSTALLATION OF EXCESS PRESSURE PUMP AND CONTROL

- .1 Provide an excess pressure pump in wet fire protection sprinkler system piping, arranged to prevent activation of alarm check valve water flow alarms during normal water pressure fluctuations in the main. Locate pump on a steel mounting plate assembly at alarm check valve(s) and install accessories supplied with pump. Provide a pressure gauge in valved tubing across pump suction and discharge connections.
- .2 Supply a starter and control panel for pump and surface wall mount adjacent to pump. Connect panel pressure switch with copper tubing in accordance with pump manufacturer's instructions. Adjust pressure switch to suit site conditions.
- .3 Start-up the pump, test operation and adjust as required.

3.09 INSTALLATION OF WATER MOTOR ALARM

- .1 Provide a water motor alarm. Secure gong on the exterior wall, impeller and motor assembly on the interior wall, and connect with drive assembly in accordance with manufacturer's instructions. Install inlet strainer supplied loose with assembly.
- .2 Provide a galvanized steel drain pipe from impeller-motor assembly down the interior wall and terminate piping back out through the wall with a 45° piping elbow and wall plate located 600 mm (24") above finished grade.
- .3 Confirm exact location of alarm gong prior to roughing-in.
- .4 When installation is complete, check and test alarm operation and adjust as required.

3.10 INSTALLATION OF ZONE CONTROL RISER MODULES

- .1 Provide zone control riser modules with drain piping where required. Terminate drainage piping over a funnel floor drain unless otherwise shown or specified. Identify each assembly.

3.11 INSTALLATION OF SPRINKLER HEADS

- .1 Provide quick response type sprinkler heads for light hazard areas.
- .2 Coordinate sprinkler head locations with all drawings, including architectural reflected ceiling plan drawings, and, where applicable, electrical drawings. Coordinate sprinkler head locations in areas with suspended ceilings with the location of lighting, grilles, diffusers, and similar items recessed in or surface mounted on the ceiling as per the reflected ceiling plans. In areas with lay-in tile, centre the sprinkler head both ways in the lay-in tile wherever possible. Confirm locations prior to roughing-in.
- .3 Maintain maximum headroom in areas with no ceilings.
- .4 Provide guards for heads where they are subject to damage.
- .5 Provide high temperature heads in equipment rooms and similar areas over heat producing or generating equipment.

3.12 INSTALLATION OF SPARE SPRINKLER HEAD CABINET

- .1 Supply a full complement (to fill cabinet) of spare sprinkler heads of types used (minimum 4 of each type) and place in a wall mounting storage cabinet located adjacent to sprinkler system "head end" equipment where later directed.

END OF SECTION

1 GENERAL

1.01 RELATED SECTIONS

- .1 None.

1.02 USE OF SYSTEMS

- .1 Use of new permanent heating and ventilating systems for supplying temporary heat or ventilation is permitted only under the following conditions:
 - .1 Building has been closed in, areas to be heated/ventilated are clean and will not thereafter be subjected to dust-producing processes.
 - .2 There is no possibility of damage from any cause.
 - .3 Supply ventilation systems are protected by [60]% filters, which shall be inspected daily, changed every [week] [[2] weeks] or more frequently as required.
 - .4 Return systems have approved filters over all openings, inlets, outlets.
 - .5 All systems will be:
 - .1 operated as per manufacturer's recommendations or instructions.
 - .2 operated by Contractor.
 - .3 monitored continuously by Contractor.
 - .6 Warranties and guarantees are not thereby relaxed.
 - .7 Regular preventive and all other manufacturers recommended maintenance routines are performed by Contractor at his own expense.
 - .10 Before static completion, entire system to be refurbished, cleaned internally and externally, restored to "as- new" condition, filters in air systems replaced.
- .2 Filters referred to herein are over and above those specified elsewhere in this specification.
- .3 Exhaust systems are not included in any approvals for temporary heating ventilation.

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 NOT USED

- .1 Not Used.

END OF SECTION

1 GENERAL

1.01 EQUIPMENT LIST

- .1 Complete list of equipment and materials to be used on this project and forming part of bid documents by adding manufacturer's name, model number and details of materials, and submit for approval.
- .2 Submit for approval within 10 days after Award of Contract.

1.02 TRIAL USAGE

- .1 Departmental Representative or designate may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Trial usage to apply to following equipment and systems:
 - .1 Heating.

1.03 PROTECTION OF OPENINGS

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

1.04 PAINTING

- .1 To Section [09 91 00][09 91 23].
- .2 Prime and touch up marred finished paintwork to match original.
- .3 Restore to new condition, finishes which have been damaged too extensively to be merely primed and touched up.

1.05 SPARE PARTS

- .1 Furnish spare parts as follows:
 - .1 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.

1.06 SPECIAL TOOLS

- .1 Provide one set of special tools required to service equipment as recommended by manufacturers.

1.07 DEMONSTRATION AND OPERATING AND MAINTENANCE INSTRUCTIONS

- .1 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .2 Where specified elsewhere in Mechanical Divisions, manufacturers to provide demonstrations and instructions.

- .3 Use operation and maintenance manual, as-built drawings, audio visual aids, etc. as part of instruction materials.
- .4 Instruction duration time requirements as specified in appropriate sections.
- .5 Where deemed necessary, Departmental Representative or designate may record these demonstrations on video tape for future reference.

1.08 CLOSEOUT SUBMITTALS

- .1 Provide operation and maintenance data for incorporation into manual.
- .2 Operation and maintenance manual to be approved by, and final copies deposited with, Departmental Representative or designate before final inspection.
- .3 Operation data to include:
 - .1 Control schematics for each system including environmental controls.
 - .2 Description of each system and its controls.
 - .3 Description of operation of each system at various loads together with reset schedules and seasonal variances.
 - .4 Operation instruction for each system and each component.
 - .5 Description of actions to be taken in event of equipment failure.
 - .6 Valves schedule and flow diagram.
 - .7 Colour coding chart.
- .4 Maintenance data shall include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.
- .5 Performance data to include:
 - .1 Equipment manufacturer's performance data sheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified elsewhere.
 - .4 Testing, adjusting and balancing reports as specified in Section 23 05 93.
- .6 Approvals:
 - .1 Submit [2] copies of draft Operation and Maintenance Manual to Departmental Representative or designate for approval. Submission of individual data will not be accepted unless so directed by Departmental Representative or designate.
 - .2 Make changes as required and re-submit as directed by Departmental Representative or designate.
- .7 Additional data:
 - .1 Prepare and insert into operation and maintenance manual when need for same becomes apparent during demonstrations and instructions specified above.

1.09 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data.2 Shop drawings and product data

shall show:

- .1 Mounting arrangements.
- .2 Operating and maintenance clearances. eg. access door swing spaces.
- .3 Shop drawings and product data shall be accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Acoustical sound power data, where applicable.
 - .3 Points of operation on performance curves.
 - .4 Manufacturer to certify as to current model production.
 - .5 Certification of compliance to applicable codes.
- .4 Use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

1.10 CLEANING

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

1.11 AS-BUILT DRAWINGS

- .1 Site records:
 - .1 Departmental Representative or designate will provide [1] set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of the work. Mark there on all changes as work progresses and as changes occur. This shall include changes to existing mechanical systems, control systems and low voltage control wiring.
 - .2 On a weekly basis, transfer information to reproducibles, revising reproducibles to show all work as actually installed.
 - .3 Use different colour waterproof ink for each service.
 - .4 Make available for reference purposes and inspection at all times.
- .2 As-built drawings:
 - .1 Prior to start of Testing, Adjusting and Balancing (TAB), finalize production of as-built drawings.
 - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (date).
 - .3 Submit to Departmental Representative or designate for approval and make corrections as directed.
 - .4 TAB to be performed using as-built drawings.
 - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .3 Submit copies of as-built drawings for inclusion in final TAB report.

1.12 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials..2 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative or designate.
- .3 Dispose of unused paint material at official hazardous material collections site approved by Departmental Representative or designate.

- .4 Do not dispose of unused paint material into sewer system, into streams, lakes, onto ground or in other locations where it will pose health or environmental hazard.
- .5 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .6 Dispose of corrugated cardboard, polystyrene, plastic packaging material in appropriate on-site bin for recycling in accordance with site waste management program.

1.13 HALOCARBONS

- .1 Comply with Federal Halocarbon Regulations 2003 under the Canadian Environmental Protection Act 1999, EPAM and PWGSC Ontario Region Halocarbon Information Sheet dated March 2010.

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 NOT USED

- .1 Not Used.

END OF SECTION

1 GENERAL

1.01 REFERENCES

- .1 American Society of Mechanical Engineers (ASME)
 - .1 ASME B1.20.1-[1983(R2006)], Pipe Threads, General Purpose (Inch).
 - .2 ASME B16.18-[2001], Cast Copper Alloy Solder Joint Pressure Fittings.
- .2 ASTM International
 - .1 ASTM A276-10, Standard Specification for Stainless Steel Bars and Shapes.
 - .2 ASTM B62-09, Standard Specification for Composition Bronze or Ounce Metal Castings.
 - .3 ASTM B283/B283M-11a, Standard Specification for Copper and Copper Alloy Die Forgings (Hot-Pressed).
 - .4 ASTM B505/B505M-11, Standard Specification for Copper-Base Alloy Continuous Castings.
- .3 Canada Green Building Council (CaGBC)
 - .1 LEED Canada For New Construction and Major Renovations 2009.
 - .2 LEED Canada For Core and Shell 2009.
 - .3 LEED Canada-CI Version 1.0-[2007], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.
- .4 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS)
 - .1 MSS SP-25-2008, Standard Marking System for Valves, Fittings, Flanges and Unions.
 - .2 MSS SP-80-[2008], Bronze Gate Globe, Angle and Check Valves.
 - .3 MSS SP-110-2010, Ball Valves, Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section [01 33 00].
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets for equipment and systems and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit WHMIS MSDS - Material Safety Data Sheets.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Submit data for valves specified in this Section.
- .4 Sustainable Design Submittals:
 - .1 LEED Canada-[NC] [CS] [CI Version 1.0] Submittals: in accordance with [Section 01 35 21].

1.03 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual.

1.04 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra Materials/Spare Parts:
- .1 None.

1.05 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse by manufacturer of pallets, crates, padding, and packaging materials.

2 PRODUCTS

2.01 MATERIALS

- .1 Sustainable Requirements:
 - .1 None.
- .2 Valves:
 - .1 Except for specialty valves, to be single manufacturer.
 - .2 Products to have CRN registration numbers.
- .3 End Connections:
 - .1 Connection into adjacent piping/tubing:
 - .1 Steel pipe systems: screwed ends to ANSI/ASME B1.20.1.
 - .2 Copper tube systems: [solder ends] [grooved ends] to ASME B16.18.
- .4 Lockshield Keys:
 - .1 Where lockshield valves are specified, provide [10] keys of each size: malleable iron cadmium plated.
- .5 Check Valves:
 - .1 Requirements common to check valves, unless specified otherwise:
 - .1 Standard specification: MSS SP-80.
 - .2 Connections: screwed with hexagonal shoulders.
 - .2 NPS 2 and under, swing type, bronze disc, Class 125:
 - .1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.
 - .2 Disc and seat: renewable rotating disc, two-piece hinge disc construction; seat: regrindable.
 - .3 NPS 2 and under, swing type, bronze disc:
 - .1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.
 - .2 Disc and seat: renewable rotating disc, two-piece hinge disc construction; seat: regrindable.

- .4 NPS 2 and under, swing type, composition disc, Class 200:
 - .1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.
 - .2 Disc: renewable rotating disc of number [6] composition to suit service conditions, bronze two-piece hinge disc construction.
- .5 NPS 2 and under, horizontal lift type, composition disc, Class 150:
 - .1 Body: with integral seat, union bonnet ring with hex shoulders, cap.
 - .2 Disc: renewable [PTFE] [no. 6 composition] rotating disc in disc holder having guides top and bottom, of bronze to ASTM B62.
- .6 NPS 2 and under, vertical lift type, bronze disc, Class 125:
 - .1 Disc: rotating disc having guides top and bottom, disc guides, retaining rings.
- .6 Silent Check Valves:
 - .1 NPS 2 and under:
 - .1 Body: cast high tensile bronze to ASTM B62 with integral seat.
 - .2 Pressure rating: [Class 125].
 - .3 Connections: screwed ends to ANSI/ASME B1.20.1 and with hex. shoulders.
 - .4 Disc and seat: renewable rotating disc.
 - .5 Stainless steel spring, heavy duty.
 - .6 Seat: regrindable.
- .7 Ball Valves:
 - .1 NPS 2 and under:
 - .1 Body and cap: cast high tensile bronze to ASTM B62.
 - .2 Pressure rating: [Class125] [2760-kPa CWP] [4140-kPa CWP], 860 kPa steam.
 - .3 Connections: [screwed ends to ASME B1.20.1 and with hexagonal shoulders] [solder ends to ANSI].
 - .4 Stem: tamperproof ball drive.
 - .5 Stem packing nut: external to body.
 - .6 Ball and seat: replaceable [stainless steel] [hard chrome] solid ball and Teflon seats.
 - .7 Stem seal: TFE with external packing nut.
 - .8 Operator: removable lever handle.

3 EXECUTION

3.01 INSTALLATION

- .1 Install rising stem valves in upright position with stem above horizontal.
- .2 Remove internal parts before soldering.
- .3 Install valves with unions at each piece of equipment arranged to allow servicing, maintenance, and equipment removal.

3.02 CLEANING

- .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling.

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END OF SECTION

1 GENERAL

1.01 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-B149.1-[10], Natural Gas and Propane Installation Code.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.60-[97], Interior Alkyd Gloss Enamel.
 - .2 CAN/CGSB-24.3-[92], Identification of Piping Systems.
- .3 Master Painters Institute (MPI)
 - .1
- .4 National Fire Protection Association (NFPA)
 - .1 NFPA 13-2010, Standard for the Installation of Sprinkler Systems.
 - .2 NFPA 14-2010, Standard for the Installation of Standpipe and Hose Systems.

1.02 SUBMITTALS

- .1 Product Data: submit product data for each item specified.
- .2 Submittals: None.
- .3 Product data to include paint colour chips, other products specified in this section.
- .4 Samples:
 - .1 None.

1.03 QUALITY ASSURANCE

- .1 Quality assurance submittals: None.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety.

1.04 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling.
 - .2 Dispose of unused paint material at official hazardous material collections site approved by Departmental Representative or designate.
 - .3 Do not dispose of unused paint material into sewer system, into streams, lakes, onto ground or in locations where it will pose health or environmental hazard.

2 PRODUCTS

2.01 SUSTAINABLE REQUIREMENTS

- .1 Materials and products in accordance with Section [01 47 15].
 - .1 None.

2.02 MANUFACTURER'S EQUIPMENT NAMEPLATES

- .1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.
- .2 Lettering and numbers raised or recessed.
- .3 Information to include, as appropriate:
 - .1 Equipment: manufacturer's name, model, size, serial number, capacity.
 - .2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.03 SYSTEM NAMEPLATES

- .1 Colours:
 - .1 Hazardous: red letters, white background.
 - .2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).
- .2 Construction:
 - .1 3 mm thick laminated plastic, matte finish, with square corners, letters accurately aligned and machine engraved into core.
- .3 Sizes:
 - .1 Conform to following table:

Size #	mm	Sizes (mm)	No. of Lines	Height of Letters (mm)
1		10 x 50	1	3
2		13 x 75	1	5
3		13 x 75	2	3
4		20 x 100	1	8
5		20 x 100	2	5
6		20 x 200	1	8
7		25 x 125	1	12
8		25 x 125	2	8
9		35 x 200	1	20
 - .2 Use maximum of 25 letters/numbers per line.
- .4 Locations:
 - .1 Terminal cabinets, control panels: use size #[5].
 - .2 Equipment in Mechanical Rooms: use size #[9].
- .5 Identification for PWGSC Preventive Maintenance Support System (PMSS):
 - .1 Use arrangement of Main identifier, Source identifier, Destination identifier.
 - .2 Equipment in Mechanical Room:
 - .1 Main identifier: size #9.
 - .2 Source and Destination identifiers: size #6.
 - .3 Terminal cabinets, control panels: size #5.

- .3 Equipment elsewhere: sizes as appropriate.

2.04 EXISTING IDENTIFICATION SYSTEMS

- .1 Apply existing identification system to new work.
- .2 Where existing identification system does not cover for new work, use identification system specified this section.
- .3 Before starting work, obtain written approval of identification system from Departmental Representative or designate.

2.05 PIPING SYSTEMS GOVERNED BY CODES

- .1 Identification:
 - .1 Natural gas: to CAN/CSA-B149.1.
 - .2 Propane gas: to CAN/CSA-B149.1.
 - .3 Sprinklers: to NFPA 13.

2.06 IDENTIFICATION OF PIPING SYSTEMS

- .1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB-24.3 except where specified otherwise.
- .2 Pictograms:
 - .1 Where required: Workplace Hazardous Materials Information System (WHMIS) regulations.
- .3 Legend:
 - .1 Block capitals to sizes and colours listed in CAN/CGSB-24.3.
- .4 Arrows showing direction of flow:
 - .1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.
 - .2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.
 - .3 Use double-headed arrows where flow is reversible.
- .5 Extent of background colour marking:
 - .1 To full circumference of pipe or insulation.
 - .2 Length to accommodate pictogram, full length of legend and arrows.
- .6 Materials for background colour marking, legend, arrows:
 - .1 Pipes and tubing 20 mm and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.
 - .2 Other pipes: pressure sensitive [plastic-coated cloth] [vinyl] with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150 degrees C and intermittent temperature of 200 degrees C.
- .7 Colours and Legends:
 - .1 Where not listed, obtain direction from Departmental Representative.
 - .2 Colours for legends, arrows: to following table:

Background colour:	Legend, arrows:
Yellow	BLACK
Green	WHITE

Contents	Background colour marking and legends for piping systems:	
	<u>Red</u> Background colour marking	<u>WHITE</u> Legend
City water	Green	CITY WATER
Treated water	Green	TREATED WATER
Domestic hot water supply	Green	DOM. HW SUPPLY
Dom. HWS recirculation	Green	DOM. HW CIRC
Domestic cold water supply	Green	DOM. CWS
Waste water	Green	WASTE WATER
Storm water	Green	STORM
Sanitary	Green	SAN
Plumbing vent	Green	SAN. VENT
Refrigeration suction	Yellow	REF. SUCTION
Refrigeration liquid	Yellow	REF. LIQUID
Refrigeration hot gas	Yellow	REF. HOT GAS
Natural gas	to Codes	
Propane	to Codes	
Gas regulator vents	to Codes	
Fire protection water	Red	FIRE PROT. WTR
Sprinklers	Red	SPRINKLERS

2.07 IDENTIFICATION DUCTWORK SYSTEMS

- .1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.
- .2 Colours: back, or co-ordinated with base colour to ensure strong contrast.

2.08 VALVES, CONTROLLERS

- .1 Brass tags with 12 mm stamped identification data filled with black paint.
- .2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

2.09 CONTROLS COMPONENTS IDENTIFICATION

- .1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.
- .2 Inscriptions to include function and (where appropriate) fail-safe position.

2.10 LANGUAGE

- .1 Identification in English.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.02 TIMING

- .1 Provide identification only after painting specified Section [09 91 23] has been completed.

3.03 INSTALLATION

- .1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.
- .2 Provide ULC or CSA registration plates as required by respective agency.
- .3 Identify systems, equipment to conform to PWGSC PMSS.

3.04 NAMEPLATES

- .1 Locations:
 - .1 In conspicuous location to facilitate easy reading and identification from operating floor.
- .2 Standoffs:
 - .1 Provide for nameplates on hot and/or insulated surfaces.
- .3 Protection:
 - .1 Do not paint, insulate or cover.

3.05 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

- .1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.
- .2 Adjacent to each change in direction.
- .3 At least once in each small room through which piping or ductwork passes.
- .4 On both sides of visual obstruction or where run is difficult to follow.
- .5 On both sides of separations such as walls, floors, partitions.
- .6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.
- .7 At beginning and end points of each run and at each piece of equipment in run.
- .8 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place

identification as close as possible, preferably on upstream side.

- .9 Identification easily and accurately readable from usual operating areas and from access points.
 - .1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

3.06 VALVES, CONTROLLERS

- .1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.
- .2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by Departmental Representative or designate. Provide one copy (reduced in size if required) in each operating and maintenance manual.
- .3 Number valves in each system consecutively.

3.07 FIELD QUALITY CONTROL

- .1 Verification requirements in accordance with Section [01 47 17], include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Certified wood.
 - .8 Low-emitting materials.

3.08 CLEANING

- .1 Proceed in accordance with Section [01 74 11].
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 GENERAL

1.01 GENERAL

- .1 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section.

1.02 QUALIFICATIONS OF TAB PERSONNEL

- .1 Names of personnel it is proposed to perform TAB to be submitted to and approved by Departmental Representative or designate within 90 days of award of contract.
- .2 Provide documentation confirming qualifications, successful experience.

1.03 PURPOSE OF TAB

- .1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads
- .2 Adjust and regulate equipment and systems so as to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.
- .3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

1.04 EXCEPTIONS

- .1 TAB of systems and equipment regulated by codes, standards to be to satisfaction of authority having jurisdiction.

1.05 CO-ORDINATION

- .1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule so as to ensure completion before acceptance of project.
- .2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

1.06 PRE-TAB REVIEW

- .1 Review specified standards and report to Consultant in writing all proposed procedures which vary from standard.
- .2 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

1.07 START-UP

- .1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.

1.08 OPERATION OF SYSTEMS DURING TAB

- .1 Operate systems for length of time required for TAB and as required by [Departmental Representative or designate] [Consultant] for verification of TAB reports.

1.09 START OF TAB

- .1 Notify Consultant 7 days prior to start of TAB.
- .2 Start TAB when building is essentially completed, including:
- .3 Installation of ceilings, doors, windows, other construction affecting TAB.
- .4 Application of weatherstripping, sealing, caulking.
- .5 All pressure, leakage, other tests specified elsewhere in Division 23.
- .6 All provisions for TAB installed and operational.
- .7 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:
 - .1 Proper thermal overload protection in place for electrical equipment.
 - .2 Air systems:
 - .1 Filters in place, clean.
 - .2 Duct systems clean.
 - .3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.
 - .4 Correct fan rotation.
 - .5 Fire, smoke, volume control dampers installed and open.
 - .6 Coil fins combed, clean.
 - .7 Access doors, installed, closed.
 - .8 Outlets installed, volume control dampers open.
 - .3 Liquid systems:
 - .1 Flushed, filled, vented.
 - .2 Correct pump rotation.
 - .3 Strainers in place, baskets clean.
 - .4 Isolating and balancing valves installed, open.
 - .5 Calibrated balancing valves installed, at factory settings.
 - .6 Chemical treatment systems complete, operational.

1.10 APPLICATION TOLERANCES

- .1 Do TAB to following tolerances of design values:
 - .1 HVAC systems: plus 5%, minus 5%.

1.11 ACCURACY TOLERANCES

- .1 Measured values to be accurate to within plus or minus 2% of actual values.

1.12 INSTRUMENTS

- .1 Prior to TAB, submit to Consultant list of instruments to be used together with serial numbers.
- .2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.
- .3 Calibrate within 3 months of TAB. Provide certificate of calibration to Consultant.

1.13 SUBMITTALS

- .1 Submit, prior to commencement of TAB:
- .2 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.14 PRELIMINARY TAB REPORT

- .1 Submit for checking and approval of Consultant, prior to submission of formal TAB report, sample of rough TAB sheets. Include:
 - .1 Details of instruments used.
 - .2 Details of TAB procedures employed.
 - .3 Calculations procedures.
 - .4 Summaries.

1.15 TAB REPORT

- .1 Format to be in accordance with referenced standard.
- .2 TAB report to show results in SI units and to include:
 - .1 Project record drawings.
 - .2 System schematics.
- .3 Submit [6] copies of TAB Report to Departmental Representative or designate for verification and approval, in English in D-ring binders, complete with index tabs.

1.16 VERIFICATION

- .1 Reported results subject to verification by Departmental Representative or designate.
- .2 Provide manpower and instrumentation to verify up to 30% of reported results.
- .3 Number and location of verified results to be at discretion of Consultant.
- .4 Bear costs to repeat TAB as required to satisfaction of Consultant.

1.17 SETTINGS

- .1 After TAB is completed to satisfaction of Consultant, replace drive guards, close access doors, lock devices in set positions, ensure sensors are at required settings.

- .2 Permanently mark settings to allow restoration at any time during life of facility. Markings not to be eradicated or covered in any way.

1.18 COMPLETION OF TAB

- .1 TAB to be considered complete when final TAB Report received and approved by Consultant.

1.19 AIR SYSTEMS

- .1 Standard: TAB to be to most stringent of this section.
- .2 Do TAB of following systems, equipment, components, controls:
 - .1 Forced air supply and return.
 - .2 Air distribution systems including supply, return and exhaust ducts systems, registers, grilles and diffusers.
 - .3 Energy Recovery Ventilators.
- .3 Qualifications: personnel performing TAB to be current member in good standing of AABC or NEBB qualified to standards of AABC or NEBB.
- .4 Quality assurance: Perform TAB under direction of supervisor qualified to standards of AABC or NEBB.
- .5 Measurements: to include, but not limited to, following as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.
- .6 Locations of equipment measurements: To include, but not be limited to, following as appropriate:
 - .1 Inlet and outlet of dampers, filter, coil, humidifier, fan, other equipment causing changes in conditions.
 - .2 At controllers, controlled device.
- .7 Locations of systems measurements to include, but not be limited to, following as appropriate: Main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

2 PRODUCTS

2.01 NOT USED

- .1 Not used.

3 EXECUTION

3.01 NOT USED

- .1 Not used.

END OF SECTION

1 GENERAL

1.01 REFERENCES

- .1 Definitions:
 - .1 For purposes of this section:
 - .1 "CONCEALED" - insulated mechanical services and equipment in suspended ceilings and non-accessible chases and furred-in spaces.
 - .2 "EXPOSED" - means "not concealed" as previously defined.
 - .3 Insulation systems - insulation material, fasteners, jackets, and other accessories.
 - .2 TIAC Codes:
 - .1 CRD: Code Round Ductwork,
 - .2 CRF: Code Rectangular Finish.
- .2 Reference Standards:
 - .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ANSI/ASHRAE/IES 90.1-2010, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.
 - .2 ASTM International Inc.
 - .1 ASTM B209M-[10], Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
 - .2 ASTM C335-10e1, Standard Test Method for Steady State Heat Transfer Properties of Pipe Insulation.
 - .3 ASTM C411-11, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - .4 ASTM C449-07, Standard Specification for Mineral Fiber-Hydraulic- Setting Thermal Insulating and Finishing Cement.
 - .5 ASTM C547-11, Standard Specification for Mineral Fiber Pipe Insulation.
 - .6 ASTM C553-11, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 - .7 ASTM C612-10, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
 - .8 ASTM C795-08, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
 - .9 ASTM C921-10, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
 - .3 Canadian General Standards Board (CGSB)
 - .1 CGSB 51-GP-52Ma-[89], Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
 - .4 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC-[2004], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations.
 - .2 Rating System Addenda for New Construction and Major Renovations LEED Canada-NC.
 - .3 LEED Canada-CI Version 1.0-[2007], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.
 - .5 Green Seal Environmental Standards (GSES)

- .1 Standard GS-36-[00], Commercial Adhesives.
- .6 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1168-[A2005], Adhesive and Sealant Applications.
- .7 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (2005).
- .8 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .9 Standards and Guidelines for Conservation of Historic Places in Canada 2nd Edition

1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for duct insulation, and include product characteristics, performance criteria, physical size, finish and limitations.
 - .1 Description of equipment giving manufacturer's name, type, model, year and capacity.
 - .2 Details of operation, servicing and maintenance.
 - .3 Recommended spare parts list.
- .2 Shop Drawings:
 - .1 Provide drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
- .3 Samples:
 - .1 Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed.
 - .2 Mount sample on 12 mm plywood board.
 - .3 Affix typewritten label beneath sample indicating service.
- .4 Manufacturers' Instructions:
 - .1 Provide manufacture's written duct insulation jointing recommendations. and special handling criteria, installation sequence, cleaning procedures.
- .5 Sustainable Design Submittals:
 - .1 LEED Submittals: in accordance with [Section 01 35 21].

1.03 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: specialist in performing work of this section, and have at least 3 years successful experience in this size and type of project.

1.04 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address and ULC markings.
- .2 Packaging Waste Management: remove for reuse by manufacturer of pallets,

crates and packaging materials.

2 PRODUCTS

2.01 SUSTAINABLE REQUIREMENTS

- .1 Materials and products.
 - .1 None

2.02 FIRE AND SMOKE RATING

- .1 To CAN/ULC-S102:
 - .1 Maximum flame spread rating: 25.
 - .2 Maximum smoke developed rating: 50.

2.03 INSULATION

- .1 Mineral fibre: as specified includes glass fibre, rock wool, slag wool.
 - .1 Recycled content: (Post-Consumer + ½ Post-Industrial) in accordance with Section [01 35 21].
- .2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C mean temperature when tested in accordance with ASTM C335.
- .3 TIAC Code C-1: Rigid mineral fibre board to ASTM C612, [with] [without] factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this Section).
- .4 TIAC Code C-2: Mineral fibre blanket to ASTM C553 faced [with] [without] factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this section).
 - .1 Mineral fibre: to ASTM C553.
 - .2 Jacket: to CGSB 51-GP-52Ma.
 - .3 Maximum "k" factor: to ASTM C553.

2.04 JACKETS

- .1 Canvas:
 - .1 Plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
- .2 Lagging adhesive: compatible with insulation.

2.05 ACCESSORIES

- .1 Vapour retarder lap adhesive:
 - .1 Water based, fire retardant type, compatible with insulation.
- .2 Indoor Vapour Retarder Finish:
 - .1 Vinyl emulsion type acrylic, compatible with insulation.
- .3 Insulating Cement: setting on mineral wool, to ASTM C449.
- .4 ULC Listed Canvas Jacket:
 - .1 Plain weave treated with dilute fire retardant lagging adhesive to ASTM C921.

- .5 Outdoor Vapour Retarder Mastic:
 - .1 Vinyl emulsion type acrylic, compatible with insulation.
 - .2 Reinforcing fabric: Fibrous glass, untreated 305 g/m².
- .6 Tape: self-adhesive, aluminum, plain, 75 mm wide minimum.
- .7 Contact adhesive: quick-setting.
- .8 Canvas adhesive: washable.
- .9 Tie wire: 1.5 mm stainless steel.
- .10 Banding: 19 mm wide, 0.5 mm thick stainless steel.

3 EXECUTION

3.01 APPLICATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.02 PRE-INSTALLATION REQUIREMENTS

- .1 Pressure test ductwork systems complete, witness and certify.
- .2 Ensure surfaces are clean, dry, free from foreign material.

3.03 INSTALLATION

- .1 Install in accordance with TIAC National Standards.
- .2 Apply materials in accordance with manufacturers instructions and as indicated.
- .3 Use 2 layers with staggered joints when required nominal thickness exceeds 75 mm.
- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Ensure hangers, and supports are outside vapour retarder jacket.
- .5 Hangers and supports in accordance with [Section 23 05 29].
 - .1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.
- .6 Fasteners: install at 300 mm on centre in horizontal and vertical directions, minimum 2 rows each side.

3.04 DUCTWORK INSULATION SCHEDULE

- .1 Insulation types and thicknesses: conform to following table:

	TIAC Code	Vapour Retarder	Thickness (mm)
Rectangular cold and dual	[C-1]	[yes]	[50]

temperature supply air ducts			
Round cold and dual temperature supply air ducts	[C-2]	[yes]	[50]
Rectangular warm air ducts	[C-1]	[no]	[25]
Round warm air ducts	[C-1]	[no]	[25]
Supply, return and exhaust ducts exposed in space being served			[none]
Outside air ducts to mixing plenum	[C-1]	[yes]	[25]
Mixing plenums	[C-1]	[yes]	[25]
Exhaust duct between dampers and louvres	[C-1]	[no]	[25]
Rectangular ducts outside	[C-1]	[special]	[50]
Round ducts outside	[C-1]	[special]	[50]
Acoustically lined ducts	[none]		

.2 Exposed round ducts 600 mm and larger, smaller sizes where subject to abuse:

.1 Use TIAC code C-1 insulation, scored to suit diameter of duct.

.1 Finishes: conform to following table:

	TIAC Code	
	Rectangular	Round
Indoor, concealed	none	none
Indoor, exposed within mechanical room	CRF/1	CRD/2
Indoor, exposed elsewhere	CRF/2	CRD/3
Outdoor, exposed to precipitation	CRF/3	CRD/4
Outdoor, elsewhere	CRF/4	CRD/5

3.05 CLEANING

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

.2 Waste Management: separate waste materials for reuse and recycling.

END OF SECTION

1 GENERAL

1.01 SUMMARY

- .1 Section Includes:
 - .1 Thermal insulation for piping and piping accessories in commercial type applications.
- .2 Sustainable requirements for construction and verification.
 - .1 None.
- .3 Related Sections:
 - .1 None.

1.02 REFERENCES

- .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ASHRAE Standard 90.1-2007, Energy Standard for Buildings Except Low-Rise Residential Buildings (ANSI approved; IESNA co-sponsored).
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM B209M-[10], Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate (Metric).
 - .2 ASTM C335/C335M-10e1, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
 - .3 ASTM C411-11, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - .4 ASTM C449-07, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - .5 ASTM C533-07, Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
 - .6 ASTM C547-07e1, Standard Specification for Mineral Fiber Pipe Insulation.
 - .7 ASTM C795-08, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
 - .8 ASTM C921-10, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- .3 Canadian General Standards Board (CGSB)
 - .1 CGSB 51-GP-52Ma-[89], Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
 - .2 CAN/CGSB-51.53-[95], Poly (Vinyl Chloride) Jacketing Sheet, for Insulated Pipes, Vessels and Round Ducts.
- .4 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Assessment Act (CEAA), 1992, c. 37.
 - .2 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
 - .3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .6 Manufacturer's Trade Associations
 - .1 Thermal Insulation Association of Canada (TIAC): Mechanical

Insulation Best Practice Guide(Revised 2005).

- .7 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies.
 - .2 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .3 CAN/ULC-S702-09, Thermal Insulation, Mineral Fibre, for Buildings
 - .4 ULC-S702.2-10, Standard for Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.

1.03 DEFINITIONS

- .1 For purposes of this section:
 - .1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.
 - .2 "EXPOSED" - will mean "not concealed" as specified.
- .2 TIAC ss:
 - .1 CRF: Code Rectangular Finish.
 - .2 CPF: Code Piping Finish.

1.04 SUBMITTALS

- .1 Submittals: None.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section [01 33 00]. Include product characteristics, performance criteria, and limitations.
 - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS).
- .3 Shop Drawings:
 - .1 Submit shop drawings.
 - .1 Shop drawings: submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
- .4 Samples:
 - .1 Submit samples.
 - .2 Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed. Mount sample on 12 mm plywood board. Affix label beneath sample indicating service.
- .5 Quality assurance submittals: submit following:
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .2 Instructions: submit manufacturer's installation instructions.
 - .1 Departmental Representative or designate will make available 1 copy of systems supplier's installation instructions.

1.05 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: specialist in performing work of this Section, and have

at least 3 years successful experience in this size and type of project.

- .2 Health and Safety:
 - .1 Do construction occupational health and safety.

1.06 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with manufacturer's written instructions.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .3 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .2 Storage and Protection:
 - .1 Protect from weather, construction traffic.
 - .2 Protect against damage.
 - .3 Store at temperatures and conditions required by manufacturer.
- .3 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling.
 - .2 Place excess or unused insulation and insulation accessory materials in designated containers.
 - .3 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative or designate.
 - .4 Dispose of unused adhesive material at official hazardous material collections site approved by Departmental Representative or designate.

2 PRODUCTS

2.01 SUSTAINABLE REQUIREMENTS

- .1 Materials and products.
 - .1 None.

2.02 FIRE AND SMOKE RATING

- .1 In accordance with CAN/ULC-S102.
 - .1 Maximum flame spread rating: 25.
 - .2 Maximum smoke developed rating: 50.

2.03 INSULATION

- .1 Mineral fibre specified includes glass fibre, rock wool, slag wool.
- .2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C mean temperature when tested in accordance with ASTM C335.

2.04 INSULATION SECUREMENT

- .1 Tape: self-adhesive, aluminum, plain, 50 mm wide minimum.
- .2 Contact adhesive: quick setting.

- .3 Canvas adhesive: washable.
- .4 Tie wire: 1.5 mm diameter stainless steel.
- .5 Bands: stainless steel, 19 mm wide, 0.5 mm thick.

2.05 CEMENT

- .1 Thermal insulating and finishing cement:
 - .1 Air drying on mineral wool, to ASTM C449.

2.06 VAPOUR RETARDER LAP ADHESIVE

- .1 Water based, fire retardant type, compatible with insulation.

2.07 INDOOR VAPOUR RETARDER FINISH

- .1 Vinyl emulsion type acrylic, compatible with insulation.

2.08 OUTDOOR VAPOUR RETARDER FINISH

- .1 Vinyl emulsion type acrylic, compatible with insulation.
- .2 Reinforcing fabric: fibrous glass, untreated 305 g/m².

2.09 JACKETS

- .1 Polyvinyl Chloride (PVC):
 - .1 One-piece moulded type to CAN/CGSB-51.53 with pre-formed shapes as required.
 - .2 Colours: by Departmental Representative or designate.
 - .3 Minimum service temperatures: -20 degrees C.
 - .4 Maximum service temperature: 65 degrees C.
 - .5 Moisture vapour transmission: 0.02 perm.
 - .6 Fastenings:
 - .1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
 - .2 Tacks.
 - .3 Pressure sensitive vinyl tape of matching colour.
 - .7 Special requirements:
 - .1 Indoor: None.
 - .2 Outdoor: UV rated material at least 0.5 mm thick.
- .2 Canvas:
 - .1 Plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
 - .2 Lagging adhesive: compatible with insulation.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.02 PRE-INSTALLATION REQUIREMENT

- .1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.
- .2 Surfaces clean, dry, free from foreign material.

3.03 INSTALLATION

- .1 Install in accordance with TIAC National Standards.
- .2 Apply materials in accordance with manufacturers instructions and this specification.
- .3 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.
- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Install hangers, supports outside vapour retarder jacket.
- .5 Supports, Hangers:
 - .1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

3.04 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES

- .1 Application: at [expansion joints], [valves], [primary flow measuring elements] [flanges and unions at equipment].
- .2 Design: [to permit movement of expansion joint] [and] [to permit periodic removal and replacement] without damage to adjacent insulation.
- .3 Insulation:
 - .1 Insulation, fastenings and finishes: same as system.
 - .2 Jacket: PVC.

3.05 INSTALLATION OF ELASTOMERIC INSULATION

- .1 Insulation to remain dry. Overlaps to manufacturers instructions. Ensure tight joints.
- .2 Provide vapour retarder as recommended by manufacturer.

3.06 PIPING INSULATION SCHEDULES

- .1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.
- .2 Thickness of insulation as listed in following table.
 - .1 Run-outs to individual units and equipment not exceeding 4000 mm long.
 - .2 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

Applic ation	Temp degree s C	TIAC code	Pipe sizes (NPS) and insulation thickness (mm)

	Run out	to 1	1 1/4 to 2	2 1/2 to 4	5 to 6	8 & over		
Domestic HWS Water		[A-1]	25	25	25	38	38	38
Domestic CWS		[A-3]	25	25	25	25	25	25
Domestic CWS with vapour retarder		[C-2]	25	25	25	25	25	25
Refrigerant[hot gas][liquid][suction]	4 - 13	[A-6]	25	25	25	25	25	25
Refrigerant[hot gas][liquid][suction]	below 4	[A-6]	25	25	38	38	38	38
RWL and RWP		[C-2]	25	25	25	25	25	25
Cooling Coil cond. drain		[C-2]	25	25	25	25	25	25

- .8 Finishes:
- .1 Exposed indoors: canvas jacket.
 - .2 Exposed in mechanical rooms: canvas jacket.
 - .3 Concealed, indoors: canvas on valves, fittings. No further finish.
 - .4 Use vapour retarder jacket on TIAC code A-3 insulation compatible with insulation.
 - .5 Outdoors: water-proof aluminum jacket.
 - .6 Finish attachments: SS screws bands, at 150 mm on centre. Seals: closed.
 - .7 Installation: to appropriate TIAC code CRF/1 through CPF/5.

3.07 FIELD QUALITY CONTROL

- .1 Verification requirements in accordance with Section [01 47 17], include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Certified wood.
 - .8 Low-emitting materials.

3.08 CLEANING

- .1 Proceed in accordance with Section [01 74 11 - Cleaning].
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 GENERAL

1.01 RELATED SECTIONS

- .1 None

1.02 REFERENCES

- .1 American Society of Mechanical Engineers (ASME)
 - .1 ANSI/ASME B16.5-2009, Pipe Flanges and Flanged Fittings.
 - .2 ANSI/ASME B16.18-2012, Cast Copper Alloy Solder Joint Pressure Fittings.
 - .3 ANSI/ASME B16.22-2001(R2010), Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.
 - .4 ANSI/ASME B18.2.1-2010, Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws.
- .2 ASTM International
 - .1 ASTM A47/A47M-99(R2009), Specification for Ferritic Malleable Iron Castings.
 - .2 ASTM A53/A53M-[10], Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
 - .3 ASTM B32-[08], Specification for Solder Metal.
 - .4 ASTM B75M-99(R2011), Specification for Seamless Copper Tube [Metric].
- .3 Canadian Standards Association (CSA)
 - .1 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.
 - .1 CAN/CSA-B149.1-[10], Natural Gas Installation Code.
 - .2 CAN/CSA-B149.2-[10], Propane Installation Code.

1.03 PRODUCT DATA

- .1 Submit product data.
- .2 Indicate on manufacturer's catalogue literature following: valves.

1.04 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual.

1.05 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .3 Fold up metal banding, flatten and place in designated area for recycling.

2 PRODUCTS

2.01 PIPE

- .1 Steel pipe: to ASTM A53/A53M, Schedule 40, seamless as follows:
 - .1 NPS 1/2 to 2, screwed.
 - .2 NPS2 1/2 and over, plain end.
- .2 Copper tube: to ASTM B75M.

2.02 JOINTING MATERIAL

- .1 Screwed fittings: pulverized lead paste.
- .2 Welded fittings: to CSA W47.1.
- .3 Flange gaskets: nonmetallic flat.

2.03 FITTINGS

- .1 Steel pipe fittings, screwed, flanged or welded:
 - .1 Malleable iron: screwed, banded, Class 150.
 - .2 Steel pipe flanges and flanged fittings: to ANSI/ASME B16.5.
 - .3 Welding: butt-welding fittings.
 - .4 Unions: malleable iron, brass to iron, ground seat, to ASTM A47/A47M.
 - .5 Bolts and nuts: to ANSI/ASME B18.2.1.
 - .6 Nipples: schedule 40, to ASTM A53/A53M.
- .2 Copper pipe fittings, screwed, flanged or soldered:
 - .1 Cast copper fittings: to ANSI/ASME B16.18.
 - .2 Wrought copper fittings: to ANSI/ASME B16.22.

2.04 VALVES

- .1 Provincial Code approved, lubricated ball type.

3 EXECUTION

3.01 PIPING

- .1 Install in accordance with applicable Provincial/Territorial Codes.
- .2 Install in accordance with CAN/CSA B149.1.
- .3 Install drip points:
 - .1 At low points in piping system.
 - .2 At connections to equipment.

3.02 VALVES

- .1 Install valves with stems upright or horizontal unless otherwise approved by Consultant.
- .2 Install valves at branch take-offs to isolate pieces of equipment, and as indicated.

3.03 FIELD QUALITY CONTROL

- .1 Test system in accordance with CAN/CSA B149.1 and requirements of authorities having jurisdiction.

3.04 PURGING

- .1 Purge after pressure test in accordance with CAN/CSA B149.1.

3.05 PRE-START-UP INSPECTIONS

- .1 Check vents from regulators, control valves, terminate outside building in approved location, protected against blockage, damage.
- .2 Check gas trains, entire installation is approved by authority having jurisdiction.

3.06 CLEANING AND START-UP

- .1 In accordance with requirements of CAN/CSA B149.1, supplemented as specified herein.

END OF SECTION

1 GENERAL

1.01 RELATED SECTIONS

- .1 None.

1.02 REFERENCES

- .1 American National Standards Institute (ANSI)/ American Society of Mechanical Engineers (ASME)
 - .1 ANSI/ASME B16.22-2001(R2010), Wrought Copper and Copper Alloy Solder - Joint Pressure Fittings.
 - .2 ANSI/ASME B16.24-2011, Cast Copper Pipe Flanges and Flanged Fittings: Class 150, 300, 400, 600, 900, 1500 and 2500.
 - .3 ANSI/ASME B16.26-2011, Cast Copper Alloy Fittings for Flared Copper Tubes.
 - .4 ANSI/ASME B31.5-2010, Refrigeration Piping and Heat Transfer Components.
- .2 ASTM International
 - .1 ASTM A307-[10], Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .2 ASTM B280-[08], Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
- .3 Canadian Standards Association (CSA)
 - .1 CSA B52-05(R2009), Mechanical Refrigeration Code.
- .4 Environment Canada (EC)
- .5 EPS 1/RA/1-[96], Environmental Code of Practice for the Reduction of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.

1.03 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan
- .3 Fold up metal banding, flatten and place in designated area for recycling.

2 PRODUCTS

2.01 TUBING

- .1 Processed for refrigeration installations, deoxidized, dehydrated and sealed.
 - .1 Hard copper: to ASTM B280, type [ACR] [B].
 - .2 Annealed copper: to ASTM B280, with minimum wall thickness as per CSA B52 and ASME B31.5.

2.02 FITTINGS

- .1 Service: design pressure [2070] kPa and temperature [121]°C.
- .2 Brazed:
 - .1 Fittings: wrought copper to ASME B16.22.
 - .2 Joints: silver solder, [45% Ag-15% Cu] [or] [copper-phosphorous, 95% Cu-5%P] and non-corrosive flux.
- .3 Flanged:
 - .1 Bronze or brass, to ASME B16.24, Class 150 and Class 300.
 - .2 Gaskets: suitable for service.
 - .3 Bolts, nuts and washers: to ASTM A307, heavy series.
- .4 Flared:
 - .1 Bronze or brass, for refrigeration, to ASME B16.26.

2.03 PIPE SLEEVES

- .1 Hard copper or steel, sized to provide 6 mm clearance around between sleeve and uninsulated pipe or between sleeve and insulation.

2.04 VALVES

- .1 22 mm and under: Class 500, 3.5 Mpa, globe or angle non-directional type, diaphragm, packless type, with forged brass body and bonnet, moistureproof seal for below freezing applications, brazed connections.
- .2 Over 22 mm: Class 375, 2.5 Mpa, globe or angle type, diaphragm, packless type, back-seating, cap seal, with cast bronze body and bonnet, moistureproof seal for below freezing applications, brazed connections.

3 EXECUTION

3.01 GENERAL

- .1 Install in accordance with CSA B52, EPS1/RA/1 and ASME B31.5.

3.02 BRAZING PROCEDURES

- .1 Bleed inert gas into pipe during brazing.
- .2 Remove valve internal parts, solenoid valve coils, sight glass.
- .3 Do not apply heat near expansion valve and bulb.

3.03 PIPING INSTALLATION

- .1 General:
 - .1 Soft annealed copper tubing: bend without crimping or constriction.
- .2 Hot gas lines:
 - .1 Pitch at least 1:240 down in direction of flow to prevent oil return to compressor during operation.
 - .2 Provide trap at base of risers greater than 2400 mm high and at each 7600 mm thereafter.

- .3 Provide inverted deep trap at top of risers.
- .4 Provide double risers for compressors having capacity modulation.
 - .1 Large riser: install traps as specified above.
 - .2 Small riser: size for 5.1 m/s at minimum load. Connect upstream of traps on large riser.

3.04 PRESSURE AND LEAK TESTING

- .1 Close valves on factory charged equipment and other equipment not designed for test pressures.
- .2 Leak test to CSA B52 before evacuation to 2MPa and 1MPa on high and low sides respectively.
- .3 Test Procedure: Build pressure up to 35 kPa with refrigerant gas on high and low sides. Supplement with nitrogen to required test pressure. Test for leaks with electronic or halide detector. Repair leaks and repeat tests.

3.05 DEHYDRATION AND CHARGING

- .1 Close service valves on factory charged equipment.
- .2 Ambient temperatures to be at least 13°C for at least 12 hours before and during dehydration.
- .3 Use copper lines of largest practical size to reduce evacuation time.
- .4 Use two-stage vacuum pump with gas ballast on 2nd stage capable of pulling 5Pa absolute and filled with dehydrated oil.
- .5 Measure system pressure with vacuum gauge. Take readings with valve between vacuum pump and system closed.
- .6 Triple evacuate system components containing gases other than correct refrigerant or having lost holding charge as follows:
 - .1 Twice to 14Pa absolute and hold for 4 h.
 - .2 Break vacuum with refrigerant to 14kPa.
 - .3 Final to 5Pa absolute and hold for at least 12 h.
 - .4 Isolate pump from system, record vacuum and time readings until stabilization of vacuum.
 - .5 Submit test results to Departmental Representative or designate.
- .7 Charging:
 - .1 Charge system through filter-drier and charging valve on high side. Low side charging not permitted.
 - .2 With compressors off, charge only amount necessary for proper operation of system. If system pressures equalize before system is fully charged, close charging valve and start up. With unit operating, add remainder of charge to system.
 - .3 Re-purge charging line if refrigerant container is changed during charging process.
- .8 Checks:
 - .1 Make checks and measurements as per manufacturer's operation and maintenance instructions.
 - .2 Record and report measurements to Departmental Representative or designate.

3.06 INSTRUCTIONS

- .1 Post instructions in frame with glass cover in accordance with CSA B52.

END OF SECTION

1 GENERAL

1.01 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation of low-pressure metallic ductwork, joints and accessories.
 - .2 Sustainable requirements for construction and verification.
 - .1 None.
- .2 Related Sections:
 - .1 Section [01 47 13 - Sustainable Requirements: Concept Design].
 - .2 Section [01 47 15 - Sustainable Requirements: Construction].
 - .3 Section [01 47 17 - Sustainable Requirements: Contractor's Verification].
 - .4 Section [01 47 19 - Sustainable Requirements: Operation].
 - .5 Section [02 62 00.01 - Hazardous Materials].
 - .6 Section [07 84 00 - Firestopping].

1.02 REFERENCES

- .1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).
- .2 ASTM International.
 - .1 ASTM A480/A480M-11b, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
 - .2 ASTM A635/A635M-09b, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot Rolled.
 - .3 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- .3 Department of Justice Canada (Jus).
 - .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33 .
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .5 National Fire Protection Association (NFPA).
 - .1 NFPA 90A-2012, Standard for the Installation of Air-Conditioning and Ventilating Systems.
 - .2 NFPA 90B-2012, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
 - .3 NFPA 96-2011, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
- .6 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
 - .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 3rd Edition [2005].
 - .2 SMACNA HVAC Air Duct Leakage Test Manual, [1985], 1st Edition.
 - .3 SMACNA IAQ Guidelines for Occupied Buildings Under Construction 2nd

edition 2007; ANSI/SMACNA 008-2008.

- .7 Transport Canada (TC).
 - .1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.
- .8 Standards and Guidelines for Conservation of Historic Places in Canada 2nd Edition.

1.03 SUBMITTALS

- .1 Submit shop drawings and product data.
- .2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets for the following:
 - .1 Sealants.
 - .2 Tape.
 - .3 Proprietary Joints.
- .3 Co-ordinate submittal requirements and provide submittals.
- .4 Submit Indoor Air Quality (IAQ) Management Plan.

1.04 QUALITY ASSURANCE

- .1 Certification of Ratings:
 - .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety.
- .3 Indoor Air Quality (IAQ) Management Plan.
 - .1 Develop and implement an Indoor Air Quality (IAQ) Management Plan for construction and preoccupancy phases of building.
 - .2 During construction meet or exceed the requirements of SMACNA IAQ Guidelines for Occupied Buildings under Construction.
- .4 Sustainable Requirements:
 - .1 None.

1.05 DELIVERY, STORAGE AND HANDLING

- .1 Protect on site stored or installed absorptive material from moisture damage.
- .2 Store and manage hazardous materials.
- .3 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
 - .4 Place materials defined as hazardous or toxic in designated containers.

- .5 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.
- .6 Fold up metal and plastic banding, flatten and place in designated area for recycling.

2 PRODUCTS

2.01 SUSTAINABLE REQUIREMENTS

- .1 Materials and resources in accordance with Section [01 47 15].

2.02 SEAL CLASSIFICATION

- .1 Classification as follows:

<u>Maximum Pressure Pa</u>	<u>SMACNA Seal Class</u>
500	[C]
250	[C]
125	[C]
125	[Unsealed]

- .2 Seal classification:

- .1 Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant and tape.
- .2 Class B: longitudinal seams, transverse joints and connections made airtight with sealant.
- .3 Class C: transverse joints and connections made air tight with sealant. Longitudinal seams unsealed.
- .4 Unsealed seams and joints.

2.03 SEALANT

- .1 Sealant: oil resistant, water borne, polymer type flame resistant duct sealant. Temperature range of minus 30°C to plus 93°C.

2.04 TAPE

- .1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide.

2.05 DUCT LEAKAGE

- .1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

2.06 FITTINGS

- .1 Fabrication: to SMACNA.
- .2 Radiused elbows.
 - .1 Rectangular: standard radius, short radius with single thickness turning vanes. Centreline radius: 1.5 times width of duct.
 - .2 Round: smooth radius. Centreline radius: 1.5 times diameter.
- .3 Mitred elbows, rectangular:
 - .1 To 400 mm: with single thickness turning vanes.
 - .2 Over 400 mm: with double thickness turning vanes.

- .4 Branches:
 - .1 Rectangular main and branch: with radius on branch 1.5 times width of duct 45 degrees entry on branch.
 - .2 Round main and branch: enter main duct at 45 degrees with conical connection.
 - .3 Provide volume control damper in branch duct near connection to main duct.
 - .4 Main duct branches: with splitter damper.
- .5 Transitions:
 - .1 Diverging: 20 degrees maximum included angle.
 - .2 Converging: 30 degrees maximum included angle.
- .6 Offsets:
 - .1 Full radiused elbows as indicated.
- .7 Obstruction deflectors: maintain full cross-sectional area.
 - .1 Maximum included angles: as for transitions.

2.07 FIRE STOPPING

- .1 Retaining angles around duct, on both sides of fire separation in accordance with Section [07 84 00].
- .2 Fire stopping material and installation must not distort duct.

2.08 GALVANIZED STEEL

- .1 Lock forming quality: to ASTM A653/A653M, Z90 zinc coating.
- .2 Thickness, fabrication and reinforcement: to ASHRAE, SMACNA.
- .3 Joints: to ASHRAE, SMACNA.

2.09 STAINLESS STEEL

- .1 To ASTM A480/A480M, Type 304.
- .2 Finish: No. 4.
- .3 Thickness, fabrication and reinforcement: to ASHRAE, SMACNA.
- .4 Joints: to ASHRAE and SMACNA.

2.10 ALUMINUM

- .1 To ASHRAE and SMACNA. Aluminum type: 3003-H-14.
- .2 Thickness, fabrication and reinforcement: to ASHRAE, SMACNA.
- .3 Joints: to ASHRAE, SMACNA.

2.11 HANGERS AND SUPPORTS

- .1 Hangers and Supports: in accordance with Section 23 05 29.
 - .1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.

- .1 Maximum size duct supported by strap hanger: 500.
- .2 Hanger configuration: to ASHRAE and SMACNA.
- .3 Hangers: galvanized steel angle with galvanized steel rods to following table:

<u>Duct Size</u> (mm)	<u>Angle Size</u> (mm)	<u>Rod Size</u> (mm)
up to 750	25 x 25 x 3	6
751 to 1050	40 x 40 x 3	6
1051 to 1500	40 x 40 x 3	10
1501 to 2100	50 x 50 x 3	10
2101 to 2400	50 x 50 x 5	10
2401 and over	50 x 50 x 6	10

- .4 Upper hanger attachments:
 - .1 For concrete: manufactured concrete inserts.
 - .2 For steel joist: manufactured joist clamp.
 - .3 For steel beams: manufactured beam clamps:

3 EXECUTION

3.01 GENERAL

- .1 Do work in accordance with ASHRAE, SMACNA.
- .2 Do not break continuity of insulation vapour barrier with hangers or rods.
- .3 Support risers in accordance with ASHRAE, SMACNA.
- .4 Install breakaway joints in ductwork on sides of fire separation.
- .5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.
- .6 Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining.

3.02 HANGERS

- .1 Strap hangers: install in accordance with SMACNA.
- .2 Angle hangers: complete with locking nuts and washers.
- .3 Hanger spacing: in accordance with as follows:

<u>Duct Size</u> (mm)	<u>Spacing</u> (mm)
to 1500	3000
1501 and over	2500

3.03 WATERTIGHT DUCT

- .1 Provide watertight duct for:
 - .1 Dishwasher exhaust.
 - .2 Fresh air intake.
 - .3 Minimum 3000 mm from duct mounted humidifier in all directions.
- .2 Form bottom of horizontal duct without longitudinal seams.

- .1 [Solder] [weld] joints of bottom and side sheets.
- .2 Seal other joints with duct sealer.

- .3 Slope horizontal branch ductwork down towards hoods served.
 - .1 Slope header ducts down toward risers.

- .4 Fit base of riser with 150 mm deep drain sump and 32 mm drain connected, with deep seal trap and valve and discharging to open funnel drain.

3.04 KITCHEN EXHAUST SYSTEMS

- .1 Install to NFPA 96 and as indicated.

3.05 SEALING AND TAPING

- .1 Apply sealant to outside of joint to manufacturer's recommendations.
- .2 Bed tape in sealant and recoat with minimum of one coat of sealant to manufacturers recommendations.

3.06 LEAKAGE TESTS

- .1 In accordance with SMACNA HVAC Duct Leakage Test Manual.
- .2 Do leakage tests in sections.
- .3 Make trial leakage tests as instructed to demonstrate workmanship.
- .4 Do not install additional ductwork until trial test has been passed.
- .5 Test section minimum of 30 m long with not less than three branch takeoffs and two 90 degrees elbows.
- .6 Complete test before performance insulation or concealment Work.

3.07 FIELD QUALITY CONTROL

- .1 Verification requirements in accordance with Section [01 47 17], include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Low-emitting materials.

END OF SECTION

1 GENERAL

1.01 REFERENCES

- .1 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
 - .1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible, 2005.

1.02 PRODUCT DATA

- .1 Submit product data.
- .2 Indicate the following:
 - .1 Flexible connections.
 - .2 Duct access doors.
 - .3 Turning vanes.
 - .4 Instrument test ports.

1.03 CERTIFICATION OF RATINGS

- .1 Catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

1.04 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section [01 74 20].
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan
- .3 Fold up metal banding, flatten and place in designated area for recycling.

2 PRODUCTS

2.01 GENERAL

- .1 Manufacture in accordance with SMACNA - HVAC Duct Construction Standards.

2.02 FLEXIBLE CONNECTIONS

- .1 Frame: galvanized sheet metal frame with fabric clenched by means of double locked seams.
- .2 Material:
 - .1 Fire resistant, self extinguishing, neoprene coated glass fabric, temperature rated at minus 40°C to plus 90°C, density of 1.3 kg/m³.

2.03 ACCESS DOORS IN DUCTS

- .1 Non-insulated ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame.

- .2 Insulated ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame and 25 mm thick rigid glass fibre insulation.
- .3 Gaskets: neoprene.
- .4 Hardware:
 - .1 Up to 300 x 300 mm: two sash locks complete with safety chain.
 - .2 301 to 450 mm: four sash locks complete with safety chain.
 - .3 451 to 1000 mm: piano hinge and minimum two sash locks.
 - .4 Doors over 1000 mm: piano hinge and two handles operable from both sides.
 - .5 Hold open devices.

2.04 TURNING VANES

- .1 Factory or shop fabricated single thickness with trailing edge, to recommendations of SMACNA and as indicated.

2.05 INSTRUMENT TEST

- .1 1.6 mm thick steel zinc plated after manufacture.
- .2 Cam lock handles with neoprene expansion plug and handle chain.
- .3 28 mm minimum inside diameter. Length to suit insulation thickness.
- .4 Neoprene mounting gasket.

2.06 SPIN-IN COLLARS

- .1 Conical galvanized sheet metal spin-in collars with lockable butterfly damper.
- .2 Sheet metal thickness to co-responding round duct standards.

3 EXECUTION

3.01 INSTALLATION

- .1 Flexible connections:
 - .1 Install in following locations:
 - .1 Inlets and outlets to supply air units and fans.
 - .2 Inlets and outlets of exhaust and return air fans.
 - .3 As indicated.
 - .2 Length of connection: 100 mm.
 - .3 Minimum distance between metal parts when system in operation: 75 mm.
 - .4 Install in accordance with recommendations of SMACNA.
 - .5 When fan is running:
 - .1 Ducting on sides of flexible connection to be in alignment.
 - .2 Ensure slack material in flexible connection.
- .2 Access doors and viewing panels:
 - .1 Size:
 - .1 As indicated.

- .2 Locations:
 - .1 Fire and smoke dampers.
 - .2 Control dampers.
 - .3 Devices requiring maintenance.
 - .4 Required by code.
 - .5 Reheat coils.
 - .6 Elsewhere as indicated.

- .3 Instrument test ports.
 - .1 General:
 - .1 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
 - .2 Locate to permit easy manipulation of instruments.
 - .3 Install insulation port extensions as required.
 - .4 Locations.
 - .1 For traverse readings:
 - .1 Ducted inlets to roof and wall exhausters.
 - .2 Inlets and outlets of other fan systems.
 - .3 Main and sub-main ducts.
 - .4 And as indicated.
 - .2 For temperature readings:
 - .1 At outside air intakes.
 - .2 In mixed air applications in locations as approved by Consultant.
 - .3 At inlet and outlet of coils.
 - .4 Downstream of junctions of two converging air streams of different temperatures.
 - .5 And as indicated.

- .4 Turning vanes:
 - .1 Install in accordance with recommendations of SMACNA and as indicated.

END OF SECTION

1 GENERAL

1.01 REFERENCES

- .1 Sheet Metal and Air Conditioning National Association (SMACNA)
 - .1 SMACNA HVAC Duct Construction Standards, Metal and Flexible-2005.

1.02 PRODUCT DATA

- .1 Submit product data.

1.03 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section [01 74 20], and with the Waste Reduction Workplan.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

2 PRODUCTS

2.01 GENERAL

- .1 Manufacture to SMACNA standards.

2.02 SPLITTER DAMPERS

- .1 Of same material as duct but one sheet metal thickness heavier, with appropriate stiffening.
- .2 Single thickness construction.
- .3 Control rod with locking device and position indicator.
- .4 Rod configuration to prevent end from entering duct.
- .5 Pivot: piano hinge.
- .6 Folded leading edge.

2.03 SINGLE BLADE DAMPERS

- .1 Of same material as duct, but one sheet metal thickness heavier. V-groove stiffened.
- .2 Size and configuration to recommendations of SMACNA, except maximum height 100 mm.
- .3 Locking quadrant with shaft extension to accommodate insulation thickness.

- .4 Inside and outside bronze end bearings.
- .5 Channel frame of same material as adjacent duct, complete with angle stop.

2.04 MULTI-BLADED DAMPERS

- .1 Factory manufactured of material compatible with duct.
- .2 Opposed blade: configuration, metal thickness and construction to recommendations of SMACNA.
- .3 Maximum blade height: 100 mm.
- .4 Bearings: pin in bronze bushings.
- .5 Linkage: shaft extension with locking quadrant.
- .6 Channel frame of same material as adjacent duct, complete with angle stop.

3 EXECUTION

3.01 INSTALLATION

- .1 Install where indicated.
- .2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
- .3 For supply, return and exhaust systems, locate balancing dampers in each branch duct.
- .4 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.
- .5 All dampers to be vibration free.
- .6 Ensure damper operators are observable and accessible.

END OF SECTION

1 GENERAL

1.01 REFERENCES

- .1 National Fire Protection Association (NFPA)
 - .1 NFPA 90A-2012, Installation of Air Conditioning and Ventilating Systems.
- .2 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S112-10, Standard Method of Fire Test of Fire Damper Assemblies.
 - .2 CAN/ULC-S112.2-07, Standard Method of Fire Test of Ceiling Firestop Flap Assemblies.
 - .3 ULC-S505-[1974], Fusible Links for Fire Protection Service.

1.02 PRODUCT DATA

- .1 Submit product data in accordance with Section [01 33 00].
- .2 Indicate the following:
 - .1 Fire dampers.
 - .2 Smoke dampers.
 - .3 Fire stop flaps.
 - .4 Operators.
 - .5 Fusible links.
 - .6 Design details of break-away joints.

1.03 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual specified in Section [01 78 00].

1.04 EXTRA MATERIALS

- .1 Provide maintenance materials in accordance with Section [01 78 00].
- .2 Provide following:
 - .1 [6] fusible links of each type.

1.05 CERTIFICATION OF RATINGS

- .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards.

1.06 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section [01 74 20], and with the Waste Reduction Workplan.
- .2 Place materials defined as hazardous or toxic waste in designated containers.

- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

2 PRODUCTS

2.01 FIRE DAMPERS

- .1 Fire dampers: arrangement Type B, listed and bear label of ULC, meet requirements of Fire Commissioner of Canada (FCC) and NFPA 90A. Fire damper assemblies to be fire tested in accordance with CAN/ULC-S112.
- .2 Mild steel, factory fabricated for fire rating requirement to maintain integrity of fire wall and/or fire separation.
- .3 Top hinged: offset single damper, round or square; multi-blade hinged or interlocking type; sized to maintain full duct cross section.
- .4 Fusible link actuated, weighted to close and lock in closed position when released or having negator-spring-closing operator for multi-leaf type or roll door type in horizontal position with vertical air flow.
- .5 40 x 40 x 3 mm retaining angle iron frame, on full perimeter of fire damper, on both sides of fire separation being pierced.

2.02 FIRE STOP FLAPS

- .1 To be ULC listed and labelled and fire tested in accordance with CAN/ULC-S112.2.
- .2 Construct of minimum 1.5 mm thick sheet steel with 1.6 mm thick non-asbestos ULC listed insulation and corrosion-resistant pins and hinges.
- .3 Flaps to be held open with fusible link conforming to ULC-S505 and close at 74°C.

3 EXECUTION

3.01 INSTALLATION

- .1 Install in accordance with NFPA 90A and in accordance with conditions of ULC listing.
- .2 Maintain integrity of fire separation.
- .3 After completion and prior to concealment obtain approvals of complete installation from authority having jurisdiction.
- .4 Install access door adjacent to each damper.
- .5 Coordinate with installer of firestopping.
- .6 Ensure access doors/panels, fusible links, damper operators are easily observed and accessible.

.7 Install break-away joints of approved design on each side of fire separation.

END OF SECTION

1 GENERAL

1.01 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C177-10, Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 51-GP-10M-[76], Thermal Insulation, Mineral Fibre, Block or Board, for Ducting, Machinery and Boilers.
 - .2 CGSB 51-GP-11M-[76], Thermal Insulation, Mineral Fibre, Blanket, for Piping, Ducting, Machinery and Boilers.
- .3 National Fire Protection Association (NFPA)
 - .1 NFPA 90A-12, Standard for the Installation of Air Conditioning and Ventilating Systems.
 - .2 NFPA 90B-12, Standard for the Installation of Warm Air Heating and Air Conditioning Systems.
- .4 Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)
 - .1 SMACNA HVAC Duct Construction Standards, Metal and Flexible-[95 (Addendum No.1, Nov. 97)].
- .5 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.02 PRODUCT DATA

- .1 Submit product data.

1.03 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan

2 PRODUCTS

2.01 DUCT LINER

- .1 General:
 - .1 Fibrous glass duct liner: air stream side faced with mat facing.
 - .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50 when tested in accordance with CAN/ULC-S102.
- .2 Rigid:
 - .1 [Use on flat surfaces [where indicated]].
 - .2 [25] mm thick, to CGSB 51-GP-10M, fibrous glass rigid board duct liner.

- .3 Density: [36] kg/m³ minimum.
 - .4 Thermal resistance to be minimum [0.76 m²·°C/W for 25 mm thickness] [1.15 m²·°C/W for 38 mm thickness] [1.51 m²·°C/W for 50 mm thickness] when tested in accordance with ASTM C177, at 24°C mean temperature.
- .3 Flexible:
- .1 [Use on [round or oval surfaces] [surfaces indicated]].
 - .2 [25] mm thick, to CGSB-51-GP-11M, fibrous glass blanket duct liner.
 - .3 Density: [24] kg/m³ minimum.
 - .4 Thermal resistance to be minimum [0.37 m²·°C/W for 12 mm thickness] [0.74 m²·°C/W for 25 mm thickness] [1.11 m²·°C/W for 38 mm thickness] [1.41 m²·°C/W to 50 mm thickness] when tested in accordance with ASTM C177, at 24°C mean temperature.

2.02 ADHESIVE

- .1 Meet requirements of NFPA 90A and NFPA 90B.
- .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50. Temperature range minus 29°C to plus 93°C.

2.03 FASTENERS

- .1 Weld pins 2.0 mm diameter, length to suit thickness of insulation. Metal retaining clips, 32 mm square.

2.04 JOINT TAPE

- .1 Poly-Vinyl treated open weave fiberglass membrane 50 mm wide.

2.05 SEALER

- .1 Meet requirements of NFPA 90A and NFPA 90B.
- .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50. Temperature range minus 68°C to plus 93°C.

3 EXECUTION

3.01 GENERAL

- .1 Do work in accordance with recommendations of SMACNA duct liner standards as indicated in SMACNA HVAC Duct Construction Standards, Metal and Flexible, except as specified otherwise.
- .2 Line inside of ducts where indicated.
- .3 Duct dimensions, as indicated, are clear inside duct lining.

3.02 DUCT LINER

- .1 Install in accordance with manufacturer's recommendations, and as follows:
 - .1 Fasten to interior sheet metal surface with 100% coverage of adhesive.
 - .2 In addition to adhesive, install weld pins not less than 2 rows per

surface and not more than 425 mm on centres.

3.03 JOINTS

- .1 Seal butt joints, exposed edges, weld pin and clip penetrations and damaged areas of liner with joint tape and sealer. Install joint tape in accordance with manufacturer's written recommendations, and as follows:
 - .1 Bed tape in sealer.
 - .2 Apply two coats of sealer over tape.
- .2 Replace damaged areas of liner at discretion of Departmental Representative or designate.
- .3 Protect leading and trailing edges of duct sections with sheet metal nosing having 15 mm overlap and fastened to duct.

END OF SECTION

1 GENERAL

1.01 RELATED SECTIONS

- .1 Door grilles: Section [08 90 00 - Louvres and Vents].

1.02 PRODUCT DATA

- .1 Submit product data in accordance with Section [01 33 00].
- .2 Indicate the following:
 - .1 Capacity.
 - .2 Throw and terminal velocity.
 - .3 Noise criteria.
 - .4 Pressure drop.
 - .5 Neck velocity.

1.03 SAMPLES

- .1 Submit samples in accordance with Section [01 33 00].
- .2 Samples are required for following:
 - .1 None.

1.04 CERTIFICATIONS

- .1 Catalogued or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards.

1.05 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section [01 74 20].
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Dispose of corrugated cardboard, polystyrene, plastic, packaging material in appropriate on-site bin for recycling in accordance with site waste management program.

1.06 EXTRA MATERIALS

- .1 Provide maintenance materials in accordance with Section [01 78 00].
- .2 Include:
 - .1 Keys for volume control adjustment.
 - .2 Keys for air flow pattern adjustment.

2 PRODUCTS

2.01 GENERAL

- .1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity [as indicated].
- .2 Frames:
 - .1 Full perimeter gaskets.
 - .2 Plaster frames [where set into plaster or gypsum board] [at all locations] [and as specified].
 - .3 Concealed fasteners.
- .3 Concealed manual volume control damper operators.
- .4 Colour: standard.

2.02 MANUFACTURED UNITS

- .1 Grilles, registers and diffusers of same generic type to be product of one manufacturer.

2.03 SUPPLY GRILLES AND REGISTERS

- .1 General: with opposed blade dampers.
- .2 Type: see schedule on drawings.

2.04 RETURN AND EXHAUST GRILLES AND REGISTERS

- .1 General: with opposed blade dampers.
- .2 Type: see schedule on drawings.

2.05 DIFFUSERS

- .1 General: volume control dampers with flow straightening devices and gaskets.
- .2 Type: see schedule on drawings.

2.06 LINEAR GRILLES

- .1 Bar core type with margin as indicated.
- .2 Plaster frame, sealing strip and accessories as indicated.
- .3 Air volume control damper with concealed adjustment.
- .4 Floor and Sill grilles to be capable of supporting 90 kg point load weight between supports with negligible deflection and be heel proof.

3 EXECUTION

3.01 INSTALLATION

- .1 Install in accordance with manufacturers instructions.
- .2 Install with screws in countersunk holes where fastenings are visible.
- .3 Bolt grilles, registers and diffusers, in place, in gymnasium and similar game rooms.
- .4 Provide concealed safety chain on each grille, register and diffuser in gymnasium and similar game rooms and elsewhere as indicated.

END OF SECTION

1 GENERAL

1.01 REFERENCES

- .1 American National Standards Institute (ANSI) / American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ASHRAE 52.2-2007, Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.
- .2 American National Standards Institute (ANSI) / Canadian Standards Association (CSA International)
 - .1 ANSI Z21.47-[2007A]/ CSA 2.3A-[2007], Gas-Fired Central Furnaces.
 - .2 ANSI Z83.8 -[2006]/CSA 2.6-[2006], CSA Standard for Gas Unit Heaters and Gas-Fired Duct Furnaces.
- .3 Canada Green Building Council (CaGBC)
 - .1 LEED Canada For New Construction and Major Renovations 2009.
 - .2 LEED Canada For Core and Shell 2009.
 - .3 LEED Canada-CI Version 1.0-[2007], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.
- .4 Canadian Electrical Code 2009
- .5 Canadian Standards Association (CSA International) / Canadian Gas Association (CGA)
 - .1 CSA 3.2-[1976(R2003)], Industrial and Commercial Gas-Fired Package Furnaces.
- .6 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-B140.2.1-[M90(R2010)], Oil Burners, Atomizing Type.
 - .2 CSA B140.2.2-[1971(R2006)], Pressure Atomizing Oil Burner Nozzles.
 - .3 CAN/CSA-B140.4-04(R2009), Oil-Fired Warm Air Furnaces.
 - .4 CSA B140.14-[M1979 (R2001)], Automatic Flue-Pipe Dampers for Use with Oil Fired Appliances.
 - .5 CAN/CSA-B139-09, Installation Code for Oil Burning Equipment.
 - .6 CAN/CSA-B149.1-[10], Natural Gas and Propane Installation Code.
 - .7 CAN/CSA-B149.2-[05], Propane Storage and Handling Code.
 - .8 CSA C22.2 No. 24-[93(R2008)], Temperature-Indicating and Regulating Equipment.
 - .9 CSA C22.2 No.46-[M1988(R2001)], Electric Air-Heaters.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for furnace units and furnace parts, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Provide drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

- .2 Submit manufacturer's written recommendations.
- .4 Sustainable Design Submittals:
 - .1 LEED Submittals: None.

1.03 CLOSEOUT SUBMITTALS

- .1 Provide operation and maintenance data for incorporation into manual.

1.04 MAINTENANCE MATERIAL SUBMITTALS

- .1 Provide spare parts as follows: None.
- .2 Extra Stock Parts:
 - .1 Spare filters: in addition to filters installed immediately prior to acceptance by Departmental Representative or designate, supply 1 complete set of filters for each filter unit or filter bank in accordance with Section [01 11 01] [01 78 00].

1.05 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .2 Packaging Waste Management: remove for reuse.

2 PRODUCTS

2.01 GENERAL

- .1 Provide CSA approved, packaged factory assembled unit consisting of cabinet, fan, induced fan, fan motor, intake/exhaust assembly, heat exchanger, combustion chamber, burner, controls, air filter, and condensate drain.
- .2 High Annual Fuel Utilization efficiency level range: 95%.
- .3 Certification of components and construction of factory assembled gas-fired unit: to ANSI Z21.47/CSA 2.3A for forced air central furnace.

2.02 CAPACITY

- .1 See schedule on drawings.

2.03 TYPE

- .1 Upflow type with gas burner.

2.04 CABINET

- .1 Welded steel base for floor type.
- .2 Easily removed and secured access doors for components requiring service.

2.05 INTAKE AND VENT ASSEMBLY

- .1 Provide manufacturer's standard wall separate vent and intake complete with termination assembly for high efficiency gas (condensing) furnace.

2.06 CONDENSATE DRAIN

- .1 Provide PVC condensate drain trap.
- .2 Condensate filter/neutralizer kit.

3 EXECUTION

3.01 APPLICATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.02 INSTALLATION

- .1 Install in accordance with manufacturer's instructions, regulations of authorities having jurisdiction and to CAN/CSA-B149.1.

3.03 CLEANING

- .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling.

END OF SECTION

1 GENERAL

1.01 SUMMARY

- .1 Section Includes:
 - .1 General requirements that are common to NMS sections found in Division 26 - Electrical, 27 - Communications and 28 - Electronic Safety and Security.

1.02 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-C22.1-2012, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations.
 - .2 CAN/CSA-C22.3 No. 1-06, Overhead Systems.
 - .3 CAN3-C235-83(R2006), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
 - .4 Do underground systems in accordance with CSA C22.3 No.7-06, Underground Systems, except where specified otherwise.
- .2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC)
 - .1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.
- .3 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .4 The Ontario Electrical Safety Code 2015, and all bulletins (Ontario).
- .5 Hydro requirements and local applicable codes and regulations.

1.03 DESIGN REQUIREMENTS

- .1 Operating voltages: to CAN3-C235.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
 - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 Language operating requirements: provide identification nameplates and labels for control items in English.

1.04 SUBMITTALS

- .1 Product Data: submit WHMIS MSDS.
- .2 Submit for review single line electrical diagrams under plexiglass and locate as indicated.
 - .1 Electrical distribution system in main electrical room.
- .3 Submit for review fire alarm riser diagram, plan and zoning of building under plexiglass at fire alarm control panel and annunciator.

- .4 Shop drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario within 3 weeks of Award of Contract.
 - .2 Submit one electronic copy of shop drawings to Departmental Representative or designate.
 - .3 If changes are required, notify Departmental Representative or designate of these changes before they are made.
- .5 Quality Control:
 - .1 Provide CSA certified equipment and material.
 - .2 Where CSA certified equipment and material is not available, submit such equipment and material to inspection authorities for special approval before delivery to site.
 - .3 Submit one electronic copy of test results of installed electrical systems and instrumentation.
 - .4 Permits and fees: in accordance with General Conditions of contract. Pay associated fees. Departmental Representative or designate will provide drawings and specifications required by Electrical Inspection Department and Supply Authority at no cost.
 - .5 Submit, upon completion of Work, load balance report as described in PART 3 - Load Balance.
 - .6 Submit certificate of acceptance from Electrical Inspection Department authority having jurisdiction upon completion of Work to Departmental Representative or designate.
- .6 Manufacturer's Field Reports: submit to Departmental Representative or designate, manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

1.05 QUALITY ASSURANCE

- .1 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices in accordance with authorities having jurisdiction and as per the conditions of Provincial Act respecting manpower vocational training and qualification.
 - .1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.
 - .2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.
- .2 Site Meetings:
 - .1 Site Meetings: as part of Manufacturer's Field 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.
- .3 Health and Safety Requirements: do construction occupational health and safety.

1.06 DELIVERY, STORAGE AND HANDLING

- .1 Material Delivery Schedule: provide Departmental Representative or designate with schedule within 2 weeks after award of Contract.
- .2 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling.

1.07 SYSTEM STARTUP

- .1 Instruct Departmental Representative or designate in operation, care and maintenance of systems, system equipment and components.
- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- .1 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from inspection authorities before delivery to site and submit such approval as described in PART 1 - Submittals.
- .2 Factory assemble control panels and component assemblies.

2.02 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

- .1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.
- .2 Control wiring and conduit: in accordance with Section 26 29 03 except for conduit, wiring and connections below 50 V which are related to control systems specified in mechanical sections and as shown on mechanical drawings.

2.03 WARNING SIGNS

- .1 Warning Signs: in accordance with requirements of authority having jurisdiction, inspection authorities and Departmental Representative or designate.
- .2 Decal signs, minimum size 175 x 250 mm.

2.04 WIRING TERMINATIONS

- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.05 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment (Distribution switchboards/panelboards, lighting/power panels, equipment disconnects/starters) with nameplates and labels as follows:
 - .1 Nameplates: lamicoid 3 mm thick plastic engraving sheet, black face, white core, lettering accurately aligned and engraved into core mechanically attached with self-tapping screws.
 - .2 Sizes as follows:

NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

- .2 Wiring Device Labels: machine printed adhesive label secured to device coverplate. Text 6 mm high letters indicating source panel and circuit number unless specified otherwise.
- .3 Wording on nameplates and labels to be approved by Departmental Representative or designate prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per lamicoid nameplate and label.
- .5 Nameplates for terminal cabinets and junction boxes to indicate system and/or source panel circuiting.
- .6 Identify equipment with Size 3 labels engraved "ASSET INVENTORY No. [_____] " as directed by Departmental Representative or designate .
- .7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .8 Terminal cabinets and pull boxes: indicate system, voltage/circuit number.
- .9 Transformers: indicate capacity, primary and secondary voltages.

2.06 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, numbered coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour coding: to CSA-C22.1.

- .4 Use colour coded wires in communication cables, matched throughout system.

2.07 CONDUIT AND CABLE IDENTIFICATION

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.
- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

	<u>Prime</u>	<u>Auxiliary</u>
up to 250 V	Silver	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Telephone	Blue	
Data	Blue	
Fibre Cabling	Orange	
Fire Alarm	Red	
Emergency Ltg	White	
Security	Yellow	
<u>Systems</u>		

2.08 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
- .1 Paint outdoor electrical equipment ["equipment green" finish].
- .2 Paint indoor switchgear and distribution enclosures light gray to EEMAC 2Y-1.

3 EXECUTION

3.01 INSTALLATION

- .1 Do complete installation in accordance with CSA-C22.1 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CAN/CSA-C22.3 No.1 except where specified otherwise.

3.02 NAMEPLATES AND LABELS

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.03 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete.
- .1 Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.
- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

- .3 Install cables, conduits and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.

3.04 LOCATION OF OUTLETS

- .1 Locate outlets in accordance with Section 26 05 32.
- .2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.
- .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.
- .4 Locate light switches on latch side of doors.
 - .1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.

3.05 MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .3 Install electrical equipment at following heights unless indicated otherwise.
 - .1 Local switches/thermostats: maximum 1200 mm.
 - .2 Wall receptacles (not mounted in raceways):
 - .1 General: 300 mm, minimum 400 mm for accessible space.
 - .2 Above top of continuous baseboard heater: 200 mm.
 - .3 Above top of counters or counter splash backs: 175 mm.
 - .4 In mechanical rooms: 300 mm.
 - .3 Panelboards: as required by Code or as indicated.
 - .4 Telephone and data outlets: 300 mm.
 - .5 Wall mounted telephone and data outlets for non-accessible locations: 1500 mm.
 - .6 Fire alarm stations: maximum 1200 mm for accessible space.
 - .7 Fire alarm audible devices: maximum 2400 mm, 150mm below ceiling
 - .8 Fire alarm strobes: minimum 2000, maximum 2400mm

3.06 CO-ORDINATION OF PROTECTIVE DEVICES

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.07 FIELD QUALITY CONTROL

- .1 Load Balance:
 - .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
 - .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
 - .3 Provide upon completion of work, load balance report as directed in PART 1 - Submittals: phase and neutral currents on panelboards,

dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.

- .2 Conduct following tests:
 - .1 Power distribution system including phasing, voltage, grounding and load balancing.
 - .2 Circuits originating from branch distribution panels.
 - .3 Lighting and its control.
 - .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
 - .5 Systems: fire alarm system, communications.
 - .6 Insulation resistance testing:
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
 - .3 Check resistance to ground before energizing.
- .3 Carry out tests in presence of Departmental Representative or designate.
- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .5 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.
- .6 Verification requirements include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Certified wood.
 - .8 Low-emitting materials.

3.08 CLEANING

- .1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 260500.

1.02 REFERENCES

- .1 CSA International
 - .1 CAN/CSA-C22.2 No.18-98(R2003), Outlet Boxes, Conduit Boxes and Fittings.
 - .2 CAN/CSA-C22.2 No.65-13, Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
 - .1 EEMAC 1Y-2-1961, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .3 National Electrical Manufacturers Association (NEMA)

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for [wire and box connectors] and include product characteristics, performance criteria, physical size, finish and limitations.

1.04 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: submit operation and maintenance data for wire and box connectors for incorporation into manual.

1.05 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 indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect wire and box connectors from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 MATERIALS

- .1 Pressure type wire connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper alloy sized to fit copper conductors as required.
- .2 Fixture type splicing connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper alloy sized to fit copper conductors 10 AWG or less.
- .3 Bushing stud connectors: to EEMAC 1Y-2 to consist of:
 - .1 Connector body and stud clamp for stranded round copper conductors.
 - .2 Clamp for stranded round copper conductors.
 - .3 Stud clamp bolts.
 - .4 Bolts for copper conductors.
 - .5 Sized for conductors as indicated.
- .4 Clamps or connectors for armoured cable, TECK cable, aluminum sheathed cable, mineral insulated cable, flexible conduit, non-metallic sheathed cable as required to: CAN/CSA-C22.2 No.18.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wire and box connectors installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative or designate.
 - .2 Inform Departmental Representative or designate of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative or designate.

3.02 INSTALLATION

- .1 Remove insulation carefully from ends of conductors and cables and:
 - .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
 - .2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 No.65.
 - .3 Install fixture type connectors and tighten to CAN/CSA-C22.2 No.65. Replace insulating cap.
 - .4 Install bushing stud connectors in accordance with EEMAC 1Y-2.

3.03 CLEANING

- .1 Progress Cleaning:

- .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
- .3 Waste Management: separate waste materials for reuse and recycling.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

1 GENERAL

1.01 DELIVERY, STORAGE AND HANDLING

- .1 Packaging Waste Management: remove for reuse by manufacturer of pallets, crates, padding and packaging materials.

2 PRODUCTS

2.01 BUILDING WIRES

- .1 Conductors: stranded for 12 AWG and larger. Minimum size: 12 AWG.
- .2 Copper conductors: size as indicated, with 600 or 1000 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE, RWU90 XLPE, Jacketted.
- .3 Copper conductors: size as indicated, with thermoplastic insulation type TWU, TWH, T90 Nylon rated at 600 V.

2.02 TECK 90 CABLE

- .1 Cable: in accordance with Section 26 05 00.
- .2 Conductors:
 - .1 Grounding conductor: copper.
 - .2 Circuit conductors: copper, size as indicated.
- .3 Insulation:
 - .1 Cross-linked polyethylene XLPE.
 - .2 Rating: 600 or 1000 V.
- .4 Inner jacket: polyvinyl chloride material.
- .5 Armour: interlocking aluminum.
- .6 Overall covering: thermoplastic polyvinyl chloride, compliant to applicable Building Code classification for this project.
- .7 Fastenings:
 - .1 One hole malleable iron straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
 - .2 Channel type supports for two or more cables.
 - .3 Threaded rods: 6 mm diameter to support suspended channels.
- .8 Connectors:
 - .1 Watertight, approved for TECK cable.

2.03 ARMOURED CABLES

- .1 Conductors: insulated, copper, size as indicated.
- .2 Type: AC90.

- .3 Armour: interlocking type fabricated from aluminum strip.
- .4 Type: ACWU90 PVC flame retardant jacket over thermoplastic armour and compliant to applicable Building Code classification for this project wet locations.
- .5 Connectors: anti short connectors.

2.04 ALUMINUM SHEATHED CABLE

- .1 Conductors: copper, size as indicated.
- .2 Insulation: cross linked polyethylene type RA90 rated 600 or 1000 V.
- .3 Sheath: aluminum applied to form continuous corrugated seamless sheath.
- .4 Outer jacket: thermoplastic applied over sheath and to be compliant to applicable Building Code classification for this project, wet locations.
- .5 Fastenings for aluminum sheathed cable:
 - .1 One hole malleable iron straps to secure surface cables 25 mm and smaller. Two hole steel straps for cables larger than 25 mm. Use aluminum strap only with single conductor cable.
 - .2 Channel type supports for two or more cables.
 - .3 Threaded rods: 6 mm diameter to support suspended channels.

2.05 CONTROL CABLES

- .1 Type: LVT: soft annealed copper conductors, quantity and sized as indicated:
 - .1 Insulation: thermoplastic.
 - .2 Sheath: thermoplastic jacket.

3 EXECUTION

3.01 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00.
- .2 Perform tests using method appropriate to site conditions and to approval of Departmental Representative or designate and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.

3.02 GENERAL CABLE INSTALLATION

- .1 Install cable in trenches.
- .2 Lay cable in cable trays in accordance with Section 26 05 36.
- .3 Terminate cables in accordance with Section 26 05 20.
- .4 Cable Colour Coding: to Section 26 05 00.
- .5 Conductor length for parallel feeders to be identical.

- .6 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.
- .7 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.
- .8 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.
- .9 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.03 INSTALLATION OF BUILDING WIRES

- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 26 05 34.
 - .2 In underground ducts in accordance with Section 33 65 73 and 33 65 76.
 - .3 In surface and lighting fixture raceways in accordance with Section 26 05 33.01.

3.04 INSTALLATION OF TECK90 CABLE (0 -1000 V)

- .1 Group cables wherever possible on channels.
- .2 Install cable exposed, securely supported by hangers.

3.06 INSTALLATION OF ARMOURED CABLES

- .1 Group cables wherever possible on channels.
- .2 Use of armoured cables limited to new stud wall construction.

3.08 INSTALLATION OF CONTROL CABLES

- .1 Install control cables in conduit.
- .2 Ground control cable shield.

3.09 INSTALLATION OF NON-METALLIC SHEATHED CABLE

- .1 Install cables.
- .2 Install straps and box connectors to cables as required.

END OF SECTION

1 GENERAL

1.01 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative or designate.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

2 PRODUCTS

2.01 SUPPORT CHANNELS

- .1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted or suspended.

3 EXECUTION

3.01 INSTALLATION

- .1 Secure equipment to solid masonry, tile and plaster surfaces with lead anchors.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.
- .5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .6 Fasten exposed conduit or cables to building construction or support system using straps.
 - .1 One-hole malleable iron straps to secure surface conduits and cables 50 mm and smaller.
 - .2 Two-hole steel straps for conduits and cables larger than 50 mm.
 - .3 Beam clamps to secure conduit to exposed steel work.
- .7 Suspended support systems.
 - .1 Support individual cable or conduit runs with 6 mm dia threaded rods

- and spring clips.
- .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.
 - .9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
 - .10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
 - .11 Do not use wire lashing or perforated strap to support or secure raceways or cables.
 - .12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative or designate.
 - .13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

1 GENERAL

1.01 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-2015, Canadian Electrical Code, Part 1.

1.02 SUBMITTALS

- .1 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Provide shop drawings:
 - .1 Provide drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

1.03 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling.

2 PRODUCTS

2.01 SPLITTERS

- .1 Construction: sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.
- .2 Terminations: main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.
- .3 Spare Terminals: minimum three spare terminals or lugs on each connection or lug block sized less than 400 A.

2.02 JUNCTION AND PULL BOXES

- .1 Construction: welded steel enclosure.
- .2 Covers Flush Mounted: 25 mm minimum extension all around.
- .3 Covers Surface Mounted: screw-on turned edge covers.

2.03 CABINETS

- .1 Construction: welded sheet steel hinged door, handle, latch and catch.
- .2 Type E Empty: surface return flange mounting as indicated.
- .3 Type T Terminal: surface return flange mounting as indicated containing 19 mm plywood backboard.

3 EXECUTION

3.01 SPLITTER INSTALLATION

- .1 Mount plumb, true and square to building lines.
- .2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.02 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Mount cabinets with top not higher than 2 m above finished floor except where indicated otherwise.
- .3 Install terminal block as indicated in Type T cabinets.
- .4 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.03 IDENTIFICATION

- .1 Equipment Identification: to Section 26 05 00.
- .2 Identification Labels: size 2 indicating system name, voltage and phase or as indicated.

END OF SECTION

1 GENERAL

1.01 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-2012, Canadian Electrical Code, Part 1, Latest Edition.

1.02 SUBMITTALS

- .1 Submit samples for floor box.

1.03 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling.

2 PRODUCTS

2.01 OUTLET AND CONDUIT BOXES GENERAL

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 250 V outlet boxes for 120 V switching devices.
- .6 Combination boxes with barriers where outlets for more than one system are grouped.

2.02 GALVANIZED STEEL OUTLET BOXES

- .1 One-piece electro-galvanized construction.
- .2 Single and multi gang flush device boxes for flush installation, minimum size 102 x 54 x 48 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
- .3 Utility boxes for outlets connected to surface-mounted EMT conduit, cast type, minimum size 102 x 54 x 48 mm.
- .4 102 mm square or octagonal outlet boxes for lighting fixture outlets.
- .5 Extension and plaster rings for flush mounting devices in finished plaster or tile walls.

2.03 MASONRY BOXES

- .1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.

2.04 CONCRETE BOXES

- .1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.05 FLOOR BOXES

- .1 Concrete tight electro-galvanized sheet steel floor boxes with adjustable finishing rings to suit floor finish with brass faceplate. Device mounting plate to accommodate short or long ear duplex receptacles. Minimum depth: 73 mm for receptacles and communication outlets.
- .2 Adjustable, watertight, concrete tight, cast floor boxes with openings drilled and tapped for 16, 21 and 27 mm conduit. Minimum size: 73 mm deep.
- .3 Refer to drawings for multi-service two compartment floor box with hinged cover for both raised floor and wood floor construction.

2.06 CONDUIT BOXES

- .1 Exposed surface wall boxes shall be cast type FS or FD aluminum boxes with factory-threaded hubs for surface wiring of devices.

2.07 OUTLET BOXES FOR NON-METALLIC SHEATHED CABLE

- .1 Electro-galvanized, sectional, screw ganging steel boxes, minimum size 102 x 54 x 48 mm with two double clamps to take non-metallic sheathed cables.

2.08 FITTINGS - GENERAL

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 35 mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

3 EXECUTION

3.01 INSTALLATION

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 For flush installations mount outlets flush with finished wall using plaster

rings to permit wall finish to come within 6 mm of opening.

- .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.
- .5 Vacuum clean interior of outlet boxes before installation of wiring devices.
- .6 Identify systems for outlet boxes as required.

END OF SECTION

1 GENERAL

1.01 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-C22.2 No. 62-93(R2013), Surface Raceway Systems.

1.02 SUBMITTALS

- .1 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Quality assurance submittals: provide following.
 - .1 Manufacturer's Instructions: provide manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures.
- .3 Indicate types of raceways with terminology similar to that used in this Section.

1.03 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling.

2 PRODUCTS

2.01 SURFACE RACEWAY SYSTEM (WIRING PULLED IN)

- .1 One piece steel, free of sharp edges to CAN/CSA-C22.2 No. 62.
- .2 Corners, pull boxes, elbows, tees, two piece assembly to facilitate site wiring.
- .3 Finish: as indicated.
- .4 Switch, receptacle, extension boxes, adapters and fittings required for complete installation.

2.02 SURFACE RACEWAY SYSTEM (WIRING LAID IN)

- .1 Two piece steel assembly CAN/CSA-C22.2 No. 62.
 - .1 Finish: as indicated.
- .2 Switch, receptacle, extension boxes, adapters and fittings required for complete installation.

2.03 SURFACE FLOOR RACEWAY SYSTEM

- .1 Two piece steel assembly manufactured for floor lay-in type raceway to CAN/CSA-C22.2 No. 62.

- .2 Finish: as indicated.

2.04 CHANNEL RACEWAY

- .1 Channel type raceway: to CAN/CSA-C22.2 No. 62, steel, solid.

2.05 PLASTIC RACEWAY

- .1 Plastic raceway: to CAN/CSA-C22.2 No. 62, rigid extruded polyvinyl chloride or reinforced thermosetting plastic with slots on either side of raceway for exit of wiring.
- .2 Channel: with solid snap-on cover throughout entire length.

2.06 LIGHTING FIXTURE RACEWAY

- .1 Fluorescent fixture support system using channel type raceway with snap-on cover.
- .2 Channel: minimum 1.6 mm thick.
- .3 Clamp hangers with as indicated with threaded rod, chain or rod hangers.

2.07 FITTINGS

- .1 Elbows, tees, supports, connectors couplings and fittings: to CAN/CSA-C22.2 No. 62.

3 EXECUTION

3.01 INSTALLATION

- .1 Install raceway systems as indicated and in accordance with manufacturer's instructions.
- .2 Install supports, elbows, tees, connectors, fittings, bushings, adaptors as required.
- .3 Keep number of elbows, offsets and connections to minimum.
- .4 Use wiring with mechanical protection in channel raceways.
- .5 Install barriers in raceways for different services where required by code.
- .6 Install wiring after installation of raceway system is complete.

END OF SECTION

1 GENERAL

1.01 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-C22.2 No. 18-98 (R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
 - .2 CAN/CSA-C22.2 NO. 18.1-13, Metallic Outlet Boxes.
 - .3 CAN/CSA-C22.2 NO. 18.2-06 (R2011), Nonmetallic Outlet Boxes.
 - .4 CAN/CSA-C22.2 No. 18.3-12, Conduit, Tubing, and Cable Fittings (Tri-National standard, with ANCE NMX-J-017 and UL 514B).
 - .5 CSA C22.2 No. 45.1-07 (R2012), Electrical Rigid Metal Conduit - Steel (Tri-National standard, with UL 6 and NMX-J-534-ANCE-2007).
 - .6 CSA C22.2 No. 56-13, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .7 CSA C22.2 No. 83-M1985 (R2013), Electrical Metallic Tubing.
 - .8 CSA C22.2 No. 211.2-06 (R2011), Rigid PVC (Unplasticized) Conduit.
 - .9 CAN/CSA-C22.2 No. 227.3-15, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada.

1.02 SUBMITTALS

- .1 Product data: submit manufacturer's printed product literature, specifications and datasheets.
 - .1 Submit cable manufacturing data.
- .2 Quality assurance submittals:
 - .1 Test reports: submit certified test reports.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Instructions: submit manufacturer's installation instructions.

1.03 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

2 PRODUCTS

2.01 CABLES AND REELS

- .1 Provide cables on reels or coils.
 - .1 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.
- .2 Each coil or reel of cable to contain only one continuous cable without

splices.

- .3 Identify cables for exclusively dc applications.

2.02 CONDUITS

- .1 Rigid metal conduit: to CSA C22.2 No. 45.1, hot dipped galvanized steel threaded.
- .2 Epoxy coated conduit: to CSA C22.2 No. 45.1, with zinc coating and corrosion resistant epoxy finish inside and outside.
- .3 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with expanded ends.
- .4 Rigid PVC conduit: to CSA C22.2 No. 211.2.
- .5 Flexible metal conduit: to CSA C22.2 No. 56, steel or aluminum liquid-tight flexible metal.
- .6 Flexible pvc conduit: to CAN/CSA-C22.2 No. 227.3.

2.03 CONDUIT FASTENINGS

- .1 One hole malleable iron straps to secure surface conduits 50 mm and smaller.
 - .1 Two hole steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits.
- .4 Threaded rods, 6 mm diameter, to support suspended channels.

2.04 CONDUIT FITTINGS

- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT.
 - .1 Set-screws are not acceptable.

2.05 EXPANSION FITTINGS FOR RIGID CONDUIT

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.06 FISH CORD

- .1 Polypropylene.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.02 INSTALLATION

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in mechanical and electrical service rooms.
- .3 Obtain approval from the Departmental Representative or designate prior to surface mounting conduits.
- .4 Use rigid hot dipped galvanized steel threaded conduit except where specified otherwise.
- .5 Use epoxy coated conduit in corrosive areas.
- .6 Use electrical metallic tubing (EMT) above 2.4 m not subject to mechanical injury.
- .7 Use rigid pvc conduit underground.
- .8 Use flexible metal conduit for connection to motors in dry areas and work in movable metal partitions.
- .9 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.
- .10 Use explosion proof flexible connection for connection to explosion proof motors.
- .11 Install conduit sealing fittings in hazardous areas.
 - .1 Fill with compound.
- .12 Minimum conduit size for lighting and power circuits: 19 mm.
- .13 Bend conduit cold:
 - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .14 Mechanically bend steel conduit over 19 mm diameter.
- .15 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .16 Install fish cord in empty conduits.
- .17 Run 2- 35 mm spare conduits up to ceiling space and 2- 35 mm spare conduits down to ceiling space from each flush panel.
 - .1 Terminate these conduits in 152 x 152 x 152 mm surface type junction boxes in ceiling space or in case of an exposed concrete slab,

terminate each conduit in surface type box.

- .18 Remove and replace blocked conduit sections.
 - .1 Do not use liquids to clean out conduits.
- .19 Dry conduits out before installing wire.

3.03 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible on channels.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.04 CONCEALED CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.
- .3 Do not install conduits in terrazzo or concrete toppings.

3.05 CONDUITS IN CAST-IN-PLACE CONCRETE

- .1 Locate to suit reinforcing steel.
 - .1 Install in centre one third of slab.
- .2 Protect conduits from damage where they stub out of concrete.
- .3 Install sleeves where conduits pass through slab or wall.
- .4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed.
 - .1 Use cold mastic between sleeve and conduit.
- .5 Conduits in slabs: minimum slab thickness 4 times conduit diameter.
- .6 Encase conduits completely in concrete with minimum 25 mm concrete cover.
- .7 Organize conduits in slab to minimize cross-overs.

3.06 CONDUITS IN CAST-IN-PLACE SLABS ON GRADE

- .1 Run conduits 25 mm and larger below slab and encase in 75 mm concrete envelope.
 - .1 Provide 50 mm of sand over concrete envelope below floor slab.

3.07 CONDUITS UNDERGROUND

- .1 Slope conduits to provide drainage.

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.2 Waterproof joints (pvc excepted) with heavy coat of bituminous paint.

3.08 CLEANING

.1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 GENERAL

1.01 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-C22.2 No.126.1-09(R2014), Metal Cable Tray Systems.
 - .2 CAN/CSA-C22.2 No.126.2-02(R2012), Nonmetallic Cable Tray Systems.
- .2 National Electrical Manufacturers Association (NEMA) standards
 - .1 NEMA VE 1-2009, Metal Cable Tray Systems.

1.02 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data.
- .2 Identify types of cabletroughs used.
- .3 Show actual cabletrough installation details and suspension system.

1.03 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Departmental Representative or designate.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

2 PRODUCTS

2.01 CABLETROUGH

- .1 Cabletroughs and fittings: to NEMA VE 1.
- .2 Wire cable type, to CAN/CSA C22.2 No.126.
- .3 Trays: welded steel wire, sized as indicated.
- .4 Fittings: horizontal elbows, end plates, drop outs, vertical risers and drops, tees, wyes, expansion joints and reducers where required, manufactured accessories for cabletrough supplied.
- .5 Solid covers for complete cabletrough system including fittings where indicated.
- .6 Barriers where different voltagesystems are in same cabletrough.

2.02 SUPPORTS

- .1 Provide supports as required.

3 EXECUTION

3.01 INSTALLATION

- .1 Install complete cabletrough system.
- .2 Support cabletrough on both sides.
- .3 Remove sharp burrs or projections to prevent damage to cables or injury to personnel.

3.02 CABLES IN CABLETROUGH

- .1 Install cables individually.
- .2 Lay cables into cabletrough. Use rollers when necessary to pull cables.
- .3 Secure cables in cabletrough at 6 m centres, with nylon ties.
- .4 Identify cables every 30 m with size 2 nameplates.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 26 05 00.
- .2 Section 01 35 43. Environmental Procedures, 1.10 Historical/Archaeological Control.

1.02 REFERENCES

- .1 Insulated Cable Engineers Association, Inc. (ICEA)

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for cables and include product characteristics, performance criteria, physical size, finish and limitations.

1.04 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 indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect cables from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 CABLE PROTECTION

- .1 38 x 140 mm planks pressure treated with copper naphthenate or 5% pentachlorophenol solution, water repellent preservative.

2.02 MARKERS

- .1 Concrete type cable markers: 600 x 600 x 100 mm with words: cable, joint or conduit impressed in top surface, with arrows to indicate change in direction of cable and duct runs.

3 EXECUTION

3.01 EXAMINATION

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

3.02 DIRECT BURIAL OF CABLES

- .1 After sand bed is in place, lay cables maintaining 75 mm clearance from each side of trench to nearest cable.
 - .1 Do not pull cable into trench.
- .2 Include offsets for thermal action and minor earth movements.
 - .1 Offset cables 150 mm minimum for each 60 m run, maintaining minimum cable separation and bending radius requirements.
- .4 Underground cable splices not acceptable.
- .5 Minimum permitted radius at cable bends for rubber, plastic or lead covered cables, 8 times diameter of cable or in accordance with manufacturer's written recommendations; for metallic armoured cables, 12 times diameter of cables or in accordance with manufacturer's instructions.
- .6 Cable separation:
 - .1 Maintain 75 mm minimum separation between cables of different circuits.
 - .2 Maintain 300 mm minimum horizontal separation between low and high voltage cables.
 - .3 When low voltage cables cross high voltage cables maintain 300 mm vertical separation with low voltage cables in upper position.
 - .4 At crossover, maintain 75 mm minimum vertical separation between low voltage cables and 150 mm between high voltage cables.
 - .5 Maintain 300 mm minimum lateral and vertical separation for fire alarm and control cables when crossing other cables, with fire alarm and control cables in upper position.
 - .6 Install treated planks on lower cables 0.6 m minimum in each direction at crossings.
- .7 After sand protective cover is in place, install continuous row of interlocking cable blocks as indicated to cover length of run.

3.03 CABLE INSTALLATION IN DUCTS

- .1 Install cables as indicated in ducts.
- .2 Do not pull spliced cables inside ducts.

- .3 Install multiple cables in duct simultaneously.
- .4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
- .5 To facilitate matching of colour coded multiconductor control cables reel off in same direction during installation.
- .6 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.
- .7 After installation of cables, seal duct ends with duct sealing compound.

3.04 MARKERS

- .1 Mark cable every 150 m along duct runs and changes in direction.
- .2 Mark underground splices.
- .3 Where markers are removed to permit installation of additional cables, reinstall existing markers.
- .4 Lay concrete markers flat and centred over cable with top flush with finish grade.

3.05 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00.
- .2 Perform tests using qualified personnel.
 - .1 Include necessary instruments and equipment.
- .3 Check phase rotation and identify each phase conductor of each feeder.
- .4 Check each feeder for continuity, short circuits and grounds.
 - .1 Ensure resistance to ground of circuits is not less than 50 megohms.
- .5 Pre-acceptance tests:
 - .1 After installing cable but before splicing and terminating, perform insulation resistance test with [1000] V megger on each phase conductor.
 - .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
- .6 Acceptance Tests:
 - .1 Ensure that terminations and accessory equipment are disconnected.
 - .2 Ground shields, ground wires, metallic armour and conductors not under test.
 - .3 High Potential (Hipot) Testing.
 - .1 Conduct hipot testing in accordance with ICEA recommendations.
 - .4 Leakage Current Testing:
 - .1 Raise voltage in steps from zero to maximum values as specified by ICEA for type of cable being tested.
 - .2 Hold maximum voltage for specified time period by ICEA.
 - .3 Record leakage current at each step.

- .7 Provide Departmental Representative designate with list of test results showing location at which each test was made, circuit tested and result of each test.
- .8 Remove and replace entire length of cable if cable fails to meet any of test criteria.

3.06 CLEANING

- .1 Progress Cleaning:
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
- .3 Waste Management: separate waste materials for reuse and recycling.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.07 PROTECTION

- .1 Repair damage to adjacent materials caused by cables installation.

END OF SECTION

1 GENERAL

1.01 WORK INCLUDED

- .1 Provide all equipment in sprinklered areas with accessories to prevent the entry of water into the enclosures in the event that the sprinkler system is activated.

2 PRODUCTS

2.01 MATERIALS

- .1 Gaskets on lighting, receptacle and distribution panelboard doors.
- .2 Drip shield on switchboards, panelboards and transformers.
- .2 Gaskets on doors and drip shields on fire alarm and communication systems panels and enclosures.
- .3 Louvres facing outward and downward where openings are required for heat dissipation. Expanded metal screening is not acceptable.
- .4 CSA certified sealing rings for rigid steel galvanized conduit and CSA certified raintight connectors for steel galvanized electrical metallic tubing (EMT).

3 EXECUTION

3.01 INSTALLATION

- .1 Install sealing rings and raintight connectors on all conduit terminations entering the top or side of all panel enclosures and for all conduit terminations for pull boxes, junction boxes, splitter troughs, wireways, auxiliary gutters, cable troughs and disconnect switches installed below the level of the sprinkler heads.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 26 05 00.

1.02 REFERENCES

- .1 CSA International
 - .1 CSA C22.2 No.29-2015, Panelboards and Enclosed Panelboards.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for panelboards and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Include on drawings:
 - .1 Electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

1.04 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: submit operation and maintenance data for panelboards for incorporation into manual.

1.05 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 indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect panelboards from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 PANELBOARDS

- .1 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.
 - .1 Install circuit breakers in panelboards before shipment.
 - .2 In addition to CSA requirements manufacturer's nameplate must show

fault current that panel including breakers has been built to withstand.

- .2 250 V panelboards: bus and breakers rated for 10,000 A (symmetrical) interrupting capacity or as indicated.
- .3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.
- .4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .5 Minimum of 2 flush locks for each panel board.
- .6 Two keys for each panelboard and key panelboards alike.
- .7 Copper bus with neutral of same ampere rating of mains.
- .8 Mains: suitable for bolt-on breakers.
- .9 Trim with concealed front bolts and hinges.
- .10 Trim and door finish: baked enamel.
- .11 Include grounding busbar with 3 of terminals for bonding conductor equal to breaker capacity of the panel board.
- .12 Provide type 1 enclosure with sprinkler drip hood.

2.02 BREAKERS

- .1 Breakers: to Section 26 28 16.02.
- .2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.
- .3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.
- .4 Lock-on devices for breakers installed as indicated. Turn over unused lock-on devices to Departmental Representative or designate.
- .5 Lock-on devices for fire alarm, emergency, exit and emergency lighting circuits.

2.03 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00.
- .2 Nameplate for each panelboard size 4 engraved.
- .3 Nameplate for each circuit in distribution panelboards size 2 engraved.
- .4 Complete circuit directory with typewritten legend showing location and load of each circuit, mounted in plastic envelope at inside of panel door.
- .5 Circuits supplying Patient Care Areas must be entered in circuit directory

with Bold Font.

3 EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION

- .1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.
- .2 Install surface mounted panelboards on plywood backboards. Where practical, group panelboards on common backboard.
- .3 Mount panelboards to height specified in Section 26 05 00.
- .4 Connect loads to circuits.
- .5 Connect neutral conductors to common neutral bus with respective neutral identified.

3.03 CLEANING

- .1 Progress Cleaning:
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
- .3 Waste Management: separate waste materials for reuse and recycling.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.04 PROTECTION

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

END OF SECTION

1 GENERAL

1.01 REFERENCES

- .1 CSA International
 - .1 CAN/CSA-C22.2 No.94.1-15, Enclosures for Electrical Equipment, Non Environment Considerations.
- .2 The Munsell System of Colour Notation

1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for [electrical cabinets and enclosures] and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

1.03 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: submit operation and maintenance data for electrical cabinets and enclosures for incorporation into manual.

1.04 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 indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect electrical cabinets and enclosures from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 MATERIALS

- .1 Enclosure constructed with 2.7 mm thick minimum steel, with weather and corrosion resistant finish to CAN/CSA-C22.2 No. 94.1, Munsell Notation 7.5GY3.5/1.5, size as indicated.
- .2 Entire enclosure to be capable of withstanding maximum impact force of 86

- MN/m2 area without rupture of material.
- .3 Removable enclosure panels with formed edges, galvanized steel external fasteners removable only from inside enclosure.
 - .4 Equip enclosure with hot dipped galvanized mounting rails 1 m adjustable horizontally and vertically to enable mounting of equipment at any location within housing.
 - .1 Rails: 14 mm holes and 50 x 14 mm slots on 100 mm centres for horizontal adjustment.
 - .2 Holes in side panel flanges in 60 mm increments for vertical adjustment.
 - .5 Cover: tamperproof, bolt-on, domed to shed water.
 - .6 Door: 3 point latching, with padlocking means.
 - .7 Ventilation panel constructed to allow air circulation yet preventing entry of foreign objects, wild life, and vermin.
 - .8 Enclosure construction such as to allow configuration of single or ganged enclosures.
 - .9 Enclosure capable of being shipped in knocked-down condition.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for electrical cabinet and enclosure installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative or designate.
 - .2 Inform Departmental Representative or designate of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative or designate.

3.02 INSTALLATION

- .1 Assemble enclosure in accordance with manufacturer's instructions and securely mount on building structure with channels, supports and fastenings.
- .2 Mount equipment in enclosure.
- .3 Label electrical cabinets and enclosure to Section 26 05 00.

3.03 CLEANING

- .1 Progress Cleaning:
 - .1 Leave Work area clean at end of each day.

- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
- .3 Waste Management: separate waste materials for reuse and recycling.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

1 GENERAL

1.01 REFERENCES

- .1 CSA International
 - .1 CSA C22.2 No.42-13, General Use Receptacles, Attachment Plugs and Similar Devices.
 - .2 CAN/CSA-C22.2 No.42.1-13, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
 - .3 CSA C22.2 No.55-15, Special Use Switches.
 - .4 CSA C22.2 No.111-10(R2015), General-Use Snap Switches (Bi-national standard, with UL 20).

1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for wiring devices and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

1.03 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: submit operation and maintenance data for wiring devices for incorporation into manual.

1.04 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 indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect wiring devices from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new

2 PRODUCTS

2.01 SWITCHES

- .1 15/20 A, 120 V, single pole, one-way/three-way switches to: CSA C22.2 No.55 and CSA C22.2 No.111.
- .2 Manually-operated general purpose AC switches with following features:

- .1 Terminal holes approved for No. 10 AWG wire.
 - .2 Silver alloy contacts.
 - .3 Urea or melamine moulding for parts subject to carbon tracking.
 - .4 Suitable for back and side wiring.
 - .5 Ivory toggle.
- .3 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.
- .4 Switches of one manufacturer throughout project.

2.02 RECEPTACLES

- .1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA C22.2 No.42 with following features:
- .1 Ivory/Brown urea moulded housing.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Break-off links for use as split receptacles.
 - .4 Eight back wired entrances, four side wiring screws.
 - .5 Triple wipe contacts and rivetted grounding contacts.
- .2 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground with following features:
- .1 [Ivory] [Brown] urea moulded housing.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Four back wired entrances, 2 side wiring screws.
- .3 Other receptacles with ampacity and voltage as indicated.
- .4 Receptacles of one manufacturer throughout project.

2.03 COVER PLATES

- .1 Cover plates for wiring devices to: CSA C22.2 No.42.1.
- .2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
- .3 Nylon cover plates, thickness 2.5 mm for wiring devices mounted in flush-mounted outlet box. Colour to be confirmed by departmental representative.
- .4 Stainless steel cover plates for surface wall mounted wiring devices mounted in cast FS or FD type conduit boxes.
- .5 Weatherproof, lockable in-use covers, complete with gaskets for exterior wall mounted duplex receptacles where shown on plans.

2.06 SOURCE QUALITY CONTROL

- .1 Cover plates from one manufacturer throughout project.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wiring devices installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative or designate.
 - .2 Inform Departmental Representative or designate of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative or designate.

3.02 INSTALLATION

- .1 Switches:
 - .1 Install single throw switches with handle in "UP" position when switch closed.
 - .2 Install switches in gang type outlet box when more than one switch is required in one location.
 - .3 Mount toggle switches at height in accordance with Section 26 05 00.
- .2 Receptacles:
 - .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
 - .2 Mount receptacles at height in accordance with Section 26 05 00 or as indicated.
 - .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
 - .4 Install GFCI type receptacles as indicated.
- .3 Cover plates:
 - .1 Install suitable common cover plates where wiring devices are grouped.
 - .2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

3.03 CLEANING

- .1 Progress Cleaning:
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
- .3 Waste Management: separate waste materials for reuse and recycling.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.04 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Protect stainless steel cover plate finish with paper or plastic film until

painting and other work is finished.

- .3 Repair damage to adjacent materials caused by wiring device installation.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

- .1 Product Data:
 - .1 Provide fuse performance data characteristics for each fuse type and size. Performance data to include: average melting time-current characteristics.
- .2 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

1.02 DELIVERY, STORAGE AND HANDLING

- .1 Ship fuses in original containers.
- .2 Do not ship fuses installed in switchboard.
- .3 Store fuses in original containers in moisture free location.
- .4 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling.

1.03 MAINTENANCE MATERIALS

- .1 Provide maintenance materials.
- .2 Three spare fuses of each type and size installed above 400 A.
- .3 Six spare fuses of each type and size installed up to and including 400 A.

2 PRODUCTS

2.01 FUSES - GENERAL

- .1 Fuse type references L and J have been adopted for use in this specification.
- .2 Fuses: product of one manufacturer.

2.02 FUSE TYPES

- .1 Class L fuses.
 - .1 Type L1, time delay, capable of carrying 500% of its rated current for 10 s minimum.
 - .2 Type L2, fast acting.
 - .3 For fuses rated 601 to 6000 A.
- .2 Class J fuses.
 - .1 Type J1, time delay, capable of carrying 500% of its rated current for 10 s minimum.

- .2 Type J2, fast acting.
- .3 For fuses rated 1 to 600 A.

3 EXECUTION

3.01 INSTALLATION

- .1 Install fuses in mounting devices immediately before energizing circuit.
- .2 Ensure correct fuses fitted to physically matched mounting devices.
- .3 Ensure correct fuses fitted to assigned electrical circuit.

END OF SECTION

1 GENERAL

1.01 PRODUCT DATA

- .1 Submit product data.

1.02 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.

2 PRODUCTS

2.01 DISCONNECT SWITCHES

- .1 Fusible or non-fusible (as indicated) disconnect switch.
- .1 CSA Enclosure and size as indicated.
- .2 Provision for padlocking in off switch position.
- .3 Mechanically interlocked door to prevent opening when handle in ON position.
- .4 Fuses: size as indicated, to Section 26 28 13.01.
- .5 Fuseholders: suitable without adaptors, for type and size of fuse indicated.
- .6 Quick-make, quick-break action.
- .7 ON-OFF switch position indication on switch enclosure cover.

2.02 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00.
- .2 Indicate name of load controlled on size 4 nameplate.

3 EXECUTION

3.01 INSTALLATION

- .1 Install disconnect switches complete with fuses if applicable.

END OF SECTION

1 GENERAL

1.01 REFERENCES

- .1 CSA International
 - .1 CSA C22.2 No.14-13, Industrial Control Equipment.
- .3 National Electrical Manufacturers Association (NEMA)
 - .1 NEMA ICS 2-2000(R2005), Controllers, Contactors and Overload Relays Rated 600 V.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for contactors and include product characteristics, performance criteria, physical size, finish and limitations.

1.03 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: submit operation and maintenance data for contactors for incorporation into manual.
- .2 Include operating information required for start-up, synchronizing and shut-down of generating units.

1.04 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 indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect contactors from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 CONTACTORS

- .1 Contactors: to CSA C22.2 No.14.
- .2 Electrically held controlled by pilot devices as indicated and rated for type of load controlled. Half size contactors not accepted.
- .3 Breaker or fused switch combination contactor as indicated.

- .4 Complete with 2 normally open and 2 normally closed auxiliary contacts unless indicated otherwise.
- .5 Mount in CSA Enclosure Type 1 unless otherwise indicated.

2.02 EQUIPMENT IDENTIFICATION

- .1 Identify equipment in accordance with Section 26 05 00.
- .2 Size 4 nameplate indicating name of load controlled.

3 EXECUTION

3.01 INSTALLATION

- .1 Install contactors and connect power wires and auxiliary control devices.
- .2 Identify contactors with nameplates or labels indicating panel and circuit number.
- .3 Test contactors in accordance with 26 05 00.

3.02 CLEANING

- .1 Progress Cleaning:
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
- .3 Waste Management: separate waste materials for reuse and recycling.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.03 PROTECTION

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

END OF SECTION

1 GENERAL

1.01 REFERENCES

- .1 CSA International
 - .1 CSA C22.2 No.14-13, Industrial Control Equipment.
- .3 National Electrical Manufacturers Association (NEMA)
 - .1 NEMA ICS 1- 2000 (R2005, R2008, R2015), Industrial Control and Systems: General Requirements.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for control devices and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Include schematic, wiring, interconnection diagrams

1.03 QUALITY ASSURANCE

- .1 Conduct tests in accordance with Section 26 05 00.

1.04 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: submit operation and maintenance data for control devices for incorporation into manual.

1.05 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 indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect control devices from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 AC CONTROL RELAYS

- .1 Control Relays: to CSA C22.2 No.14 and NEMA ICS 1.
- .4 Universal pole type: electrically held with number of poles as indicated, convertible from NO to NC by changing wiring connections. Coil rating: as indicated. Contact rating: as indicated.

2.02 RELAY ACCESSORIES

- .1 Standard contact cartridges: normally-open - convertible to normally-closed in field.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for control devices installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative or designate.
 - .2 Inform Departmental Representative or designate of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative or designate.

3.02 INSTALLATION

- .1 Install control devices and interconnect as indicated.

3.03 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00.
- .2 Depending upon magnitude and complexity, divide control system into convenient sections, energize one section at time and check out operation of section.
- .3 Upon completion of sectional test, undertake group testing.
- .4 Check out complete system for operational sequencing.

3.04 CLEANING

- .1 Progress Cleaning:
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

- .3 Waste Management: separate waste materials for reuse and recycling.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

1 GENERAL

1.01 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI C82.1- 2004 (R2008, R2015), American National Standard for Lamp Ballasts - Line Frequency Fluorescent Lamp Ballasts.
 - .2 ANSI C82.4-2002, American National Standard for Ballasts for High-Intensity Discharge and Low-Pressure Sodium (LPS) Lamps (Multiple-Supply Type).
- .2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
 - .1 ANSI/IEEE C62.41-[1991], Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- .3 Canadian Standards Association (CSA International)
- .4 Underwriters' Laboratories of Canada (ULC)

1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Departmental Representative or designate.
 - .3 Photometric data to include: spacing criterion.
- .2 Samples:
 - .1 Provide samples fixtures and install in mock-up ceiling. Include cost of mock-up in project price. Locate mock-up on site.
- .3 Quality assurance submittals: provide following.
 - .1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence and cleaning procedures.

1.03 QUALITY ASSURANCE

- .1 Provide mock-ups.

1.04 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse by manufacturer of pallets, crates, padding and packaging materials.

- .4 Divert unused metal materials from landfill to metal recycling facility.
- .5 Disposal and recycling of fluorescent lamps as per local regulations.
- .6 Disposal of old PCB filled ballasts.

2 PRODUCTS

2.01 LAMPS

- .1 Fluorescent lamps to be - T8, 32 Watt, medium bi-pin, rapid-start, 4100 K, 30,000 hour lamp life, 2950 initial lumens, CRI 80; or as indicated.
- .2 Compact fluorescent lamps to be - 18 Watt, G24q-2 base, 12,000 hour lamp life, 12,000 initial lumens, 4100 K, CRI 80; or as indicated.
- .3 LED lamps to be - 50,000 hour lamp life, 12,000 initial lumens, 4000 K, CRI 80, lumen maintenance L70 rating; or as indicated.

2.02 BALLASTS AND DRIVERS

- .1 Fluorescent ballast: CBM and CSA certified, energy efficient type, IC electronic dimmable.
 - .1 Rating: 120 V, 60 Hz, for use with 2-32W, rapid start lamps.
 - .2 Totally encased and designed for 40 degrees Celsius ambient temperature.
 - .3 Power factor: minimum 95 % with 95% of rated lamp lumens.
 - .4 Current crest factor: 1.7 maximum.
 - .5 Harmonics: 10 % maximum THD.
 - .6 Operating frequency of electronic ballast: 20 kHz minimum.
 - .7 Total circuit power: 62 Watts.
 - .8 Ballast factor: greater than 0.90.
 - .9 Sound rated: Class A.
 - .10 Mounting: integral with luminaire.
- .2 LED drivers:
 - .1 LED drivers shall be electronic-type, 120V and with a minimum efficiency of 85%.
 - .2 Dimmable LED drivers shall be 0-10V type. Dimmable LED drivers shall be capable of dimming without LED strobing or flicker across the full dimming range.

2.03 FINISHES

- .1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

2.04 OPTICAL CONTROL DEVICES

- .1 As indicated in luminaire schedule.

2.05 LUMINAIRES

- .1 As indicated in luminaire schedule.

3 EXECUTION

3.01 INSTALLATION

- .1 Locate and install luminaires as indicated.
- .2 Provide adequate support to suit ceiling system.

3.02 WIRING

- .1 Connect luminaires to lighting circuits:
 - .1 Install flexible or rigid conduit for luminaires as indicated.

3.03 LUMINAIRE SUPPORTS

- .1 For suspended ceiling installations support luminaires independently of ceiling.

3.04 LUMINAIRE ALIGNMENT

- .1 Align luminaires mounted in continuous rows to form straight uninterrupted line.
- .2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

3.05 CLEANING

- .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling.

END OF SECTION

1 GENERAL

1.01 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.2 No. 211.1-06 (R2011), Rigid Types EBI and DB2/ES2 PVC Conduit.
 - .2 CSA C22.2 NO. 2420-09 (R2014), Belowground reinforced thermosetting resin conduit (RTRC) and fittings (Bi-national standard, with UL 2420).

1.02 SUBMITTALS

- .1 Submit WHMIS MSDS - Material Safety Data Sheets acceptable to Labour Canada and Health and Welfare Canada for solvent cement. Indicate VOC content.

2 PRODUCTS

2.01 PVC DUCTS AND FITTINGS

- .1 Rigid PVC duct: to CSA C22.2 No. 211.1, Type DB2/ES2, with moulded fittings, for direct burial expanded flange ends, Trade sizes. Nominal length: 6 m plus or minus 12 mm.
- .2 Rigid PVC split ducts.
- .3 Rigid PVC bends, couplings, reducers, bell end fittings, plugs, caps, adaptors same product material as duct, to make complete installation.
- .4 Rigid PVC 90° and 45° bends.
- .5 Rigid PVC 5° angle couplings.
- .6 Expansion joints as required.

2.02 SOLVENT WELD COMPOUND

- .1 Solvent cement for PVC duct joints.

2.03 CABLE PULLING EQUIPMENT

- .1 6 mm stranded nylon pull rope tensile strength 5 kN.

2.04 MARKERS

- .1 Concrete type cable markers: as indicated, with words: "Cable", "Joint" or "Conduit" impressed in top surface, with arrows to indicate change in direction of duct runs.

3 EXECUTION

3.01 INSTALLATION

- .1 Install duct in accordance with manufacturer's instructions.
- .2 Clean inside of ducts before laying.
- .3 Ensure full, even support every 1.5 m throughout duct length.
- .4 Slope ducts with 1 to 400 minimum slope.
- .5 During construction, cap ends of ducts to prevent entrance of foreign materials.
- .6 Pull through each duct steel or wooden mandrel not less than 300 mm long and of diameter 6 mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign matter. Pull stiff bristle brush through each duct immediately before pulling-in cables.
- .7 In each duct install pull rope continuous throughout each duct run with 3 m spare rope at each end.
- .8 Install markers as required.

END OF SECTION

1 GENERAL

1.01 REFERENCES

- .1 CSA International
 - .1 CSA C22.2 No.141-15, Emergency Lighting Equipment.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for emergency lighting and include product characteristics, performance criteria, physical size, finish and limitations

1.03 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: submit operation and maintenance data for emergency lighting for incorporation into manual.

1.04 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 indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect emergency lighting from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

1.05 WARRANTY

- .1 For batteries in this Section 26 52 00 - Emergency Lighting, 12 months warranty period is extended to 120 months.

2 PRODUCTS

2.01 EQUIPMENT

- .1 Emergency lighting equipment: to CSA C22.2 No.141.
- .2 Supply voltage: 120 V, AC.
- .3 Output voltage: 24 V DC.
- .4 Operating time: 30 minutes.

- .5 Battery: sealed, maintenance free.
- .6 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01 V for plus or minus 10% input variations.
- .7 Solid state transfer circuit.
- .8 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.
- .9 Signal lights: solid state, for 'AC Power ON'.
- .10 Lamp heads: integral on unit, 345 degrees horizontal and 180 degrees vertical adjustment. Lamp type: LED, as indicated.
- .11 Cabinet: suitable for direct or shelf mounting to wall and c/w knockouts for conduit. Removable or hinged front panel for easy access to batteries.
- .13 Auxiliary equipment:
 - .1 Ammeter.
 - .2 Voltmeter.
 - .3 Test switch.
 - .4 Time delay relay.
 - .5 Battery disconnect device.
 - .6 AC input and DC output terminal blocks inside cabinet.
 - .7 Shelf.
 - .8 Cord and plug connection for AC.
 - .9 RFI suppressors.

2.02 WIRING OF REMOTE HEADS

- .1 Conduit: in accordance with Section 26 05 34.
- .2 Conductors: in accordance with Section 26 05 21, sized in accordance with manufacturer's recommendations.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for emergency lighting installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative or designate.
 - .2 Inform Departmental Representative or designate of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative or designate.

3.02 INSTALLATION

- .1 Install unit equipment and remote mounted fixtures.
- .2 Direct heads.
- .3 Connect exit lights to unit equipment.

3.03 CLEANING

- .1 Progress Cleaning:
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
- .3 Waste Management: separate waste materials for reuse and recycling.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.04 PROTECTION

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

END OF SECTION

1 GENERAL

1.01 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2 No.141-15, Unit Equipment for Emergency Lighting.
 - .2 CAN/CSA-C860- 11 (R2016), Performance of Internally Lighted Exit Signs.
- .2 National Fire Protection Association (NFPA)
 - .1 NFPA 101-2015, Life Safety Code.
- .3 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S572-10, First Edition Standard for Photoluminescent and Self-Luminous Exit Signs and Path Marking Systems.

1.02 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit WHMIS MSDS - Material Safety Data Sheets.
- .3 Quality Assurance Submittals:
 - .1 Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures.
- .4 For the Work of this Section 26 53 00 Exit Lights the 12 months warranty period is extended to 25 years.

1.03 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling.

2 PRODUCTS

2.01 STANDARD UNITS

- .1 Exit lights: to CSA C22.2 No.141 and CSA C860.
- .2 Housing: cast anodized extruded aluminum housing, brush aluminum finish.
- .3 Face and back plates: extruded aluminum.
- .4 Lamps: LED, less than 4.6 W, 24 V.
- .5 Operation: designed for over 100,000 hours of continuous operation without relamping.
- .6 Green running man to comply with OBC.

- .7 Face plate to remain captive for relamping.

2.02 SELF-POWERED UNITS

- .1 Exit lights: to CSA C22.2 No.141 and CSA C860.
- .2 Housing: cast anodized extruded aluminum housing, brush aluminum finish.
- .3 Face and back plates: extruded aluminum.
- .4 Lamps: LED, less than 4.6 W, 24 V.
- .5 Operation: designed for over 100,000 hours of continuous operation without relamping.
- .6 Green running man to comply with OBC.
- .7 Supply voltage: 120 V, ac.
- .8 Output voltage: 24 V dc.
- .9 Operating time: 30 minimum.
- .10 Recharge time: 12 hours
- .11 Battery: sealed, maintenance free.
- .12 Charger: solid state, voltage/current regulated, inverse temperature compensated, short circuit protected, with regulated output of plus or minus 0.01 V for plus or minus 10% V input variation.
- .13 Solid state transfer circuit.
- .14 Signal lights: solid state, for 'AC Power ON' condition.
- .15 Mounting: suitable for universal mounting directly on junction box and c/w knockouts for conduit.
 - .1 Removable or hinged front panel for easy access to batteries.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.02 INSTALLATION

- .1 Install exit lights to manufacturer's recommendations, listing requirements, NFPA standard and local regulatory requirements.
- .2 Connect fixtures to exit light circuits.
- .3 Connect emergency lamp sockets to emergency circuits.

- .4 Ensure that exit light circuit breaker is locked in on position.

3.03 CLEANING

- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 GENERAL

1.01 RELATED SECTIONS

- .1 Section 26 05 00 - Common Work Results - Electrical.

1.02 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI J-STD-607-A-2002, Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.

1.03 SYSTEM DESCRIPTION

- .1 Telecommunications raceways system consists of outlet boxes, cover plates, distribution cabinets, conduits, cabletroughs, pull boxes, sleeves and caps, fish wires, service poles, service fittings, concrete encased ducts.

2 PRODUCTS

2.01 MATERIAL

- .1 Conduits: in accordance with Section 26 05 34.
- .2 Underground cable ducts: in accordance with Section 33 65 76.
- .3 Junction boxes: in accordance with Section 26 05 31.
- .4 Outlet boxes, conduit boxes, and fittings: in accordance with Section 26 05 31.
- .5 Fish wire: polypropylene type.

3 EXECUTION

3.01 INSTALLATION

- .1 Install empty raceway system, including distribution system, fish wire, terminal cabinets, outlet boxes, floor boxes, pull boxes, cover plates, conduit, sleeves and caps, cabletroughs, service poles, miscellaneous and positioning material to constitute complete system.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 26 05 00.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for communication raceway systems and include product characteristics, performance criteria, physical size, finish and limitations.

1.03 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 indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect communication raceway systems from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 SYSTEM DESCRIPTION

- .1 Empty telecommunications raceways system consists of outlet boxes, cover plates, distribution cabinets, conduits, cable trays, pull boxes, sleeves and caps, fish wires, service poles, service fittings, concrete encased ducts.

2.02 MATERIAL

- .1 Conduits: in accordance with Section 26 05 34.
- .2 Underground cable ducts: in accordance with Section 33 65 76.
- .3 Cable trays: in accordance with Section 26 05 36.
- .4 Junction boxes: in accordance with Section 26 05 31.
- .5 Outlet boxes, conduit boxes, and fittings: in accordance with Section 26 05 31.

- .6 Fish wire: polypropylene type.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for communication raceway systems installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Departmental Representative or designate.
 - .2 Inform Departmental Representative or designate of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative or designate.

3.02 INSTALLATION

- .1 Install empty raceway system, including distribution system, fish wire, terminal cabinets, outlet boxes, floor boxes, pull boxes, cover plates, conduit, sleeves and caps, cable tray, service poles, miscellaneous and positioning material to constitute complete system.

3.03 CLEANING

- .1 Progress Cleaning:
- .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
- .3 Waste Management: separate waste materials for reuse and recycling.
- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.04 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by pathways for communications systems installation.

END OF SECTION

1 GENERAL

1.01 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-C22.2 No. 214-08, Communications Cables (Bi-National standard with UL 444).
 - .2 CSA-C22.2 No. 232-M1988(R2004), Optical Fiber Cables.
- .2 Telecommunications Industry Association (TIA)/Electronic Industries Alliance (EIA)
 - .1 TIA/EIA-568-[B.1-(2001)], Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements.
 - .2 TIA/EIA-568-[B.2-(2001)], Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted-Pair Cabling Components.
 - .3 TIA/EIA-568-[B.3-(2000)], Optical Fiber Cabling Components Standard.
 - .4 TIA/EIA-606-[A-(2002)], Administration Standard for the Commercial Telecommunications Infrastructure.
 - .5 TIA TSB-140-[2004], Telecommunications Systems Bulletin - Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems.
 - .6 TIA-598-[C-(2005)], Optical Fiber Cable Color Coding.

1.02 DEFINITIONS

- .1 Refer to TIA/EIA-598-[C], Annex A for definitions of terms: optical-fiber interconnect, distribution, and breakout cables.

1.03 SYSTEM DESCRIPTION

- .1 Structured telecommunications wiring system consist of unshielded-twisted-pair and optical fiber cables, terminations, connectors, cross-connection hardware and related equipment installed inside building for Parks Canada telecommunications systems, including voice (telephone), data, and image.
- .2 Installed in physical star configuration with separate horizontal and backbone sub-systems.
 - .1 Horizontal cables link work areas to telecommunications room[s] located on same floor.
 - .2 Telecommunications/Server rooms linked to main terminal/equipment room (MT/ER) by backbone cables.

1.04 SUBMITTALS

- .1 Provide submittals in accordance with Section [01 33 00].
- .2 As-built Records and Drawings:
 - .1 Provide [Microsoft Access] database reflecting cable installation and cross-connections.
 - .2 Provide electronic drawings in AutoCAD 2011 format depicting all construction.
 - .3 Provide one electronic set of as-built records to the Departmental

Representative.

- .1 Provide and place one hard copy of as-built records for each telecommunications/Server room in plan holder in each telecommunications/Server room.

1.05 QUALITY ASSURANCE

- .1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section [01 35 29.06].

1.06 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section [01 74 20].

2 PRODUCTS

2.01 FOUR-PAIR 100 Ω BALANCED TWISTED PAIR CABLE

- .1 Four-pair, 100 ohm balanced unshielded-twisted-pair (UTP) cable, flame test classification FT6 to: CSA-C22.2 No. 214, Category 6 (Cat 6) to: TIA/EIA-568-[B.2].

2.03 WORK AREA UTP 2-PAIR.4 MODULAR JACK

- .1 Eight-position modular jack ("RJ-45"), type Category 6 to: TIA/EIA-568-B.2:
 - .1 In self-contained recessed deep box or dual channel raceway device plate.
 - .2 Recessed device box - Where 1 jack is shown, provide 2-position faceplate; Where 2 jacks are shown, provide 4-position faceplate; Where 4 jacks are shown, provide 6-position faceplate in 2-gang box with reducing faceplate.

2.05 TERMINATION AND CROSS-CONNECTION HARDWARE FOR UTP

- .1 Wall mounted rack - supplied and installed by Parks Canada.
- .3 Modular Patch panel(s) 19" deep - supplied and installed by Parks Canada:
 - .1 Each patch panel equipped with factory installed "RJ-45" jacks, type T568B Category 6 to: TIA/EIA-568-B.2.
 - .2 Provide horizontal cable-management unit for every 48 ports.

2.06 UTP CROSS-CONNECT WIRE

- .1 Category 6, 4 pairs to: TIA/EIA-568-B.2.

2.07 UTP PATCH CORDS

- .1 Two meter long, with factory-installed male plug at one end to mate with "RJ-45" jack and with factory-installed male plug at other end to mate with "RJ-45" jack Category 6, 4 pairs to: TIA/EIA-568-[B.2].

2.08 UTP EQUIPMENT CABLE

- .1 4 pair "pigtail", 2 meters long, with factory-installed male plug on one end to mate with "RJ-45" jack and other end equipped with male plug to mate with "RJ-45" jack: Category 6 to: TIA/EIA-568-B.2.

2.10 OPTICAL-FIBRE CABLE

- .1 Provide 6-strand 50/125um micron multimode fibre optic cable, indoor, plenum rated from incoming demarcation point in Mechanical room to Rack in Server Room: TIA/EIA-568-B.3, flame test classification FT6, each end terminated with 6 position SC Coupler plate and SC multimode connector.

3 EXECUTION

3.01 INSTALLATION OF TERMINATION AND CROSS-CONNECT HARDWARE

- .1 Install termination and cross-connect hardware in rack in Server room as indicated and according to manufacturers' instructions. Identify and label as indicated to: TIA/EIA-606-[A].
- .2 Install consolidation points, as indicated according to manufacturer's instructions. Identify and label as indicated to: TIA/EIA-606-[A].

3.02 INSTALLATION OF HORIZONTAL DISTRIBUTION CABLES

- .1 Install horizontal cables as indicated in conduits, cable trays and perimeter raceways from Server room to individual work-area jacks. Identify and label as indicated to: TIA/EIA-606-[A].
- .2 Above suspended acoustic ceilings, support horizontal cables at intervals not exceeding 2 meters on j-hooks or from structure with Velcro straps.
- .5 Coil spare cables and store in ceiling space in zone.
- .6 Harness slack cable in cabinets, racks, and wall-mounted termination and cross-connection hardware.

3.04 INSTALLATION OF EQUIPMENT CABLES

- .1 Install equipment cables from equipment [terminal strips] [patch panel] as indicated.
 - .1 Identify and label as indicated to: TIA/EIA-606-[A].

3.05 IMPLEMENT CROSS-CONNECTIONS

- .1 Implement cross-connections using patch cords as specified.

3.06 FIELD QUALITY CONTROL

- .1 Test horizontal UTP cables as specified below and correct deficiencies. Provide record of results as electronic record on CD.
 - .1 Perform tests for Permanent Link on installed cables, including spares:

- .1 Category 6 using certified level III tester to:
TIA/EIA-568-[B.2].
- .2 Perform tests for Channel on cross-connected data horizontal cabling installed from each telecommunications room, including shortest and longest drops from each telecommunications room: should more than 5% of tested cables fail, test remaining cross-connected data cables.
 - .1 Category 6 using certified level III tester to:
TIA/EIA-568-[B.2].
- .2 Test backbone UTP cables as specified below and correct deficiencies: provide record of results as [hard copy] [electronic record on [USB drive][CD]].
 - .1 Perform tests for Permanent Link on 4-pair cables:
 - .1 Category 5e using certified level IIe tester to:
TIA/EIA-568-[B.1].
 - .2 Category 6 using certified level III tester to:
TIA/EIA-568-[B.2].
 - .2 Perform Wire Map tests on multi-pair UTP cables to: TIA/EIA-568-[B.1].
- .3 Test Optical-fiber strands for attenuation to: TIA/EIA-568-[B.1] and correct deficiencies:
 - .1 Test horizontal links need at only one wavelength (850 nm or 1300 nm) and in one direction.
 - .1 Attenuation to be less than 2.0 dB, unless consolidation point is used.
 - .2 If consolidation point is used, attenuation test result to be less than 2.75 dB when testing between horizontal cross-connect and telecommunications outlet/connector.
 - .2 Test backbone links in [one] [both] direction[s]. Backbone links:
 - .1 Test multi-mode fiber at both applicable wavelengths (850 nm and 1300 nm).
 - .2 Test single-mode fiber at both applicable wavelengths (1550 nm and 1310 m).
 - .3 Maximum attenuation: Cable attenuation + Connector loss + Splice loss.
 - .1 Multi-mode-fiber attenuation coefficients:
 - .1 3.5 db/km @ 850 nm; and
 - .2 1.5 db km @ 1300 nm
 - .2 Single-mode fiber attenuation coefficients at both 1310 nm and 1550 nm:
 - .1 1.0 db/km for inside plant cable; and
 - .2 0.5 db/km for outside plant cables.
 - .3 Maximum connector insertion loss: 0.75 db per pair and maximum splice insertion loss: 0.3 db.
- .4 Provide record of results as hard copy and electronic record to: TIA/TSB-140.

END OF SECTION

1 GENERAL

1.01 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for fire alarm systems.
 - .2 Control panel to carry out fire alarm and protection functions including receiving alarm signals, initiating general alarm, supervising system continuously, actuating zone annunciators, and initiating trouble signals.
 - .3 Trouble signal devices.
 - .4 Power supply facilities.
 - .5 Manual alarm stations.
 - .6 Automatic alarm initiating devices.
 - .7 Audible signal devices.
 - .8 End-of-line devices.
 - .9 Annunciators.
 - .10 Visual alarm signal devices.
 - .11 Ancillary devices.
- .2 Related Sections:
 - .1 26 05 00.

1.02 REFERENCES

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .2 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-S524-2014, Standard for the Installation of Fire Alarm Systems.
 - .2 CAN/ULC-S525-2016, Audible Signal Device for Fire Alarm Systems.
 - .3 CAN/ULC-S526-2016, Visual Signal Devices for Fire Alarm Systems.
 - .4 CAN/ULC-S527-11-AMD-1(2014), Control Units.
 - .5 CAN/ULC-S528-2014, Manual Pull Stations for Fire Alarm Systems.
 - .6 CAN/ULC-S529-2016, Smoke Detectors for Fire Alarm Systems.
 - .7 CAN/ULC-S530-M91, Heat Actuated Fire Detectors for Fire Alarm Systems.
 - .8 CAN/ULC-S531-14, Standard for Smoke Alarms.
- .4 National Fire Protection Agency
 - .1 NFPA 72-2016, National Fire Alarm Code.

1.03 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet.
 - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS).
- .2 Shop Drawings:
 - .1 Submit shop drawings.
 - .1 Shop drawings: stamped and signed by professional engineer

- registered or licensed in Province of Ontario, Canada.
- .2 Include:
 - .1 Layout of equipment.
 - .2 Zoning.
 - .3 Complete wiring diagram, including schematics of modules.
 - .3 Quality assurance submittals:
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .2 Instructions: submit manufacturer's installation instructions.
 - .3 Manufacturer's Field Reports: manufacturer's field reports specified.
 - .4 Closeout Submittals:
 - .1 Submit maintenance and engineering data for incorporation into manual specified in accordance with ANSI/NFPA 20.
 - .2 Authority of Jurisdiction will delegate authority for review and approval of submittals required by this Section.
 - .3 Submit to Authority of Jurisdiction 2 sets of approved submittals and drawings immediately after approval but no later than 15 working days to prior to final inspection.
 - .4 Submit following:
 - .1 Manufacturer's Data for:
 - .1 Control panel and modules.
 - .2 Storage batteries.
 - .3 Battery charger.
 - .4 Manual pull stations.
 - .5 Heat detectors.
 - .6 Open-area smoke detectors.
 - .7 Duct smoke detectors.
 - .8 Alarm horns.
 - .9 Visible appliances.
 - .10 Main annunciator.
 - .11 Remote annunciator panel.
 - .12 Electro-magnetic door holder-releases.
 - .13 Wiring.
 - .14 Conduit.
 - .15 Outlet boxes.
 - .16 Fittings for conduit and outlet boxes.
 - .17 Trouble buzzer.
 - .18 Surge suppression devices.
 - .19 Mark data which describe more than one type of item to indicate which type will be provided.
 - .20 Submit 1 original for each item and clear, legible, first-generation photocopies for remainder of specified copies.
 - .2 System wiring diagrams:
 - .1 Submit complete wiring diagrams of system showing points of connection and terminals used for electrical connections in the system.
 - .2 Show modules, relays, switches and lamps in control panel.
 - .3 Design data: Power Calculations:
 - .1 Submit design calculations new work specified to substantiate that battery capacity exceeds supervisory

- and alarm power requirements.
- .2 Show comparison of detector power requirements per zone versus control panel smoke detector power output per zone in both standby and alarm modes.
- .3 Show comparison of notification appliance circuit alarm power requirements with rated circuit power output.
- .4 Instructions for operation:
 - .1 Projected beam smoke detector.
- .5 Schedules:
 - .1 Conductor wire marker schedule.
- .6 Test Reports:
 - .1 Open-area 2-wire smoke detectors.
 - .2 Preliminary testing:
 - .1 Final acceptance testing.
 - .2 Submit for inspections and tests specified under Field Quality Control.

1.04 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: company or person specializing in fire alarm system installations with 5 -years documented experience and approved by manufacturer.
- .2 Provide services of representative or technician from manufacturer of system, experienced in installation and operation of type of system being provided, to supervise installation, adjustment, preliminary testing, and final testing of system and to provide instruction to project personnel.
- .3 System:
 - .1 Subject to Fire Commissioner of Canada (FC) approval.
 - .2 Subject to FC inspection for final acceptance.
 - .3 To Canadian Forces Fire Marshal approval.
- .4 Extra Materials:
 - .1 Provide maintenance materials.
 - .2 Include:
 - .1 4 spare glass rods for manual pull box stations if applicable.
- .5 Maintenance Service:
 - .1 Provide one year's free maintenance with two inspections by manufacturer during warranty period. Inspection tests to conform to CAN/ULC- S536. Submit inspection report to Departmental Representative or designate.

1.05 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling.

2 PRODUCTS

2.01 MATERIALS

- .1 Equipment and devices: ULC listed and labelled and supplied by single manufacturer.
- .2 Power supply: to CAN/ULC-S524.
- .3 Audible signal devices: to CAN/ULC-S525.
- .4 Visual signal devices: to CAN/ULC-S526.
- .5 Control unit: to CAN/ULC-S527.
- .6 Manual pull stations: to CAN/ULC-S528.
- .7 Thermal detectors: to CAN/ULC-S530.
- .8 Smoke detectors: to CAN/ULC-S529.
- .9 Smoke alarms: to CAN/ULC-S531.

2.02 SYSTEM OPERATION

- .1 Provide complete, electrically supervised, non-coded, manual and automatic, zoned, annunciated, fire alarm system.
- .2 Provide separate circuits from control panel to each zone of initiating devices. Transmission of signals from more than one zone over common circuit to control panel is prohibited.
- .3 Single stage operation. Operation to actuation following:
 - .1 Manual station.
 - .2 Heat detector.
 - .3 Smoke detector.
 - .4 Automatic fire sprinkler system.
 - .5 Fire extinguishing system.
 - .6 Fire standpipe system.
- .4 Actuation of single operation device to initiate following:
 - .1 Building evacuation alarm devices to operate continuously.
 - .2 Transmit signal to fire department via monitoring station.
 - .3 Zone of alarm device to be indicated on control panel and remote annunciators.
 - .4 Air conditioning and ventilating fans to shut down or to function so as to provide required control of smoke movement.
 - .5 Fire doors and smoke control doors if normally held open, to close automatically.
 - .6 Electro-magnetic door holders to de-energize.
 - .7 Operations to remain in alarm mode (except alarm notification appliances if manually silenced) until system is manually restored to normal.
- .8 Capability to program smoke detector status change confirmation on any or zones in accordance with CAN/ULC-S527, Appendix C.

2.03 CONTROL PANEL

- .1 Class A.
- .2 Single stage operation.
- .3 Zoned.
- .4 Non-coded.
- .5 Enclosure:
 - .1 CSA Enclosure 1, c/w lockable concealed hinged door, full viewing window, flush lock and 2 keys.
 - .2 Provide modular type panel installed in flush mounted steel cabinet with hinged door and cylinder lock.
 - .3 Mount with panel centerline 1.5 m above finished floor elevation.
 - .4 Switches and other controls: not accessible without use of key.
 - .5 Design of control panel: neat, compact assembly containing parts and equipment required to provide specified operating and supervisory functions of system.
 - .6 Control panel components: CSA approved and approved by control panel manufacturer for use in control panel.
 - .7 Panel cabinet: finished on inside and outside with factory-applied enamel finish.
 - .8 Provide main annunciator located on exterior of cabinet door or visible through cabinet door.
 - .9 Provide audible trouble signal.
 - .10 Provide identification plates, silk-screened labels attached to rear face of panel viewing window, for lamps and switches.
 - .11 Provide 1 set of Form C dry alarm contacts per zone, common system Form C dry alarm contact, and common system Form C dry trouble contact.
 - .12 Permanently label switches.
 - .13 Provide panel with following switches:
 - .1 Trouble silencing switch which silences audible trouble signals including remote trouble devices without extinguishing trouble indicating lamp(s).
 - .1 For non-self-resetting type switch: Upon correction of trouble condition, audible signals will again sound until switch is returned to its normal position.
 - .2 For silencing switch of momentary action self-resetting type: trouble signal circuit automatically restored to normal upon correction of trouble condition.
 - .2 Evacuation alarm silencing switch which when activated will silence alarm notification appliances without resetting panel, and cause operation of system trouble signals. Subsequent alarm(s) from additional zone(s) not originally in alarm to cause activation of notification appliances even with alarm silencing switch in "silenced" position.
 - .3 Individual zone disconnect switches which when operated will disable only their respective initiating circuit and cause operation of system and zone trouble signals.
 - .4 Reset switch which when activated will restore the system to normal standby status after cause of alarm has been corrected, and activated initiating devices reset.
 - .1 Operation of reset switch to restore activated smoke detectors to normal standby status.

- .5 Lamp test switch.
 - .6 Drill switch which will enable test of notification appliances and restoration to normal without tripping master box.
 - .7 Master box disconnect switch which when activated will disconnect coded device and cause operation of system trouble signal.
 - .8 HVAC shutdown bypass switch. Operation of the switch to allow HVAC system to operate with detectors in alarm and cause operation of system trouble signals.
- .6 Supervised, modular design with plug-in modules:
- .1 Alarm receiver with trouble and alarm indications, for class A initiating circuit.
 - .2 Spare zones: compatible with smoke detectors and open circuit devices.
 - .3 Space for future modules.
 - .4 Latching type supervisory receiver circuits. Discrete indication for both off-normal and trouble.
- .7 Components:
- .1 Coded alarm receiver panel with trouble and alarm indications for class A initiating circuit.
 - .2 Single stage alarm pulse rate panels:
 - .1 Single stroke control type for output to signal control panel continuously.
 - .3 Audible signal control panel with adequate control circuits complete with terminals for wiring and plug-in modules for dc signals up to 2.0 A load with trouble indication with class B connections.
 - .4 Common control and power units:
 - .1 Control panel containing following indications and controls:
 - .1 "Power on" LED (green) to monitor primary source of power to system.
 - .2 "Power trouble" indication.
 - .3 "Ground trouble" indication.
 - .4 "Remote annunciator trouble" indication.
 - .5 "System trouble" indication.
 - .6 "System trouble" buzzer and silence switch c/w trouble resound feature.
 - .7 System reset switch.
 - .8 "LED test" switch if applicable.
 - .9 "Alarm silence" switch to silence signals manually. If new alarm occurs after signals have been silenced, signals to resound.
 - .10 "Signals silenced" indication.
 - .2 Master power supply panel to provide 24 V dc to system from 120 V ac, 60 Hz input.
 - .5 Auxiliary relays: plug-in type, dust cover, supervised against unauthorized removal by common trouble circuit and c/w individual bypass switch.
 - .1 Contacts: 2.0 A, 120 V ac, for functions such as release of door holders or initiation of fan shut down.
 - .2 Contact terminal size: capable of accepting 22-12 AWG wire.

2.04 POWER SUPPLY

- .1 120 V, ac, 60 Hz input, 24 V dc output from rectifier to operate alarm and signal circuits, with standby power of gell cell batteries minimum expected

life of 4 years, sized in accordance with NBC.

2.05 MANUAL ALARM STATIONS

- .1 Provide non-coded single action type with mechanical reset features.
 - .1 Non-coded single pole normally open contact for single stage.
 - .2 General alarm key switch for two stage system.
- .2 Stations: semi-flush mounted and interior type as indicated.
 - .1 For surface mounting provide station manufacturer's approved back box.
 - .2 Back box finish to match station finish.
- .3 Equip each station with terminal strip with contacts of proper number and type to perform functions required.
- .4 Stations: type not subject to operation by jarring or vibration.
 - .1 Break-glass-front stations are not permitted; pull-lever break-rod type is acceptable provided presence of rod is not required to reset station.
- .5 Station colour: red.
- .6 Provide station with visible indication of operation.
- .7 Restoration to require use of key.
 - .1 Keys: identical throughout system for stations and control panel(s).
- .8 Mount stations with operating lever not more than 1.2 m above finished floor

2.06 AUTOMATIC ALARM INITIATING DEVICES

- .1 Heat detectors: provide heat detectors designed for detection of fire by combination fixed temperature rate-of-rise and line-type fixed temperature principle.
- .2 Combination Fixed Temperature Rate-Of-Rise Detectors (Spot Type): designed for semi-flush outlet box mounting and supported independently of conduit, tubing or wiring connections.
 - .1 Contacts: self-resetting after response to rate-of-rise actuation
 - .2 Operation under fixed temperature actuation to result in external indication.
 - .3 Detector units located in boiler rooms, showers, or other areas subject to abnormal temperature changes to operate on fixed temperature principle only.
- .3 Line-Type Fixed Temperature Detectors: provide thermostatic or thermistor line-type heat detection cable where indicated.
 - .1 Cable: nominally rated for temperature of 57 or 88 degrees C and operate on fixed temperature principle.
- .4 Open-Area Smoke Detectors: provide detectors designed for detection of abnormal smoke densities by photoelectric principle.
 - .1 Detectors: 4-wire type.
 - .2 Provide necessary control and power modules required for operation integral with control panel.
 - .3 Detectors and associated modules: compatible with control panel and

- suitable for use in supervised circuit.
- .4 Malfunction of electrical circuits to detector or its control or power units to result in operation of system trouble signals.
 - .5 Equip each detector with visible indicator lamp that will flash when detector is in normal standby mode and glow continuously when detector is activated.
 - .6 Each detector: plug-in type with tab-lock or twist-lock, quick disconnect head and separate base in which detector base contains screw terminals for making wiring connections.
 - .7 Detector head: removable from its base without disconnecting wires. Removal of detector head from its base to cause activation of system trouble signals.
 - .8 Screen each detector to prevent entrance of insects into detection chamber(s).
- .5 4-Wire Smoke Detectors: detector circuits 4-wire type capable of transmitting detector operating power over conductors separate from initiating circuit.
- .1 Provide separate, power circuit for each smoke detection initiating circuit (zone).
 - .2 Failure of power circuit to be indicated as trouble condition on corresponding initiating circuit.
- .6 Photoelectric Detectors: operate on light scattering principle using LED light source.
- .1 Detector: respond to both flaming and smoldering fires.
- .7 Locate detectors in accordance with their listing by ULC and the requirements of NFPA 72, except provide at least 2 detectors in rooms of 54 square meters or larger in area.
- .8 Mount detectors at underside of ceiling or deck above unless otherwise indicated.
- .1 For mounting heights greater than 3 m above floor level, reduce actual detector linear spacing from listed spacing as required by NFPA 72.
 - .2 For heights greater than 9 m space detectors no farther apart than 34 % of their listed spacing.
- .9 Temperature rating of detectors: in accordance with NFPA 72.
- .10 Locate detectors minimum 300 mm to lighting fixtures and not closer than 600 mm to air supply or return diffuser.
- .11 Ensure detectors, located in areas subject to moisture or exterior atmospheric conditions or hazardous locations as defined by NFPA 70, are approved for such locations.
- .12 Provide detectors with terminal screw type connections.
- .13 Removal of detector head from its base to cause activation of system trouble signals if detectors are provided with separable heads and bases.

2.07 ALARM INITIATING DEVICE SPACING AND LOCATION

- .1 Detector spacing and location: in accordance with manufacturer's recommendations and requirements of NFPA 72.

- .2 Provide at least 2 detectors in rooms of 54 square meters or larger.
- .3 Spacing: not to exceed 9 m by 9 m per detector, and 9 linear m per detector along corridors.
- .4 Locate detectors minimum 1.5 m from air discharge or return grille, and not closer than 300 mm to lighting fixtures.
- .5 In areas without finished ceilings, mount detectors at underside of deck above unless otherwise indicated

2.08 DUCT SMOKE DETECTORS

- .1 Provide detectors installed in ducts of photoelectric type and listed by ULC duct installation.
- .2 Provide integral control and power modules required for operation with main control panel.
- .3 Ensure detectors and associated modules are compatible with main control panel and suitable for use in supervised circuit.
- .4 Detector circuits: 4-wire type where detector operating power is transmitted over conductors separate from initiating circuit. Malfunction of electrical circuits to detector or its control or power modules to cause operation of system trouble signals.
- .5 Provide a separate, fused power circuit for each smoke detection initiating circuit.
- .6 Failure of power circuit: indicated as a trouble condition on corresponding initiating circuit.
- .7 Provide duct detectors in accordance with NFPA 90A.
- .8 Provide duct detectors with approved duct housing, mounted exterior to duct, with perforated sampling tubes extending across width of duct.
- .9 Activation of duct detectors to cause shutdown of associated air handling unit, annunciation at control panel and sounding of building evacuation alarms.
- .10 Provide detectors with visible indicator lamp that flashes when detector is in normal standby mode and glows continuously when detector is activated.
- .11 Provide remote indicator lamp for each detector.
- .12 Permanently label remote indicator with description of associated air handling unit(s).
- .13 Provide each detector with remote test switch. Mount switch not more than 1.8 m above finished floor.
- .14 Permanently label test switch with description of associated air handling unit(s).

2.09 AUDIBLE SIGNAL DEVICES

- .1 Audible device(s):
 - .1 Horns: 24 V dc.
 - .2 Mini-horns: red colour, 24 V dc.
- .2 Do not exceed 80 percent of listed rating in amperes of notification appliance circuit. Provide additional circuits above those shown if required to meet this requirement.
- .3 Provide appliances specifically listed for outdoor use in locations exposed to weather.
- .4 Finish appliances in red enamel.
- .7 For surface mounting provide appliance manufacturer's approved back box. Back box finish to match appliance finish.

2.10 END-OF-LINE DEVICES

- .1 End-of-line devices to control supervisory current in signalling circuits, sized to ensure correct supervisory current for each circuit. Open, short or ground fault in any circuit will alter supervisory current in that circuit, producing audible and visible alarm at main control panel.

2.11 REMOTE ANNUNCIATOR PANELS

- .1 Provide panels where indicated mounted 1.5 m above finished floor elevation.
- .2 Panels: duplicate requirements for control panel annunciator, with exception of individual trouble lamps are not required.
- .3 LED type with designation cards to indicate zone.
- .4 LEDs to annunciate alarm and trouble.
- .5 Wired in multiple with main control panel.
- .6 Supervised, including trouble signal for open circuit.
- .7 LED test button.

2.12 VISUAL ALARM SIGNAL DEVICES

- .1 Flush-mounted assembly of stroboscopic type suitable for use in electrically supervised circuit and powered from notification appliance circuits.
- .2 Appliances: minimum candela, as indicated, measured as approved by ULC, but not less than effective intensity required by National Building Code of Canada for appliance spacing and location.
- .3 Protect lamps with thermoplastic lens and labelled "FIRE" in letters at least 12 mm high.
- .4 Provide visible appliances with each audible appliance as indicated.
- .5 Visible appliances may be part of audio-visual assembly, where more than

two appliances are located in same room or corridor.

2.13 ELECTRO- MAGNETIC DOOR HOLDER-RELEASES

- .1 Provide as indicated shown.
- .2 Mount armature portion on door. Armature complete with adjusting screw for setting angle of contact plate.
- .3 Mount electro-magnetic release on wall or in wall recess behind door.
- .4 Activation of smoke detector designated for door release service to release doors on circuit to close.
- .5 Total projection of door holder-release not to exceed 100 mm.
- .6 Door holders: not require battery backup power.

2.14 CONDUIT

- .1 Electrical Metallic Tubing (EMT).

2.15 WIRING

- .1 Wire for 120 V circuits: No. 12 AWG minimum solid copper conductor.
- .2 Wire for low voltage DC circuits: No. 14 AWG minimum solid copper conductor
- .3 Wire to remote annunciators: No. 18 AWG minimum solid copper conductor.
- .4 Insulation 90 degrees C minimum with nylon jacket.
- .5 Colour code wiring.

2.16 SURGE SUPPRESSION

- .1 Provide line voltage and low voltage surge suppression devices to suppress voltage transients which might damage control panel components.
- .2 Mount suppressors in separate enclosure(s) adjacent to control panel unless suppressors are specifically UL approved for mounting inside control panel provided and approved for such use by control panel manufacturer.

2.17 AS-BUILT RISER DIAGRAM

- .1 Fire alarm system riser diagram: in glazed frame minimum size 600 x 600 mm.

2.18 ANCILLARY DEVICES

- .1 Remote relay unit to initiate fan shutdown.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.02 INSTALLATION

- .1 Install systems in accordance with CAN/ULC-S524.
- .2 Install main control panel and connect to ac power supply, dc standby power.
- .3 Locate and install manual alarm stations and connect to alarm circuit wiring.
- .4 Locate and install detectors and connect to alarm circuit wiring. Do not mount detectors within 1 m of air outlets. Maintain at least 600 mm radius clear space on ceiling, below and around detectors. Locate duct type detectors in straight portions of ducts.
- .5 Connect alarm circuits to main control panel.
- .6 Locate and install horns and visual signal devices and connect to signalling circuits.
- .7 Connect signalling circuits to main control panel.
- .8 Install end-of-line devices at end of alarm and signalling circuits.
- .9 Install remote annunciator panels and connect to annunciator circuit wiring.
- .10 Locate and install door releasing devices.
- .11 Locate and install remote relay units to control fan shut down.
- .12 Sprinkler system: wire alarm and supervisory switches and connect to control panel.
- .13 Connect fire suppression systems to control panel.

3.03 FIELD QUALITY CONTROL

- .1 Site Tests:
 - .1 Perform tests in accordance with Section 26 05 00 and CAN/ULC-S537.
- .2 Fire alarm system:
 - .1 Test each device and alarm circuit to ensure manual stations, thermal and smoke detectors and sprinkler system transmit alarm to control panel and actuate general alarm.
 - .2 Check annunciator panels to ensure zones are shown correctly.
 - .3 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of system.
 - .4 Class A circuits.
 - .1 Test each conductor on circuits for capability of providing alarm signal on each side of single open-circuit fault condition imposed near midmost point of circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.

- .2 Test each conductor on circuits for capability of providing alarm signal during ground-fault condition imposed near midmost point of circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.
- .5 Class B circuits.
 - .1 Test each conductor on circuits for capability of providing alarm signal on line side of single open-circuit fault condition imposed at electrically most remote device on circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.
 - .2 Test each conductor on circuits for capability of providing alarm signal during ground-fault condition imposed at electrically most remote device on circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.
- .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 Verification requirements include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Low-emitting materials.

3.04 TRAINING

- .1 Arrange and pay for on-site lectures and demonstrations by fire alarm equipment manufacturer to train operational personnel in use and maintenance of fire alarm system.

3.05 CLEANING

- .1 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 32 11 23 - Granular 'A'.

1.02 REFERENCES

- .1 OPSS.MUNI 401 - Construction Specification for Trenching, Backfilling and Compacting.

1.03 DESCRIPTION

- .1 Excavating or trenching includes the excavation or trenching of all materials of whatever nature, including granular, dense tills, hardpan, and partially cemented materials.
- .2 Any required shoring, bracing, and de-watering of excavation is part of this work.
- .3 Removal of any shrubs and trees to facilitate the trenching for sanitary sewer installation.

1.04 EXISTING CONDITIONS

- .1 Buried Services:
 - .1 Before commencing work verify location of buried services on and adjacent to site.
 - .2 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .3 Prior to beginning excavation Work, notify applicable Departmental Representative authorities having jurisdiction establish location and state of use of buried utilities and structures. Departmental Representative authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work.
 - .4 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
 - .5 For excavations inside building, protect from damage all existing building elements to remain.

1.05 SUBMITTALS FOR SHORING SYSTEMS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings showing temporary shoring requirements for excavations to be sealed and signed by qualified Professional Engineer licensed in the Province of Ontario.
- .3 Shop Drawings shall clearly indicate systems of shoring consisting of walers, struts, rakers, anchorages, sheeting and other components as required to resist lateral soil pressure and maintain excavation in a safe and stable condition for duration of construction period.

- .4 Shoring systems shall account for presence of all existing building foundation elements and other buried structures and shall be designed to prevent damaging lateral and vertical movements in existing structures.

2 PRODUCTS

2.01 MATERIALS

- .1 Granular 'A' material shall meet the requirements of Section 32 11 23.

3 EXECUTION

3.01 SITE PREPARATION

- .1 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.
- .2 Cut existing concrete slab neatly as indicated along limits of proposed excavation.

3.02 PREPARATION/ PROTECTION

- .1 Protect existing features in accordance with applicable local regulations.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.

3.03 DEWATERING

- .1 Keep excavations free of water while work is in progress.
- .2 Submit for Departmental Representative's review details of proposed dewatering.
- .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur. Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .4 Dispose of water in manner not detrimental to public and private property, or any portion of work completed or under construction.
- .5 Provide silt fence or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, water courses or drainage areas.

3.04 SHORING

- .1 Construct temporary excavation shoring in accordance with reviewed shop drawings.
- .2 Do not proceed with work in excavated areas until shoring systems have been

inspected by shoring design engineer and written approval, signed by shoring design engineer, has been submitted to Departmental Representative.

- .3 Remove all components of shoring systems prior to, or during backfilling of excavated areas.

3.05 STOCKPILING

- .1 Topsoil shall be disposed of off-site to locations arranged by the Contractor. Characterization of soil prior to disposal shall be done in accordance with Section 01 35 43.
- .2 Protect fill materials from contamination.
- .3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

3.06 EXCAVATION

- .1 Advise Departmental Representative at least 7 days in advance of excavation operations for initial cross sections to be taken.
- .2 Excavate to lines, grades, elevations and dimensions as indicated.
- .3 Excavation must not interfere with bearing capacity of adjacent foundations.
- .4 Do not disturb soil within branch spread of trees or shrubs that are to remain.
 - .1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .5 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 5 m at end of day's operation.
- .6 For footing excavations, earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or unsuitable material.
- .7 Notify Departmental Representative when bottom of excavation is reached.
- .8 Obtain Departmental Representative approval of completed excavation.
- .9 For footing excavations, geotechnical engineer on behalf of Departmental Representative shall approve all bearing surfaces prior to commencing footing construction.
- .10 Remove unsuitable material from trench bottom to extent and depth as directed by Departmental Representative.
- .11 Correct unauthorized over-excavation as follows:
 - .1 In structural areas (within building footprint) fill with 30 MPa concrete when excavation is in rock, and compacted Engineered Fill, when excavation is in earth.
- .12 Protect existing features and repair any damage to the satisfaction of the Departmental Representative at no cost to the Owner.

3.07 FILL TYPES AND COMPACTION

- .1 Use types of fill as indicated.

3.08 BEDDING AND SURROUND OF UNDERGROUND SERVICES

- .1 Place and compact granular material for bedding and surround of underground services where applicable.
- .2 Place bedding and surround material in unfrozen condition.

3.09 BACKFILLING

- .1 Do not proceed with backfilling operations until Departmental Representative has inspected and approved installations.
- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Place backfill material in uniform layers not exceeding lift depths indicated in material specification sections up to grades indicated. Compact each layer before placing succeeding layer.
- .5 Backfill around installations.
 - .1 Do not backfill around or over cast-in-place concrete within 24 h after placing of concrete.
 - .2 Place layers simultaneously on both sides of installed work to equalize loading. Difference not to exceed 0.5m.
 - .3 Where temporary unbalanced earth pressures are liable to develop on walls or other structures.
 - .1 Permit concrete to cure for minimum 7 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from Departmental Representative or:
 - .2 If approved by Departmental Representative, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Departmental Representative.

3.10 RESTORATION

- .1 Upon completion of Work, remove waste materials and debris, trim slopes, and correct defects as directed by Departmental Representative.
- .2 Clean and reinstate areas affected by Work as directed by Departmental Representative.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 31 23 33.01 - Excavating, Trenching and Backfilling.

1.02 REFERENCES

- .1 OPSS.MUNI 1010 - Material Specification for Aggregates - Base, Sub-base, Select Subgrade, and Backfill Material.

1.03 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 aggregate materials and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Submit granular gradations.

2 PRODUCTS

2.01 MATERIALS

- .1 Aggregate materials in accordance with OPSS.MUNI 1010.
- .2 Material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, free from adherent coatings and injurious amounts of disintegrated pieces or other deleterious substances.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions are acceptable for topsoil stripping.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with topsoil stripping only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.02 PREPARATION

- .1 Topsoil stripping:
 - .1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.
 - .2 Begin topsoil stripping of areas as indicated as directed by Departmental Representative after area has been cleared of brush weeds and grasses and removed from site.
 - .3 Strip topsoil to depths as indicated as directed by Departmental Representative. Avoid mixing topsoil with subsoil.
 - .4 Stockpile in locations as indicated directed by Departmental Representative. Stockpile height not to exceed 2 m.
 - .5 Topsoil shall be disposed of offsite to locations arranged by the Contractor. Characterization of soil prior to disposal shall be done in accordance with Section 01 35 43.

- .2 Aggregate source preparation:
 - .1 Prior to excavating materials for aggregate production, clear and grub area to be worked, and strip unsuitable surface materials. Contractor is required to dispose of material offsite in accordance with Section 01 35 43.
 - .2 Where clearing is required, leave screen of trees between cleared area and roadways as directed.
 - .3 Clear, grub and strip area ahead of quarrying or excavating operation sufficient to prevent contamination of aggregate by deleterious materials.
 - .4 When excavation is completed dress sides of excavation to nominal 1.5:1 slope, and provide drains or ditches as required to prevent surface standing water.
 - .5 Trim off and dress slopes of waste material piles and leave site in neat condition.
 - .6 Provide silt fence or other means to prevent contamination of existing watercourse or natural wetland features.

- .3 Processing:
 - .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
 - .2 Blend aggregates, as required, including reclaimed materials that meet physical requirements of specification is permitted in order to satisfy gradation requirements for material and, percentage of crushed particles, or particle shapes specified.
 - .1 Use methods and equipment approved in writing by Departmental Representative.

- .4 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate gradation.

- .5 Where necessary, screen, crush, wash, classify and process aggregates with suitable equipment to meet requirements.
 - .1 Use only equipment approved in writing by Departmental Representative.

- .6 Stockpiling:
 - .1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Departmental Representative. Do not stockpile on completed pavement surfaces.

3.03 CLEANING

- .1 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 31 05 16 - Aggregate Materials.
- .2 Section 31 23 33.01 - Excavating, Trenching and Backfilling.

1.02 REFERENCES

- .1 OPSS.MUNI 1010 - Material Specification for Aggregates - Base, Sub-base, Select Sub-grade and Backfill Material.
- .2 OPSS.MUNI 314 - Construction Specification for Untreated Granular Subbase, Base, Surface, Shoulder, and Stockpiling.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

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

1.04 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 31 05 16 - Aggregate Materials.

2 PRODUCTS

2.01 MATERIALS

- .1 Granular 'A' for bedding and cover: material in accordance with Section 31 05 16 - Aggregate Materials and following requirements:
 - .1 OPSS.MUNI 1010.
- .2 Granular 'A' for base: material in accordance with Section 31 05 16 - Aggregate Materials and following requirements:
 - .1 OPSS.MUNI 314.

3 EXECUTION

3.01 PLACEMENT AND INSTALLATION

- .1 Compact in maximum 200 mm lifts to 100% Standard Proctor Maximum Dry Density (SPMDD), unless noted otherwise.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 31 05 16 - Aggregate Materials.

1.02 REFERENCES

- .1 OPSS 310 - Construction Specification for Hot Mix Asphalt.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data:
 - .1 Submit printed product literature and data sheets for asphalt mixes and aggregate and include product characteristics, performance criteria, physical size, finish and limitations.

2 PRODUCTS

2.01 MATERIALS

- .1 In accordance with OPSS 310.

3 EXECUTION

3.01 FOUNDATIONS

- .1 Granular Material for Paved Areas:
 - .1 As indicated on Drawings and in accordance with Town of Niagara-on-the-Lake Specifications.
- .2 Compaction: In accordance with Section 32 11 23.

3.02 PAVEMENT THICKNESS

- .1 Pavements: As indicated on Drawings and in accordance with Town of Niagara-on-the-Lake Specifications.

3.03 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - 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 11 - Cleaning.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 32 92 19.16 - Hydraulic Seeding.

1.02 REFERENCES

- .1 OPSS 802 - Construction Specification for Topsoil.

1.03 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Do not dispose of unused soil amendments into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

2 PRODUCTS

2.01 TOPSOIL

- .1 Topsoil areas indicated on Contract Drawings in accordance with OPSS 802.

3 EXECUTION

3.01 PREPARATION OF EXISTING GRADE

- .1 Verify that grades are correct.
- .1 If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative.
- .2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.
- .3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.
- .4 Cultivate entire area which is to receive topsoil to minimum depth of 100 mm.
 - .1 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

3.02 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL

- .1 Place topsoil in accordance with OPSS 802.

3.03 FINISH GRADING

- .1 Grade to eliminate rough spots and low areas and ensure positive drainage.

- .1 Prepare loose friable bed by means of cultivation and subsequent raking.

3.04 ACCEPTANCE

- .1 Departmental Representative will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

3.05 SURPLUS MATERIAL

- .1 Dispose of excess materials not required off site.

3.06 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 32 91 19.13 - Topsoil Placement & Grading.

1.02 REFERENCES

- .1 OPSS.MUNI 804 - Construction Specification for Seed and Cover.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit Certificate of Seed Analysis for approval.

1.04 WARRANTY

- .1 For seeding, warranty period is 12 months.
- .3 End-of-warranty inspection will be conducted by Departmental Representative.

2 PRODUCTS

2.01 MATERIALS

- .1 Seed: In accordance with OPSS.MUNI 804 - Standard Roadside Mix.
- .2 Mulch: In accordance with OPSS.MUNI 804.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for hydraulic seeding in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.

3.02 PROTECTION OF EXISTING CONDITIONS

- .1 Protect existing features such as structures, signs, guide rails, fences, plant material, utilities and other surfaces not intended for spray.

3.03 PREPARATION OF SURFACES

- .1 Do not perform work under adverse field conditions such as wind speeds over 10 km/h, frozen ground or ground covered with snow, ice or standing water.
- .2 Obtain Departmental Representative's approval of grade and topsoil depth before starting to seed.

3.04 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - 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 11 - Cleaning.
 - .1 Clean and reinstate areas affected by Work.

3.05 PROTECTION

- .1 Protect seeded areas from trespass until plants are established.
- .2 Remove protection devices as directed by Departmental Representative.

3.06 MAINTENANCE DURING ESTABLISHMENT PERIOD

- .1 In accordance with OPSS.MUNI 804.

3.07 ACCEPTANCE

- .1 Seeded areas will be accepted by Departmental Representative provided that:
 - .1 Areas have been mown at least twice.
 - .2 Areas have been fertilized.
- .2 Areas seeded in fall will achieve final acceptance in following spring, one month after start of growing season provided acceptance conditions are fulfilled.

3.08 MAINTENANCE DURING WARRANTY PERIOD

- .1 Perform following operations from time of acceptance until end of warranty period:
 - .1 Repair and reseed dead or bare spots to satisfaction of Departmental Representative.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 33 31 13 - Sanitary Sewer

1.02 REFERENCES

- .1 OPSS 407 - Construction Specification for Maintenance Hole, Catch Basin, Ditch Inlet and Valve Chamber Installation.
- .2 Town of Niagara-on-the-Lake Municipal Engineering Standards (<http://www.notl.org/content/engineering>)

1.03 SCOPE OF WORK

- .1 Installation of sanitary maintenance hole as indicated on the Contract Drawings, to OPSD 701.010 and grate to OPSD 401.010 (A).
- .2 Connection to new and existing sanitary sewers as indicated on the Contract Drawings.

1.04 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 maintenance holes and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings for review.

2 PRODUCTS

2.01 MATERIALS

- .1 Precast maintenance hole units in accordance with OPSS 407.
- .2 Granular bedding and backfill in accordance with Section 31 05 16 - Aggregate Materials.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for maintenance hole installation in accordance with manufacturer's written instructions.

- .2 Visually inspect substrate in presence of Departmental Representative.
- .3 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .4 Proceed with installation only after unacceptable conditions have been remedied [and after receipt of written approval to proceed from Departmental Representative.

3.02 EXCAVATION AND BACKFILL

- .1 Excavate and backfill in accordance with Section [31 23 33.01 - Excavating Trenching and Backfilling and as indicated.
- .2 Obtain approval of Departmental Representative before installing maintenance hole.

3.03 INSTALLATION

- .1 Install and bench maintenance hole in accordance with OPSS 407.
- .2 Install in accordance with manufacturer's recommendations and to approval of Departmental Representative.

3.04 ADJUSTING TOPS OF EXISTING UNITS

- .1 Raise or lower by adding or removing precast sections as required, in accordance with OPSS 407.

3.05 FIELD QUALITY CONTROL

- .1 In accordance with OPSS 407.

3.06 CLEANING

- .1 In accordance with OPSS 407.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 31 05 16 - Aggregate Materials
- .2 Section 31 23 33.01 - Excavating, Trenching and Backfilling
- .3 Section 32 11 23 - Granular 'A'
- .4 Section 33 05 16 - Maintenance Holes

1.02 REFERENCES

- .1 OPSS.MUNI 410 - Construction Specification for Pipe Sewer Installation in Open Cut
- .2 Town of Niagara-on-the-Lake Municipal Engineering Standards (<http://www.notl.org/content/engineering>)

1.03 SCOPE OF WORK

- .1 Installation of sanitary sewer as indicated on the Contract Drawings.
- .2 Sanitary sewer installation beneath an existing creek as indicated on the Contract Drawings.
- .3 Connection to existing sanitary sewers and new and existing maintenance holes as indicated on the Contract Drawings.
- .4 Restoration of disturbed areas to match existing conditions, as indicated on the Contract Drawings.

1.04 ADMINISTRATIVE REQUIREMENTS

- .1 Scheduling:
 - .1 Schedule Work to minimize interruptions to existing services and maintain existing sewage flows during construction.
 - .2 Submit schedule of expected interruptions for approval and adhere to approved schedule.
 - .3 Notify Departmental Representative and building manager 24 hours minimum in advance of any interruption in service.

1.05 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 pipes, and backfill and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Pipe certification to be marked on pipe.

2 PRODUCTS

2.01 PLASTIC PIPE

- .1 PSM Polyvinyl Chloride (PVC) with bell and spigot joints and elastomeric gaskets, as per OPSS 1841 and CSA B182.2.
 - .1 Standard Dimensional Ratio (SDR) 35 for sewer mains.

2.02 PIPE BEDDING AND SURROUND MATERIALS

- .1 Granular material to Section 31 05 16 - Aggregate Materials and following requirements:
 - .1 Granular 'A' in accordance with OPSS.MUNI 1010.
 - .2 Pipe Bedding as per applicable OPSD 802.010 or OPSD 802.013.

2.03 BACKFILL MATERIAL

- .1 Native material in accordance with Niagara-on-the-Lake Specifications.
- .2 In accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for sewer pipe installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied [and after receipt of written approval to proceed from Departmental Representative.

3.02 PREPARATION

- .1 Clean pipes and fittings of debris and water before installation, and remove defective materials from site to approval of Departmental Representative.
- .2 Clean and dry pipes and fittings before installation.

3.03 TRENCHING

- .1 Do trenching Work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

3.04 GRANULAR BEDDING

- .1 Place bedding in unfrozen condition.
- .2 Place granular bedding materials in uniform layer[s] not exceeding 150 mm

compacted thickness.

- .3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.
 - .1 Do not use blocks when bedding pipe.
- .4 Shape transverse depressions as required to suit joints.
- .5 Compaction in accordance with Section 32 11 23.

3.05 INSTALLATION

- .1 Lay pipes in accordance with OPSS.MUNI 410.
- .2 Lay and join pipes in accordance with manufacturer's recommendations and to approval of Departmental Representative.

3.06 INSTALLATION BENEATH CREEK

- .1 The Contractor shall submit three (3) copies of the proposed sanitary sewer installation method and all necessary dewatering techniques in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Proposed method shall be submitted at least two (2) weeks in advance of proposed work for approval.

3.07 PIPE SURROUND

- .1 Place surround material in unfrozen condition.
- .2 Upon completion of pipe laying, and after Departmental Representative has inspected pipe joints, surround and cover pipes as indicated.
 - .1 Leave joints and fittings exposed until field testing is completed.
- .5 Compact each layer from pipe invert to mid height of pipe to 100% Standard Proctor Maximum Dry Density (SPMDD).

3.08 BACKFILL

- .1 Place backfill material in unfrozen condition.
- .2 Place backfill material, above pipe surround in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.
- .3 Compact backfill to 100% Standard Proctor Maximum Dry Density (SPMDD).

3.09 FIELD TESTING

- .1 Complete in accordance with OPSS.MUNI 410.07.16 and Town of Niagara-on-the-Lake Specifications.

3.10 CLEANING

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

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

END OF SECTION