
PWGSC Ontario	SPECIFICATION	Section 00 00 00
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Number R.083503.001		2018-03-14

PROJECT TITLE TORONTO, ONTARIO
330-338 KEELE STREET
MAJOR RENOVATIONS

PROJECT NUMBER R.083503.001

PROJECT DATE 2018-03-14

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PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Contract Method.
- .2 Work sequence.
- .3 Contractor use of premises.
- .4 Owner occupancy.
- .5 Alterations to existing building and site.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- .1 Work of this Contract comprises renovation of the building at 330-338 Keele Street, located in Toronto, Ontario.

1.3 COST BREAKDOWN

- .1 Within 48 hours of notification of acceptance of bid furnish a cost breakdown by Section aggregating Contract Amount.
- .2 Show separately cost of equipment purchased exempt from Ontario Retail Sales Tax under your Ontario Sales Tax licence number.
- .3 Within 48 hours of acceptance of bid submit a list of subcontractors.

1.4 WORK SEQUENCE

- .1 Coordinate Progress Schedule and coordinate with Owner Occupancy during construction.
- .2 Maintain fire access/control.

1.5 CONTRACTOR USE OF PREMISES

- .1 Contractor shall limit use of premises for Work, for storage, and for access, to allow for Partial owner occupancy.
- .2 Coordinate use of premises under direction of Departmental Representative.

1.6 OWNER OCCUPANCY

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

1.7 ALTERATIONS TO EXISTING BUILDING

- .1 Remove and recycle, compost, anaerobically digest, sell material for reuse or dispose of:
 - .1 Mechanical and electrical items as indicated.
- .2 Remove in good order, temporarily store, clean, alter to suit and reinstall:
 - .1 Brick salvaged from demolition work.
- .3 Block in openings where items removed with material and finish to match existing adjoining construction.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not used.

PART 1 - GENERAL

1.1 ACCESS AND EGRESS

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

1.2 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 Departmental Representative will assign sanitary facilities for use by Contractor's personnel. Keep facilities clean.
- .5 Closures: protect work temporarily until permanent enclosures are completed.

1.3 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

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

1.4 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 minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.
- .3 Provide for personnel and vehicular traffic.
- .4 Construct barriers in accordance with Section 01 56 00.

1.5 SPECIAL REQUIREMENTS

- .1 Paint public or Departmental Representative occupied areas Monday to Friday from 18:00 to 07:00 hours only and on Saturdays or Sundays.

- .2 In accordance with City of Toronto bylaws, carry out noise generating Work Monday to Friday from 07:00 to 19:00 hours only and from 09:00 to 19:00 hours on Saturdays. Noise generating Work is not permitted on Sundays.
- .3 Submit schedule in accordance with Section 01 32 16.
- .4 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .5 Keep within limits of work and avenues of ingress and egress.
- .6 Ingress and egress of Contractor vehicles at site is limited to Keele Street.
- .7 Deliver materials outside of peak traffic hours 17:00 to 07:00 and 13:00 to 15:00 unless otherwise approved by Departmental Representative.
- .8 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.

1.6 NOT USED

- .1 Not Used.
- .2 Not Used.

1.7 BUILDING SMOKING ENVIRONMENT

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

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

PART 1 - GENERAL

1.1 ADMINISTRATIVE

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

1.2 PRECONSTRUCTION MEETING

- .1 Within 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 supervisors will be in attendance.
- .3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.
- .4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .5 Agenda to include:
 - .1 Appointment of official representative of participants in the Work.
 - .2 Schedule of Work: in accordance with Section 01 32 16.
 - .3 Schedule of submission of shop drawings, samples, mock-ups, colour chips. Submit submittals in accordance with Section 01 33 00.
 - .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00.
 - .6 Site security in accordance with Section 01 56 00.
 - .7 Health and safety in accordance with Section 01 35 29.
 - .8 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
 - .9 Owner provided products.

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

1.3 PROGRESS MEETINGS

- .1 During course of Work and two (2) weeks prior to project completion, schedule progress meetings bi-weekly.
- .2 Contractor, major Subcontractors involved in Work and Departmental Representative are to be in attendance.
- .3 Notify parties minimum seven days prior to meetings.
- .4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within five days after meeting.
- .5 Agenda to include the following:
 - .1 Review, approval of minutes of previous meeting.
 - .2 Review of Work progress since previous meeting.
 - .3 Field observations, problems, conflicts.
 - .4 Problems which impede construction schedule.
 - .5 Review of off-site fabrication delivery schedules.
 - .6 Corrective measures and procedures to regain projected schedule.
 - .7 Revision to construction schedule.
 - .8 Progress schedule, during succeeding work period.
 - .9 Review submittal schedules: expedite as required.
 - .10 Maintenance of quality standards.
 - .11 Review proposed changes for affect on construction schedule and on completion date.
 - .12 Other business.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 77 00 - Closeout Procedures.

1.2 PROGRESS PHOTOGRAPHS

- .1 Sizes: Prints 200 x 300 mm.
- .2 Type: glossy colour with binding margin at one end.
- .3 Paper: single weight, unmounted.
- .4 Number of prints required: 1 set.
- .5 Identification: typewritten name and number of project and date of exposure on 25 x 50 mm white patch in upper right hand corner.
- .6 Viewpoints: interior and exterior locations: viewpoints determined by Departmental Representative.
- .7 Frequency: as directed by Departmental Representative.
- .8 Submit all negatives of coloured prints before final acceptance of building.
- .9 Insert negatives in envelopes and identify with name and number of project. Indicate exposure dates and view points of each frame of 35 mm film strips.

1.4 ELECTRONIC COPY

- .1 Submit electronic and hard copy of colour digital photography in jpg format, standard resolution.
- .2 Identification: name and number of project and date of exposure indicated.
- .3 Number of viewpoints: 2. Locations of viewpoints determined by Departmental Representative.
- .4 Frequency: as directed by Departmental Representative.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

PART 1 - GENERAL

1.1 DEFINITIONS

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

1.2 REQUIREMENTS

- .1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
- .2 Plan to complete Work in accordance with prescribed milestones and time frame.
- .3 Limit activity durations to maximum of approximately 5 working days, to allow for progress reporting.

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

1.3 SUBMITTALS

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

1.4 NOT USED

- .1 Not used

1.5 MASTER PLAN

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

1.6 PROJECT SCHEDULE

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
 - .1 Award.
 - .2 Shop Drawings, Samples.
 - .3 Permits.
 - .4 Mobilization.
 - .5 Demolition.
 - .6 Excavation.
 - .7 Backfill.
 - .8 Structural Steel.
 - .9 Masonry and Roofing.
 - .10 Interior Architecture (Walls, Floors and Ceiling).
 - .11 Plumbing.
 - .12 Lighting.
 - .13 Electrical.
 - .14 Piping.

- .15 Controls.
- .16 Heating, Ventilating, and Air Conditioning.
- .17 Fire Systems.
- .18 Testing and Commissioning.
- .19 Supplied equipment long delivery items.
- .20 Departmental Representative supplied equipment required dates.

1.7 PROJECT SCHEDULE REPORTING

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

1.8 PROJECT MEETINGS

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

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not used.

PART 1 - GENERAL

1.1 ADMINISTRATIVE

- .1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are co-ordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.
- .10 Keep one reviewed copy of each submission on site.
- .11 Submit number of hard copies specified for each type and format of submittal and also submit in electronic format as pdf files. Forward pdf, NMSEdit Professional spp, MS Word, MS Excel, MS Project and Autocad dwg files on USB compatible with Departmental Representative encryption requirements or through email or alternate electronic file sharing service such as ftp, as directed by Departmental Representative.

1.2 SHOP DRAWINGS AND PRODUCT DATA

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

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

- .9 After Departmental Representative's review, distribute copies.
- .10 Submit three hard copies and one electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
- .11 Submit three hard copies and one electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Submit three hard copies and one electronic copy of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
 - .2 Testing must have been within 3 years of date of contract award for project.
- .13 Submit three hard copies and one electronic copy of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 - .2 Certificates must be dated after award of project contract complete with project name.
- .14 Submit three hard copies and one electronic copy of manufacturers instructions for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .15 Submit three hard copies and one electronic copy of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .17 Submit three hard copies and one electronic copy of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
- .18 Delete information not applicable to project.
- .19 Supplement standard information to provide details applicable to project.

- .20 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .21 The review of shop drawings by Departmental Representative is for sole purpose of ascertaining conformance with general concept.
- .1 This review shall not mean that Departmental Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
- .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.3 SAMPLES

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

1.4 MOCK-UPS

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

1.6 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.

1.7 FEES, PERMITS AND CERTIFICATES

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

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

PART 1 - GENERAL

1.1 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 2015 (NBC):
 - .1 NBC 2015, Division B, Part 8 Safety Measures at Construction and Demolition Sites.
- .3 National Fire Code 2015 (NFC):
 - .1 NFC 2015, Division B, Part 5 Hazardous Processes and Operations, subsection 5.6.1.3 Fire Safety Plan.
- .4 Province of Ontario:
 - .1 Occupational Health and Safety Act Revised Statutes of Ontario 1990, Chapter O.1 as amended, and Regulations for Construction Projects, O. Reg. 213/91 as amended.
 - .2 O. Reg. 490/09, Designated Substances.
 - .3 Workplace Safety and Insurance Act, 1997.
 - .4 Municipal statutes and authorities.
- .5 Treasury Board of Canada Secretariat (TBS):
 - .1 Treasury Board, Fire Protection Standard April 1, 2010
www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=17316§ion=text.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and 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 8.1.1.1.3 prior to commencement of work. The plan shall be coordinated with, and integrated into, the existing Building, Facility, Tenant's Emergency Procedures and Evacuation Plan in place at the site. Departmental Representative will provide Building, Facility, Tenant's Emergency Procedures and Evacuation Plan. Deliver two copies of the Fire Safety Plan to the Departmental Representative not later than 14 days before commencing work.
- .4 Contractor's and Sub-contractors' Safety Communication Plan.

- .5 Contingency and Emergency Response Plan addressing standard operating procedures specific to the project site to be implemented during emergency situations. Coordinate plan with existing Building, Facility, Tenant's Emergency Response requirements and procedures provided by Departmental Representative.
- .6 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 3 days after receipt of plan. 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 2 copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative weekly.
- .11 Submit 2 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.

1.3 FILING OF NOTICE

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

1.4 WORK PERMIT

- .1 Obtain building permits related to project prior to commencement of Work.
- .2 Obtain 'Permit to Work Form' from AFD Contractor.

- .3 Obtain Hot Work Permit from Property Manager.

1.5 SAFETY ASSESSMENT

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

1.6 MEETINGS

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

1.7 REGULATORY REQUIREMENTS

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

1.8 PROJECT/SITE CONDITIONS

- .1 Work at site will involve contact with:
 - .1 Silica in concrete and concrete block.
 - .2 Mercury in switches, fluorescent light tubes and thermostats.
 - .3 Asbestos in pipe covering and gypsum board joint compound.
 - .4 Lead in paint, flashing, solder in electronic equipment, and vent and pipe flashings.
 - .5 Benzene in paints and adhesives.
 - .6 PCBs in ballasts.
 - .7 Mould on painted insulation of air handling units, duct lining, and gypsum board.
 - .8 Vinyl chloride in pipes, conduits and interior finishes.

1.9 GENERAL REQUIREMENTS

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

1.10 COMPLIANCE REQUIREMENTS

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

1.11 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.
- .3 Where applicable the Contractor shall be designated "Constructor", as defined by Occupational Health and Safety Act and Regulations for Construction Projects for the Province of Ontario.

1.12 UNFORSEEN HAZARDS

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

1.13 HEALTH AND SAFETY CO-ORDINATOR

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
 - .1 Have site-related working experience specific to activities associated with abatement of lead and asbestos.
 - .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 of health and safety regulations is not corrected.

1.16 BLASTING

- .1 Blasting or other use of explosives is not permitted without prior receipt of written instruction by Departmental Representative.

1.17 POWDER ACTUATED DEVICES

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

1.18 WORK STOPPAGE

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

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not used.

PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 35 29: Fire safety plan.

1.2 GENERAL

- .1 This section specifies general requirements and procedures for fire safety. Additional requirements may be specified in individual sections elsewhere in specifications.

1.3 REPORTING FIRES

- .1 The Departmental Representative will co-ordinate arrangements for the Contractor to be briefed at the pre-construction meeting concerning Building's fire safety protocol.
- .2 Building Manager will supply a copy of "Fire Safety Emergency Evacuation Plan" in effect for this building. Contractor shall comply with outlined fire safety requirements.
- .3 Know location of nearest fire alarm box and telephone, including emergency phone number.
- .4 Report immediately all fire incidents to Fire Department as follows:
 - .1 activate nearest fire alarm box; or
 - .2 telephone.
- .5 Person activating fire alarm box will remain at box to direct Fire Department to scene of fire.
- .6 When reporting fire by telephone, give location of fire, name or number of building and be prepared to verify the location.

1.4 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 not required. 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.

1.5 INTERIOR AND EXTERIOR FIRE PROTECTION AND ALARM SYSTEMS

- .1 Fire protection and alarm system will not be:
 - .1 obstructed;
 - .2 shut-off; or
 - .3 left inactive at end of working day or shift.
- .2 Fire hydrants, standpipes and hose systems will not be used for other than fire-fighting purposes unless authorized by Departmental Representative.
- .3 Provide and maintain free access to fire extinguishing equipment. Maintain exit facilities. Keep means of egress free from materials, equipment and obstructing.

1.6 FIRE EXTINGUISHERS

- .1 Supply fire extinguishers, as necessary to protect work in progress and contractor's physical plant on site.

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

- .1 Ensure personnel use and take precautions as follows:
 - .1 Use kettles equipped with thermometers or gauges in good working order.
 - .2 Locate kettles in safe place outside of building. Locate to avoid danger of igniting combustible material.
 - .3 Maintain continuous supervision while kettles are in operation and provide metal covers for kettles to smother any flames in case of fire. Fire extinguishers shall be provided as required in 1.5.
 - .4 Prior to start of work, demonstrate container capacities to Departmental Representative.
 - .5 Use only glass fibre roofing mops.
 - .6 Used roofing mops will not be left unattended on roof and shall be stored away from building and combustible materials.
 - .7 All roofing materials will be stored in location no closer than 3 m to any structures.

1.8 BLOCKAGE OF ROADWAYS

- .1 Advise Departmental Representative of any work that would impede fire apparatus response. This includes violation of minimum required overhead clearance.

1.9 SMOKING PRECAUTIONS

- .1 Smoking is not permitted within areas of work or site storage.

1.10 RUBBISH AND WASTE MATERIALS

- .1 Rubbish and waste materials are to be kept to a 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 local Building Manager.
- .3 Transfer of flammable and combustible liquids is prohibited within buildings or jetties.
- .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 local Building Manager 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 local Building Manager. Contractors are responsible for providing fire watch service for work on a scale established and in conjunction with Building Manager 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. Building Manager 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 within 3 m of combustible material or in occupied spaces.
- .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 on standby 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 local Building Manager.

1.15 FIRE INSPECTION

- .1 Site inspections by Building Manager will be coordinated through Departmental Representative.
- .2 Allow local Building Manager unrestricted access to work site.
- .3 Co-operate with Building Manager during routine fire safety inspection of work site.
- .4 Immediately remedy all unsafe fire situations observed by Building Manager.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not used.

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FIRE SAFETY REQUIREMENTS
FOR ROOFING

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PART 3 - EXECUTION

3.1 NOT USED

.1 Not used.

PART 1 - GENERAL

1.1 DEFINITIONS

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

1.2 REFERENCES

- .1 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) 2017.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Before commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Departmental Representative.
- .3 Environmental Protection Plan must include comprehensive overview of known or potential environmental issues to be addressed during construction.
- .4 Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .5 Include in Environmental Protection Plan:
 - .1 Names of persons responsible for ensuring adherence to Environmental Protection Plan.
 - .2 Names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.
 - .3 Names and qualifications of persons responsible for training site personnel.
 - .4 Descriptions of environmental protection personnel training program.
 - .5 Erosion and sediment control plan identifying type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations and EPA 832/R-92-005, Chapter 3.
 - .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 and discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.
- .14 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.

1.4 FIRES

- .1 Fires and burning of rubbish on site permitted only when approved by Departmental Representative.
- .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.

1.5 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, EPA 832/R-92-005, Chapter 3.
- .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.

1.6 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 indicated or designated by Departmental Representative.

1.7 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.
- .7 Blasting is allowed only above water and 100 m minimum from indicated spawning beds.

1.8 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.

1.9 HISTORICAL/ARCHAEOLOGICAL CONTROL

- .1 Provide historical, archaeological, cultural resources, biological resources, and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on project site: and identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in area are discovered during construction.
- .2 Plan: include methods to assure protection of known or discovered resources and identify lines of communication between Contractor personnel and Departmental Representative.

1.10 NOTIFICATION

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

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
 - .1 Leave Work area clean at end of each day.
- .2 Bury rubbish and waste materials on site where directed after receipt of written approval from Departmental Representative.
- .3 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.
- .4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .5 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

PART 1 - GENERAL

1.1 REFERENCES AND CODES

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

1.2 HAZARDOUS MATERIAL DISCOVERY

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

1.3 BUILDING SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions.

1.4 NOT USED

- .1 Not used

1.5 NOT USED

- .1 Not used

1.6 IAQ - INDOOR AIR QUALITY

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

1.7 ACCESSIBLE DESIGN

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

1.8 STATISTICAL INFORMATION

- .1 Provide statistical information to Departmental Representative:
 - .1 Within ten working days after March 31 and September 30 occurring between commencement of work and final completion
 - .2 Within ten working days after final completion.
- .2 Include in statistical information:
 - .1 Statement of total person days of labour used on site in performance of contract, including labour provided under sub-contracts.
 - .2 Estimate of total value in dollars of material delivered to site and installed, including material provided and installed under sub-contracts.
- .3 This information is required by Government of Canada solely to provide statistics that will aid in assessing socio-economic benefits of this project.

1.9 TAXES

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

1.10 EXAMINATION

- .1 Examine existing conditions and determine conditions affecting work.
- .2 Conduct concrete floor moisture testing using Calcium Chloride moisture tests.
 - .1 Submit test results to Departmental Representative for approval prior to installing any flooring. Conduct one test per 100 m² of area being covered.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

PART 1 - GENERAL

1.1 SECTION INCLUDES

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

1.3 INSPECTION

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

1.4 INDEPENDENT INSPECTION AGENCIES

- .1 Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work, above and beyond those required of the Contractor. Cost of such services will be borne by Departmental Representative.
- .2 Provide equipment required for executing inspection and testing by appointed agencies.
- .3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.

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

1.5 ACCESS TO WORK

- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

1.6 PROCEDURES

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

1.7 REJECTED WORK

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

1.8 REPORTS

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

1.9 TESTS AND MIX DESIGNS

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

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

1.10 MOCK-UPS

- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of all Sections required to provide mock-ups.
- .2 Construct in all locations acceptable to Departmental Representative.
- .3 Prepare mock-ups for Departmental Representative's review with reasonable promptness and in an orderly sequence, so as not to cause any delay in Work.
- .4 Failure to prepare mock-ups in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .5 If requested, Departmental Representative will assist in preparing a schedule fixing dates for preparation.
- .6 Remove mock-up at conclusion of Work or when acceptable to Departmental Representative.

1.11 MILL TESTS

- .1 Submit mill test certificates as requested.

1.12 EQUIPMENT AND SYSTEMS

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

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Temporary utilities.

1.2 RELATED SECTIONS

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

1.3 REFERENCES

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

1.4 SUBMITTALS

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

1.5 INSTALLATION AND REMOVAL

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

1.6 DEWATERING

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

1.7 WATER SUPPLY

- .1 Departmental Representative will provide continuous supply of potable water for construction use.
- .2 Departmental Representative will pay for utility charges at prevailing rates.

1.8 TEMPORARY HEATING AND VENTILATION

- .1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.
- .2 Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.
- .3 Provide temporary heat and ventilation in enclosed areas as required to:
 - .1 Facilitate progress of Work.
 - .2 Protect Work and products against dampness and cold.

- .3 Prevent moisture condensation on surfaces.
- .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
- .5 Provide adequate ventilation to meet health regulations for safe working environment.
- .4 Maintain temperatures of minimum 10°C in areas where construction is in progress.
- .5 Ventilating:
 - .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
 - .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
 - .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
 - .4 Ventilate storage spaces containing hazardous or volatile materials.
 - .5 Ventilate temporary sanitary facilities.
 - .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
- .6 Permanent heating system of building, may be used when available. Be responsible for damage to heating system if use is permitted.
- .7 Departmental Representative will pay utility charges when temporary heat source is existing building equipment.
- .8 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
 - .1 Conform with applicable codes and standards.
 - .2 Enforce safe practices.
 - .3 Prevent abuse of services.
 - .4 Prevent damage to finishes.
 - .5 Vent direct-fired combustion units to outside.
- .9 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.9 TEMPORARY POWER AND LIGHT

- .1 Departmental Representative will pay for temporary power during construction for temporary lighting and operating of power tools, to a maximum supply of 230 volts 30 amps.
- .2 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx.
- .3 Electrical power and lighting systems installed under this Contract may be used for construction requirements only with prior approval of Departmental Representative provided that guarantees are not affected. Make good damage to electrical system caused by use under this Contract. Replace lamps which have been used for more than 3 months.

1.10 TEMPORARY COMMUNICATION FACILITIES

- .1 Provide and pay for temporary data hook up, lines/equipment necessary for own use and use of Departmental Representative.

1.11 FIRE PROTECTION

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

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
- .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.

PART 1 - GENERAL

1.1 SECTION INCLUDES

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

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA Z797-09(R2014), Code of practice for Access Scaffold.
 - .2 CAN/CSA-Z321-96(R2006), Signs and Symbols for the Occupational Environment, withdrawn but still available from CSA, CCOHS and Techstreet.

1.3 INSTALLATION AND REMOVAL

- .1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.
- .2 Identify areas which have to be gravelled to prevent tracking of mud.
- .3 Indicate use of supplemental or other staging area.
- .4 Provide construction facilities in order to execute work expeditiously.
- .5 Remove from site all such work after use.

1.4 SCAFFOLDING

- .1 Scaffolding in accordance with CSA Z797.
- .2 Provide and maintain scaffolding, ladders, and temporary stairs.

1.5 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.

1.6 SITE STORAGE/LOADING

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

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

1.7 CONSTRUCTION PARKING

- .1 Parking will be permitted on site provided it does not disrupt performance of Work.
- .2 Provide and maintain adequate access to project site.
- .3 Build 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.
- .5 Clean construction runways and taxi areas where used by Contractor's equipment.

1.8 SECURITY

- .1 Pay for responsible security personnel to guard site and contents of site after working hours and during holidays.

1.9 OFFICES

- .1 PWGSC to provide office space within existing building, heated to 22°C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings. Provide drawing laydown table.
- .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.
- .4 Departmental Representative's Site office.
 - .1 Provide temporary office for Departmental Representative.
 - .2 Inside dimensions minimum 3.6 m long x 3 m wide x 2.4 m high, with floor 0.3 m above grade, complete with 4 50% opening windows and one lockable door.
 - .3 Insulate building and provide heating system to maintain 22° C inside temperature at -20° C outside temperature.
 - .4 Finish inside walls and ceiling with plywood, hardboard or wallboard and paint in selected colours. Finish floor with 19 mm thick plywood.
 - .5 Install electrical lighting system to provide min 750 lx using surface mounted, shielded commercial fixtures with 10% upward light component.
 - .6 Provide private washroom facilities adjacent to office complete with flush or chemical type toilet, lavatory and mirror and maintain supply of paper towels and toilet tissue.
 - .7 Equip office with 1 x 2 m table, 4 chairs, 6 m of shelving 300 mm wide, one 3 drawer filing cabinet, one plan rack and one coat rack and shelf.

.8 Maintain in clean condition.

1.10 EQUIPMENT, TOOL AND MATERIALS STORAGE

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

1.11 SANITARY FACILITIES

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition.
- .3 Permanent facilities may be used on approval of Departmental Representative.

1.12 CONSTRUCTION SIGNAGE

- .1 No other signs or advertisements, other than warning signs, are permitted on site.
- .2 Signs and notices for safety and instruction shall be in both official languages. Graphic symbols shall conform to CAN/CSA-Z321.
- .3 Maintain approved signs and notices in good condition for duration of project, and dispose of off-site on completion of project or earlier if directed by Departmental Representative.

1.13 PROTECTION AND MAINTENANCE OF TRAFFIC

- .1 Provide access roads as necessary to maintain traffic.
- .2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.
- .3 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs
- .4 Protect travelling public from damage to person and property.
- .5 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
- .6 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.

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

1.14 CLEAN-UP

- .1 Remove construction debris, waste materials, packaging material from work site daily.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways.
- .3 Store materials resulting from demolition activities that are salvageable.
- .4 Stack stored new or salvaged material.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

PART 1 - GENERAL

1.1 SECTION INCLUDES

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

1.2 RELATED SECTIONS

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

1.3 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 O121-17, Douglas Fir Plywood.

1.4 INSTALLATION AND REMOVAL

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

1.6 GUARD RAILS AND BARRICADES

- .1 Provide secure, rigid guard rails and barricades around deep excavations and open edges of floors and roofs.
- .2 Provide as required by governing authorities.

1.7 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.

1.8 DUST TIGHT SCREENS

- .1 Provide dust tight screens or insulated partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.
- .2 Maintain and relocate protection until such work is complete.

1.10 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.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

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TEMPORARY BARRIERS
AND ENCLOSURES

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PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

PART 1 - GENERAL

1.1 SECTION INCLUDES

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

1.2 RELATED SECTIONS

- .1 Section 01 45 00 - Quality Control.

1.3 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>.

1.4 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.

1.5 AVAILABILITY

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

1.6 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.

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

1.8 TRANSPORTATION

- .1 Pay costs of transportation of products required in performance of Work.
- .2 Transportation cost of products supplied by Owner will be paid for by Owner. Unload, handle and store such products.

1.9 MANUFACTURER'S INSTRUCTIONS

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

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

1.10 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.304 stainless steel for exterior areas.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.17 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/or building occupants] [and pedestrian and vehicular traffic].
- .2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

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COMMON PRODUCT
REQUIREMENTS

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PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

PART 1 - GENERAL

1.1 SUBMITTALS

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

1.2 MATERIALS

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

1.3 PREPARATION

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

1.4 EXECUTION

- .1 Execute cutting, fitting, and patching including excavation and fill to complete Work.
- .2 Fit several parts together, to integrate with other Work.

- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.
- .5 Remove samples of installed Work for testing.
- .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.

1.5 WASTE MANAGEMENT AND DISPOSAL

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

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

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EXECUTION

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PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

PART 1 - GENERAL

1.1 SECTION INCLUDES

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

1.2 PROJECT CLEANLINESS

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

1.3 FINAL CLEANING

- .1 When Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review, remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste products and debris other than that caused by Owner or other Contractors.
- .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 Clean and polish glass, hardware, stainless steel, 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, walls, and floors.
- .9 Clean lighting reflectors, lenses, and other lighting surfaces.
- .10 HEPA vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .11 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 and areaways.
- .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.

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CLEANING

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PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

PART 1 - GENERAL

1.1 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.
- .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 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.

1.2 WASTE PROCESSING SITES

- .1 Province of: Ontario.
 - .1 Ministry of Environment and Climate Change, 135 St. Clair Avenue West, Toronto, ON, M4V 1P5.
 - .2 Telephone: 800-565-4923 or 416-323-4321.
 - .3 Fax: 416-323-4682.
- .2 Recycling Council of Ontario: 215 Spadina Avenue, #225, Toronto, ON, M5T 2C7.
 - .1 Telephone: 416-657-2797 or 1-888-501-9637.
 - .2 Fax: 416-960-8053.
 - .3 Email: rco@rco.on.ca.
 - .4 Internet: <http://www.rco.on.ca/>.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 CANADIAN GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT

.1 Government Chief Responsibility for the Environment.

Province	Address	General Inquiries	Fax
Ontario	Ministry of Environment and Climate Change 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	

PART 1 - GENERAL

1.1 INSPECTION AND DECLARATION

- .1 Contractor's Inspection: Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 - .1 Notify Departmental Representative in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
 - .2 Request Departmental Representative's Inspection.
- .2 Departmental Representative's Inspection: Departmental Representative and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor to correct Work accordingly.
- .3 Completion: submit written certificate that following have been performed:
 - .1 Work has been completed and inspected for compliance with Contract Documents.
 - .2 Defects have been corrected and deficiencies have been completed.
 - .3 Equipment and systems have been tested, adjusted and balanced and are fully operational.
 - .4 Certificates required by PWGSC Fire Protection Engineer and Utility companies 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 reinspection.

1.2 CLEANING

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

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

PART 1 - GENERAL

1.1 SECTION INCLUDES

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

1.2 SUBMISSION

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

1.3 FORMAT

- .1 Organize data in the form of an instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.

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

1.4 CONTENTS - EACH VOLUME

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

1.5 AS-BUILTS AND SAMPLES

- .1 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".

1.6 RECORDING ACTUAL SITE CONDITIONS

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

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

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

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

- .5 Specifications: legibly mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Amendments and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

1.7 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.

1.8 MATERIALS AND FINISHES

- .1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture-protection and Weather-exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .4 Additional Requirements: as specified in individual specifications sections.

1.9 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.

1.10 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.

1.11 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.

1.12 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.

1.13 WARRANTIES AND BONDS

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

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Procedures for demonstration and instruction of equipment and systems to Departmental Representative.
- .2 Departmental Representative includes property facility manager, building operators, maintenance staff, security staff and technical specialists, as applicable.

1.2 DESCRIPTION

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

1.3 QUALITY CONTROL

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

1.4 CONDITIONS FOR DEMONSTRATIONS

- .1 Equipment has been inspected and put into operation in accordance with Section the Contract Documents.
- .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.

1.5 PREPARATION

- .1 Verify that conditions for demonstration and instructions comply with requirements.
- .2 Verify that designated Departmental Representative personnel are present.

1.6 DEMONSTRATION AND INSTRUCTIONS

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

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Includes general requirements for commissioning facilities and facility systems.

1.2 RELATED SECTIONS

- .1 23 05 00 - Common Work Results for HVAC
- .2 26 05 00 - Common Work Results for Electrical
- .3 28 08 01 - Commissioning for Fire Alarm System

1.3 QUALITY ASSURANCE

- .1 Provide System Commissioning Administrator under provisions specified in Section 01 45 00.
- .2 System Commissioning Administrator: current member in good standing of AABC and NEBB certified to perform specified services.
- .3 Comply with applicable procedures and standards of the certification sponsoring association.
- .4 Perform services under direction of supervisor qualified under certification requirements of sponsoring association.

1.4 REFERENCES

- .1 Associated Air Balance Council (AABC): National Standards For Total System Balance, 7th edition, 2015.
- .2 ASHRAE Guideline 1.1-2007, HVAC&R Technical Requirements for the Commissioning Process.
- .3 ASHRAE Guideline 4-2008(RA 2013), Preparation of Operating and Maintenance Documentation for Building System.
- .4 NEBB Standard S120-2016, Rev.1-2017 - Technical Retro-Commissioning of Existing Buildings.
- .5 NETA Standard for Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems 2009.
- .6 CAN/ULC-S536-13, Inspection and Testing of Fire Alarm Systems.
- .7 CAN/ULC-S537-13, Verification of Fire Alarm Systems.

- .8 CAN/ULC-S1001-11, Standard for Integrated Systems Testing of Fire Protection and Life Safety Systems.
- .9 Canadian Electrical Code (CEC) CSA C22.1-18.
- .10 Ontario Electrical Safety Code, 2015

1.5 SUBMITTALS

- .1 Within 15 working days of Award of Contract, submit name of System Commissioning Administrator proposed to perform services who has managerial responsibilities for coordination of all commissioning activities.
- .2 Submit documentation to confirm System Commissioning Administrator compliance with quality assurance provision.
- .3 Submit 3 preliminary specimen copies of each type of startup checklist, product information and performance verification report forms proposed for use.
- .4 Submit completed report forms within 3 days after completion of each testing to Consultant for review and verification.
- .5 Fifteen days prior to Substantial Performance, submit 3 copies of final reports on applicable forms for functional performance verification.
- .6 Submit post-commissioning reports of testing, adjusting, and balancing postponed due to seasonal, climatic, occupancy, or other reasons beyond Contractor's control, promptly after execution of those services.

1.6 REPORT FORMS

- .1 System Commissioning Administrator having managerial responsibility shall make reports.
- .2 Report forms shall include:
 - .1 Startup Checklists.
 - .2 Product Information (PI) Report forms.
 - .3 Performance Verification (PV) Report forms.
- .3 Ensure each form bears signature of recorder, and that of supervisor of reporting organization.
- .4 Submit signed form to Consultant for review and approval. After approval, immediately submit form bearing Consultant's signature to Departmental Representative.
- .5 Identify each instrument used for testing, adjusting and balancing and its latest date of calibration.
- .6 Report the verification and testing results for electrical and Fire Alarm

system.

1.7 CONTRACTOR'S RESPONSIBILITIES

- .1 Prepare each system for testing and balancing.
- .2 Cooperate with testing organization and provide access to equipment and systems.
- .3 Provide personnel and operate systems at designated times, and under conditions required for proper testing, adjusting, and balancing.
- .4 Notify testing organization and Departmental Representative 7 days prior to time project will be ready for testing, adjusting, and balancing.
- .5 Accurately record data for each step.
- .6 Report to Departmental Representative any deficiencies or defects noted during performance of services.
- .7 Correct deficiencies identified in accordance with Departmental Representative's written instructions.

1.8 PREPARATION

- .1 Provide instruments required for testing, adjusting, and balancing operations.
- .2 Make instruments available to Departmental Representative to facilitate spot checks during testing and functional performance verification.
- .3 Retain possession of instruments and remove at completion of services.
- .4 Verify systems installation is complete and in continuous operation.
- .5 Verify lighting is turned on when lighting is included in cooling load.
- .6 Verify equipment such as computers, laboratory and electronic equipment are in full operation when these equipment are included in cooling load.
- .7 Verify the Fire Alarm system panels, devices and circuits affected as part of this project.
- .8 Verify and test all breakers, lighting, receptacles and cables within scope of this project.

1.9 EXECUTION

- .1 Test equipment, balance distribution systems, and adjust devices for HVAC systems.

- .2 Test hydronic systems, adjust and record liquid flow at each piece of heating radiators.
- .3 Measure the lighting distribution (average, min, max, max/average, min/max) within the area of the project.
- .4 Test cables and measure the Voltage drop at the end of the feeders.
- .5 Operational test of feeders and ensure the installation meet the applicable Codes requirements.

1.10 SCHEDULE OF SYSTEMS REQUIRING TESTING, ADJUSTING, AND BALANCING SERVICES

- .1 Section 23 05 00 - Common Work Results for HVAC.
- .2 Section 26 05 00 - Common Work Results for Electrical
- .3 Section 28 08 01 - Commissioning for Fire Alarm System

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

PART 1 - GENERAL

1.1 REFERENCES

- .2 CSA International
 - .1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Sections 01 33 00 and 01 74 20.
- .2 Submit demolition drawings:
 - .1 Submit for review and approval by Departmental Representative showing drawings stamped and signed by professional engineer registered or licensed in the Province of Ontario, showing proposed method.

1.3 QUALITY ASSURANCE

- .1 Health and Safety.
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Storage and Protection.
 - .1 Protect existing items designated to remain and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of Departmental Representative and at no cost to Departmental Representative.
 - .2 Remove and store materials to be salvaged, in manner to prevent damage.
 - .3 Store and protect in accordance with requirements for maximum preservation of material.
 - .4 Handle salvaged materials as new materials.

1.5 SITE CONDITIONS

- .1 Review "Designated Substance Report" and take precautions to protect environment.
- .2 If material resembling spray or trowel-applied asbestos or other designated substance listed as hazardous be encountered, stop work, take preventative measures, and notify Departmental Representative immediately.
 - .1 Proceed only after receipt of written instructions have been received from Departmental Representative.
- .3 Interruptions to Owners operations will not be permitted.
- .4 Notify Departmental Representative before disrupting building access or services.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- .1 Leave equipment and machinery running only while in use, except where extreme temperatures prohibit shutting down.
- .2 Demonstrate that tools are being used in manner which allows for salvage of materials in best condition possible.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Inspect building and site with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.
- .2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.
- .3 Notify and obtain approval of utility companies before starting demolition.
- .4 Disconnect, cap, plug or divert, as required, existing public utilities within the property where they interfere with the execution of the work, in conformity with the requirements of the authorities having jurisdiction. Mark the location of these and previously capped or plugged services on the site and indicate location (horizontal and vertical) on the record drawings. Support, shore up and maintain pipes and conduits encountered.
 - .1 Immediately notify Departmental Representative and utility company concerned in case of damage to any utility or service, designated to remain in place.
 - .2 Immediately notify the Departmental Representative should uncharted utility or service be encountered, and await instruction in writing regarding remedial action.

3.2 HAZARDOUS MATERIALS

- .1 Immediately stop work and notify the Departmental Representative should toxic or hazardous materials be encountered, and await instructions in writing regarding remedial action.

3.3 PROTECTION

- .1 Prevent movement, settlement, or damage to adjacent utilities, and parts of building to remain in place. Provide bracing and shoring required.
- .2 Keep noise, dust, and inconvenience to occupants to minimum.
- .3 Protect building systems, services and equipment.

- .4 Provide temporary dust screens, covers, railings, supports and other protection as required.

3.4 PREPARATION

- .1 Protection of In-Place Conditions:
 - .1 Prevent movement, settlement, or damage to adjacent structures, utilities, and parts of building to remain in place. Provide bracing and shoring required to support second floor slab during removal of exterior load bearing wall.
 - .2 Keep noise, dust, and inconvenience to occupants to minimum.
 - .3 Protect building systems, services and equipment.
 - .4 Provide temporary dust screens, covers, railings, supports and other protection as required.
 - .5 Do Work in accordance with Section 01 35 29.

3.5 REMOVAL OPERATIONS

- .1 Remove items as indicated.
- .2 Do not disturb items designated to remain in place.
- .3 Removal of Pavements, Curbs and Gutters:
 - .1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by Departmental Representative.
 - .2 Protect adjacent joints and load transfer devices.
 - .3 Protect underlying and adjacent granular materials.
- .4 Prevent contamination with base course aggregates, when removing asphalt pavement for subsequent incorporation into hot mix asphalt concrete paving,
- .5 Salvage.
 - .1 Items to be salvaged: exterior brick, highest possible quantities to be reused; remaining brick to be recycled.
 - .2 Dismantle items containing materials for salvage and stockpile salvaged materials at locations as indicated.
- .6 Disposal of Material.
 - .1 Dispose of materials not designated for salvage or reuse on site as instructed by Departmental Representative.
 - .2 Trim disposal areas to approval of Departmental Representative.

3.6 CLEANING AND RESTORATION

- .1 Keep site clean and organized throughout deconstruction.
- .2 Upon completion of project, remove debris, trim surfaces and leave work site clean.
- .3 Upon completion of project, reinstate areas and parking surfaces affected by Work to match condition of adjacent, undisturbed areas.

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 03 20 00: Concrete Reinforcing.
- .2 Section 03 30 00: Cast-in-Place Concrete.

1.2 REFERENCES

- .1 All referenced standards to be the current edition or the edition referenced by the applicable Building Code in force at the time of building permit application, as noted on Structural Drawings.
- .2 Canadian Standards Association (CSA International).
 - .1 CSA A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA S269.1-16, Falsework and Formwork.

1.3 QUALITY ASSURANCE

- .1 In accordance with Section 01 45 00.
- .2 Samples
 - .1 Samples for Architectural Concrete: Submit one sample for each type of the following items to be used:
 - .1 Circular forms.

1.4 ACTION AND INFORMATION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 DESIGN REQUIREMENTS

- .1 Design in accordance with CSA S269.1
- .2 The Structural Engineering Consultant accepts no responsibility for structural adequacy of formwork, falsework and re-shoring and will not review its design.

2.2 MATERIALS

- .1 Formwork materials: to CSA S269.1
 - .1 Tubular column forms: round, spirally wound laminated fibre forms, internally treated with release material.

PART 3 - EXECUTION

3.1 FABRICATION AND ERECTION

- .1 Conform to CSA A23.1/A23.2.
- .2 Clean formwork in accordance with CSA A23.1/A23.2, before placing concrete.

3.2 FIELD QUALITY CONTROL

- .1 Refer to Section 01 45 00.
- .2 Obtain field review of falsework and reshoring by the Professional Engineer responsible for that work prior to each pour. The Structural Engineering Consultant will not field review the formwork, falsework or reshoring.
- .3 An independent Inspection and Testing Agency will be appointed to inspect all features of formwork affecting appearance of finished architectural concrete surfaces for conformance with Contract Documents.

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 03 10 00: Concrete Forming and Accessories.
- .2 Section 03 30 00: Cast-in-Place Concrete.
- .3 Section 04 20 00: Unit Masonry.

1.2 REFERENCES

- .1 All referenced standards to be the current edition or the edition referenced by the applicable Building Code in force at the time of building permit application, as noted on Structural Drawings.
- .2 Canadian Standards Association (CSA International):
 - .1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CSA A23.3-14, Design of Concrete Structures.
 - .3 CSA G30.18(R2014), Carbon Steel Bars for Concrete Reinforcement.
 - .4 CSA S269.1-16, Falsework and Formwork.
- .3 Reinforcing Steel Institute of Canada (RSIC):
 - .1 Reinforcing Steel Manual of Standard Practice.
- .4 American Concrete Institute:
 - .1 ACI SP 66 Detailing Manual

1.3 QUALITY ASSURANCE

- .1 In accordance with Section 01 45 00.

1.4 QUALITY CONTROL

- .1 Submit in accordance with Section 01 45 00.
- .2 Source Quality Control Submittals:
 - .1 Upon request, provide the Structural Engineering Consultant with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis.
 - .2 Upon request, inform the Structural Engineering Consultant of proposed source of reinforcement material to be supplied.
 - .3 Upon request, provide the Structural Engineering Consultant with a copy of plant certificate by the Concrete Reinforcing Steel Institute for epoxy coating of reinforcement.

1.5 ACTION AND INFORMATION SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Shop Drawings:
 - .1 Prepare shop drawings in accordance with RSIC Manual of Standard Practice unless the Contract Documents contain a more stringent requirement. Conform to ACI SP 66 Detailing Manual whenever a detail condition is not covered by any of the above.
 - .2 Submit plans, elevations, sections and details necessary to

- fabricate, place and review reinforcement without reference to structural drawings, including masonry wall reinforcement. Draw to scale not smaller than 1:50.
- .3 Show on drawings:
 - .1 Sizes, spacings and locations of reinforcement, with identifying labels.
 - .2 Bar bending details.
 - .3 Lengths and locations of all lap splices.
 - .4 Types and locations of mechanical splices.
 - .5 Placing sequence.
 - .6 Bar lists.
 - .7 Concrete cover.
 - .4 Do not release for fabrication reinforcing bars whose length may be affected by field conditions, such as the final elevation of footings, until obtaining the required field measurements.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Reinforcing steel: carbon steel, deformed bars to CSA G30.18, unless indicated otherwise.
- .2 Chairs, bolsters, bar supports, spacers: to CSA A23.1/A23.2. Design in accordance with CSA S269.1

PART 3 - EXECUTION

3.1 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CSA A23.1/A23.2 and Reinforcing Steel Manual of Standard Practice.
- .2 Ship bundles of bar reinforcement, clearly identified in accordance with bar lists.
- .3 Provide standard hooks at ends of all hooked bars.
- .4 Substitute different size bars only if permitted in writing by the Structural Engineering Consultant.

3.2 FIELD BENDING

- .1 Do not field bend or field weld reinforcement except where indicated or authorized by the Structural Engineering Consultant.
- .2 When field bending is authorized, bend without heat, applying slow and steady pressure. Use tools which will limit bend radii to the values given in CSA A23.1/A23.2.
- .3 Where key-creating stay form with pre-installed blind dowels is used, bend

the dowels out using special tools approved by the stay form manufacturer.

- .4 Replace bars which develop cracks or splits.

3.3 PLACING REINFORCEMENT

.1 Place reinforcing steel as indicated on reviewed placing drawings and in accordance with CSA A23.1/A23.2.

- .2 Remove all loose scale, dirt, oil or other coatings which would reduce bond.

- .3 Ensure cover to reinforcement is maintained during concrete pour.

- .4 Turn ends of tie wire towards the interior of concrete.

- .5 Support bars, chairs and spacers:

.1 Provide sufficient support bars, chairs, carriers and side form spacers as necessary to secure against displacement of reinforcement and maintain concrete cover before and during concrete placement. Support devices contacting surfaces exposed to the exterior to be non-corroding. Bars which are not shown on Structural Drawings and whose only function is supporting other reinforcing in lieu of other supporting devices to be considered accessories.

.2 Use side form spacers for piers.

.3 Use plastic or plastic tipped bar supports and spacer with colour to match concrete for exposed concrete surfaces.

- .6 Do not cut reinforcement without the Structural Engineering Consultant's written approval.

- .7 Unless otherwise noted on drawings, stagger alternate mechanical couplers 750 mm.

3.4 INSPECTION AND TESTING

- .1 An independent Inspection and Testing Agency will be appointed to carry out inspection and testing of concrete reinforcing and check conformance with applicable Standards and Contract Documents.

- .2 Assist the Inspection and Testing Agency in its work. Notify as to the Work Schedule and provide safe access to the work area as required.

- .3 The Agency will submit reports covering the work inspected and provide details of errors or deficiencies observed.

- .4 When requested, the Agency will review mill test reports and correlate reinforcing steel supplied with mill test reports provided.

- .5 If reinforcing steel cannot be correlated to mill test reports, the Agency will conduct a sufficient number of tests to determine the yield strength of the reinforcing steel supplied.

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 03 10 00: Concrete Forming and Accessories.
- .2 Section 03 20 00: Concrete Reinforcing.
- .3 Section 05 12 23: Structural Steel for Buildings.

1.2 REFERENCES

- .1 All referenced standards to be the current edition or the edition referenced by the applicable Building Code in force at the time of building permit application, as noted on Structural Drawings.
- .2 Canadian Standards Association CSA International:
 - .1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA A283-06, Qualification Code for Concrete Testing Laboratories.
 - .3 CSA A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .4 CSA S413-14, Parking Structures
- .3 ASTM International Inc.:
 - .1 ASTM C457, Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete.
 - .2 ASTM C578, Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
 - .3 ASTM C1107, Standard Specification for Packaged Dry, Hydraulic Cement Grout (Nonshrink).

1.3 QUALITY ASSURANCE

- .1 In accordance with Section 01 45 00.
- .2 Qualifications
 - .1 Concrete supplier to have a valid "Certificate of Ready Mixed Concrete Production Facilities" issued by the relevant Ready Mixed Concrete Association.

1.5 ACTION AND INFORMATION SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Minimum 2 weeks prior to starting concrete work, submit all concrete mix designs, and indicate where each concrete mix is to be used.
- .3 Minimum submission requirements for each concrete mix design shall include the following:
 - .1 Minimum specified compressive strength at 28 day (or at the time specified on drawings).
 - .2 Maximum aggregate size.
 - .3 Aggregate type (if not normal density).
 - .4 Concrete density range, wet and dry (if not normal density).
 - .5 CSA exposure class.
 - .6 Cement type (if not type GU).

- .7 Percentage and type of supplemental cementing materials.
- .8 Maximum water/cementitious materials ratio.
- .9 Assumed method of placement of concrete.
- .10 Corrosion inhibitor (name and quantity, if applicable).
- .11 Alkali-aggregate resistance.
- .12 Maximum time from batching to placing concrete (if retarding admixtures are used).

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

- .1 To CSA A23.1/A23.2, Alternative 1 - Performance, and as described under Mixes and on Structural Drawings.

2.2 PERFORMANCE CRITERIA

- .1 Concrete supplier to meet the concrete performance criteria established by the Structural Engineering Consultant and to provide verification of compliance.

2.3 MATERIALS

- .1 Portland cement: to CSA A3001, Type GU.
- .2 Cementitious hydraulic slag: to CSA A3000.
- .3 Fly ash: to CSA A3001, Type CI.
- .4 Water: to CSA A23.1.
- .5 Aggregates: to CSA A23.1/A23.2. Do not use recycled concrete as aggregate.
- .6 Admixtures: not to contain chlorides.
- .7 Corrosion-inhibiting admixture: calcium nitrite solution.
- .8 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA A23.1/A23.2. Minimum compressive strength: 40 MPa at 28 days.
- .9 Non premixed dry pack grout: composition of non metallic aggregate and Portland cement with sufficient water for mixture to retain its shape when made into ball by hand and capable of developing compressive strength of 40 MPa at 28 days.
- .10 Bonding adhesive: synthetic latex.
- .11 Rigid insulation: extruded polystyrene boards per ASTM C578, structural grade, compressive strength 275 kPa.
- .12 Crack Filler: low viscosity epoxy resin.
- .13 Bond Breaker: 0.25 mm polyethylene or grade D, 30 minute building paper

perforated with 8 mm holes at 150 mm centres, each way.

- .14 Post-Installed Anchors and Dowels:
 - .1 Unless otherwise noted, anchorage to concrete to be:
 - .1 Where drilled concrete anchors (DCA) are noted on drawings, provide HILTI KWIK BOLT - TZ expansion anchors or approved equivalent.
 - .2 Where adhesive concrete anchors (ACA) are noted on drawings, provide HILTI HIT-HY 200 adhesive anchoring system with hilti hit-z anchor rods or approved
 - .2 Unless otherwise noted on drawings, anchorage to solid or grouted masonry to be:
 - .1 Where drilled masonry anchors (DMA) are noted on drawings, provide HILTI KB-3 expansion anchors or approved equivalent. Locate min. 35 (1-3/8") from any vertical mortar joint.
 - .2 Where adhesive masonry (AMA) anchors are noted on drawings, provide HILTI HIT-HY 70 adhesive anchoring system with HAS-E threaded rods or approved equivalent.
 - .3 Unless otherwise noted on drawings, anchorage to hollow masonry to be HILTI HIT-HY 70 adhesive anchoring system with HIT-SC mesh sleeve and HAS-E threaded rods or approved equivalent.
 - .4 In order to be accepted, any alternatives to the HILTI products specified in notes 1, 2 and 3 must be accompanied by testing data demonstrating that their performance (including capacity in cracked concrete and capacity reductions due to spacing and edge distance) is equivalent to the performance of HILTI products. In addition, that performance must be achieved using installation tools and procedures which do not required drilled holes to be cleaned prior to anchor installation.
 - .5 Anchors located outside the building envelope's vapour barrier to be hot dip galvanized.
 - .6 Concrete to be minimum 28 days old at the time of anchor installation.
 - .7 Use drilling and installation tools and procedures per manufacturer's recommendations. Do not core drill unless specifically noted on drawings. Hole diameters not to exceed those required by manufacturer.
 - .8 Where core drilling is specified, clean and roughen holes per manufacturer's recommendation.
 - .9 Arrange for the anchor manufacturer to conduct on-site training for installation of all the products specified, and for all conditions encountered (e.g. horizontal, inclined, overhead). All installers must complete the hilti certified installer training program. Submit copies of completion certificates for the Structural Engineering Consultant's record.
 - .10 Arrange for a manufacturer's technical representative to be present during installation of first few anchors of each size and type. Submit site reports indicating anchor types and sizes installed, locations and installers' names.

- .11Anchor and dowel capacity is dependent upon spacing between adjacent anchors and their proximity to concrete and masonry edges; therefore, all anchors must be installed with clearances and edge distances indicated on drawings
- .12Unless core drilling is specified on drawings, do not cut reinforcement to accommodate drilled anchors and dowels. Scan the structure to locate reinforcement prior to fabricating structural steel fastened by drilled anchors.
- .13When obstructions prevent drilling holes in specified locations to the required depth, relocate at no extra cost to the contract. Obtain the Structural Engineering Consultant's approval of new locations before drilling; modifications to connected members and additional anchors / dowels may be required. Fill abandoned holes which are closer than 3 times the hole diameter from the relocated anchors with HILTI HY-200 adhesive. Do not tighten anchors until the adhesive has fully cured.
- .14Unless otherwise noted on drawings, embedment lengths for post-installed hilti anchors to be standard embedments.
- .15If anchors other than the HILTI products specified in notes 1, 2 and 3 are approved to be used, anchor supplier to establish the embedment lengths required to achieve performance equivalent to the HILTI products embedded as indicated in the table above.
- .16Do not bend post installed dowels and rods after installation.
- .17Do not weld to plates fastened with adhesive anchors after the adhesive is placed.

2.4 CONCRETE MIXES

- .1 Use ready-mix concrete. Proportion concrete in accordance with CSA A23.1, Alternative 1.
- .2 Set performance characteristics of concrete in plastic state in coordination with all trades involved.
- .3 Meet performance criteria of concrete in hardened state as shown on Structural Drawings and provide verification of compliance.
- .4 Use water-reducing agent in all concrete.
- .5 Do not use admixtures containing chlorides.
- .6 Supplementary cementing materials (SCM):
 - .1 Conform to CSA A23.1/A23.2.
 - .2 Follow slag and fly ash manufacturers' directions for proportioning and mixing of concrete.
 - .3 Fly ash not to exceed 15% of total cementitious material.
 - .4 Do not use concrete with more than 40% of SCM when ambient temperature is forecast to be below +10°C at the time of concrete pour and during the seven days after the pour, except for footings, walls and columns.

.5 Reduce W/C ratio to 0.45 where using more than 40% of SCM in concrete for slabs and other horizontal finished surfaces, in order to reduce bleed water and to increase rate or strength gain.

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Provide advanced notice as indicated on drawings to allow the Structural Engineering Consultant field review of reinforcing prior to placing of concrete/closing of wall forms.
- .2 Obtain written approval of each foundation bearing surface by the Geotechnical Consultant before placing concrete.
- .3 Remove water and disturbed soil from excavations before placing concrete.
- .4 Place concrete reinforcing in accordance with Section 03 20 00.

3.2 INSTALLATION/APPLICATION

- .1 Set anchor rods using templates under supervision of appropriate trade prior to placing concrete. Locate each anchor rod group to within 6 mm (1/4") of required location.

3.3 PLACING CONCRETE

- .1 Place concrete in accordance with CSA A23.1/A23.2.
- .2 Delivery and place concrete with minimum re-handling.
- .3 If concrete is pumped or placed pneumatically, control discharge velocity to prevent separation or scattering of concrete mix ingredients.
- .4 Place concrete in a continuous operation without cold joints. If cold joints develop inadvertently, notify the Structural Engineering Consultant to obtain instructions for required remedial work.

3.4 FINISHING CONCRETE

- .1 Finish concrete to CSA A23.1/A23.2.

3.5 CONCRETE CURING AND PROTECTION

- .1 At a minimum cure and protect concrete in accordance with CSA A23.1/A23.2.
 - .1 Piers and footings: 50% of specified 28 day strength.
- .2 For concrete containing supplementary cementing materials, curing and protection times may need to be extended beyond those outlined by CSA A23.1/A23.2 to achieve the required structural properties.

3.6 GROUTING UNDER BASE PLATES AND BEARING PLATES

- .1 Grout under base plates and bearing plates using procedures in accordance

with manufacturer's recommendations.

- .2 Provide 100% contact over grouted area.

3.7 EXISTING STRUCTURE

- .1 Take precautions to protect the existing structure from damage.
- .2 Remove portions of existing concrete structure as required.
- .3 Provide temporary shoring and bracing as required.
- .4 Retain a Professional Engineer to design the temporary shoring and bracing and to review this work on site.
- .5 Obtain approval from the Structural Engineering Consultant before coring or cutting existing slabs, beams or walls.
- .6 Retain an independent testing company to locate existing reinforcement and conduit in the areas of proposed openings and to mark locations on the surfaces of slabs and walls on which the cores and cuts are to be started using a non-destructive method.
- .7 Remove toppings prior to locating reinforcement and conduit.
- .8 Mark locations and sizes of cores and openings and locations of reinforcement and conduit using indelible markers as follows:
 - .1 Red for top bars
 - .2 Green for bottom bars
 - .3 Black for cores, openings and conduit.
- .9 Relocate proposed openings and repeat process at no extra cost to the Contract if proposed locations are not acceptable to the Structural Engineering Consultant.
- .10 Patching:
 - .1 Patch existing concrete where necessary to provide required smooth, flat surfaces for reinforcement and for other trades.

3.8 INSPECTION AND TESTING:

- .1 An independent Inspection and Testing Agency (certified under CSA A283 with category to suit testing provided) will be appointed to carry out inspection and testing of concrete and concrete materials and check conformance with applicable Standards and Contract documents.
- .2 Assist the Inspection and Testing Agency in its work. Notify as to the Work Schedule and provide safe access to the work area as required. Provide concrete samples.
- .3 The Agency will submit reports covering the work inspected and the testing performed. The reports will include the Supplier's mix design numbers, locations in structure to which the tests relate and comments on abnormal results and conditions. The reports will be provided not later than five

- working days after the testing is completed.
- .4 Sampling, storing, curing and testing of concrete will be in accordance with CSA A23.1/A23.2.
 - .5 The Agency will review all submittals pertaining to concrete mix designs and certification of plant, equipment and materials.
 - .6 Compressive Strength Testing:
 - .1 One test for each concrete mix placed each day. At least 3 tests are required for each class of concrete used.
 - .2 A group of three cylinders for each test will be provided, Location of concrete placement will be recorded for each cylinder set. One specimens will be tested at 7 and one at 28 days. The third specimen will be tested at 56 days if the required strength at 28 days is not achieved.
 - .3 If the final concrete strength is specified at 56, 90 or 120 days, a group of four cylinders will be provided. One specimen will be tested at 7 and one at 28 days, with the third specimen tested at the time the final concrete strength is specified. If the required strength is not achieved at the time specified, the fourth specimen will be tested 28 days later.
 - .4 One additional cylinder will be provided for each concrete mix during cold weather concreting. The specimens will be cured on site adjacent to and under the same conditions as the work they represent, and will be tested prior to form removal.
 - .5 If standard on site cured cylinders are used to determine concrete strength prior to removal of formwork, they will be kept adjacent to and under the same conditions as the work they represent.
 - .7 Air Entrainment Testing:
 - .1 One standard test for air content in plastic concrete will be conducted for each 100 cubic meters of each air entrained concrete mix.
 - .2 One standard test per ASTM C457 will be conducted to determine air void spacing factor in hardened concrete for each 100 cubic meters each air entrained concrete mix.
 - .8 Grout Testing
 - .1 One standard test per ASTM C1107 will be made each day when concrete grout is installed under base plates.
 - .2 A group of 6 cubes for each test will be provided. 3 cubes will be tested after 7 days, and 3 after 28 days.

PART 1 - GENERAL

1.1 REFERENCES

- .1 ASTM International
 - .1 ASTM A1064/A1064M-17, Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
- .2 CSA International
 - .1 CAN/CSA-A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction / Test Methods and Standard Practices for Concrete.
 - .2 CAN/CSA-A82-14, Fired Masonry Brick Made From Clay or Shale.
 - .3 CAN/CSA A165.1-04, Concrete Block Masonry Units.
 - .4 CAN/CSA-A179-14, Mortar and Grout for Unit Masonry.
 - .5 CAN/CSA-A370-14, Connectors for Masonry.
 - .6 CAN/CSA-A371-14, Masonry Construction for Buildings.
 - .7 CSA G30.18-09(R2014), Carbon Steel Bars for Concrete Reinforcement.
 - .8 CSA S304.1-14, Design of Masonry Structures.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .4 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1113-A2016, Architectural Coatings.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for masonry products and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit 2 copies of WHMIS MSDS.
 - .1 Indicate VOC's in g/L for epoxy coatings and galvanized protective coatings and touch-up products to be applied within building envelope.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Shop drawings consist of bar bending details, lists and placing drawings.
 - .3 Placing drawings, indicate sizes, spacing, location and quantities of reinforcement and connectors.
- .4 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Samples will be returned for inclusion into work.
 - .3 Submit duplicate full size samples of each type masonry units.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect masonry products from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return of pallets, crates, padding and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 MASONRY UNITS

- .1 Standard concrete block units: to CSA A165 Series (CSA A165.1).
 - .1 Classification: H/15/A/M.
 - .2 Size: modular, CCMPA size code 15.
 - .3 Provide purpose-made shapes for lintels and bond beams. Provide additional special shapes as indicated.
 - .4 Special shapes: provide purpose-made shapes for lintels and bond beams and provide additional shapes as indicated.
- .2 Burned clay brick: to CAN/CSA-A82.
 - .1 Type: X.
 - .2 Grade: EG.
 - .3 Size: To allow for tothing into existing masonry wall.
 - .4 Colour and texture: to match approved sample.
- .3 Salvaged brick: From stockpile on Site.
- .4 Precast concrete sills: Fabricate to shapes and sizes shown on drawings, 35 MPa concrete in accordance with CSA A23.4, galvanized steel reinforced. Dowel and hook anchors to be stainless steel.

2.2 REINFORCEMENT AND CONNECTORS

- .1 Bar reinforcement: to CAN/CSA-A371 and CSA G30.18, Grade 400, minimum 30% recycled content.
- .2 Wire reinforcement: to CAN/CSA-A371 and A1064/A1064M, truss type, minimum 30% recycled content.
- .3 Connectors shall be corrosion resistant: to CAN/CSA-A370 and CSA S304.1.

2.3 MORTAR AND GROUT

- .1 Mortar: to CAN/CSA-A179.
 - .1 Use aggregate passing 1.18 mm sieve where 6 mm thick joints are indicated.
 - .2 Colour: ground coloured natural aggregates or metallic oxide pigments.
- .2 Mortar Type: S based on property specifications,
- .3 Following applies regardless of mortar types and uses specified above:
 - .2 Mortar for grouted reinforced masonry: type S based on property specifications.
- .4 Grout: to CAN/CSA-A179, Table 3.
- .5 Parging mortar: type N to CAN/CSA-A179.

2.4 ACCESSORIES

- .1 Weep hole vents: purpose-made polypropylene fibre filter, colour to be selected by Departmental Representative.
- .2 Nailing Inserts: 0.5 mm minimum thickness, galvanized.
- .3 Bolts: 12 mm diameter x 150 mm long with ends bent 50 mm at 90 degrees.
- .4 Flashings: prefinished metal sheet, 600 g/m², asphalt laminated to two layers of creped kraft paper, reinforced with 12.7 x 12.7 mm fibreglass scrim.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.
- .2 Verification of salvaged materials: Visually inspect and verify condition of salvaged brick that has been stockpiled for reuse. Replace with new brick if facing has been damaged.

3.2 INSTALLATION

- .1 Do masonry work in accordance with CAN/CSA-A371 except where specified otherwise.
 - .1 Bond: running stretcher bond with vertical joints in perpendicular alignment and centred on adjacent stretchers above and below.
 - .2 Coursing height: 200 mm for one block and one joint.
 - .3 Jointing: tool where exposed or where paint or other finish coating is specified to provide smooth compressed surface.
- .2 Build masonry plumb, level, and true to line, with vertical joints in alignment.
- .3 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

3.3 CONSTRUCTION

- .1 Exposed masonry:
 - .1 Remove chipped, cracked, and otherwise damaged units, in exposed masonry and replace with undamaged units.
 - .2 Cut out for electrical switches, outlet boxes, and other recessed or built-in objects. Make cuts straight, clean, and free from uneven edges.
- .2 Building-in:
 - .1 Install masonry connectors and reinforcement where indicated on drawings.
 - .2 Build in items required to be built into masonry.
 - .3 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.
 - .4 Brace door jambs to maintain plumb. Fill spaces between jambs and masonry with mortar.
 - .5 Install loose steel lintels over openings where indicated.
- .3 Concrete block lintels:
 - .1 Install reinforced concrete block lintels over openings in masonry where steel or reinforced concrete lintels are not indicated.
 - .2 End bearing: not less than 200 mm.
- .4 Support of loads:
 - .1 Use grout to CAN/CSA-A179 where grout is used in lieu of solid units.
 - .2 Install building paper below voids to be filled with grout; keep paper 25 mm back from faces of units.
- .5 Provision for movement:
 - .1 Leave 3 mm space below shelf angles.
 - .2 Leave 6 mm space between top of non-load bearing walls and partitions and structural elements. Do not use wedges.
 - .3 Built masonry to tie in with stabilizers, with provision for vertical movement.
- .6 Interface with other work:
 - .1 Cut openings in existing work as indicated.

- .2 Openings in walls: approved by Departmental Representative.
- .3 Make good existing work. Use materials to match existing.

- .7 Build in flashings in masonry in accordance with CAN/CSA-A371.
 - .1 Install flashings under exterior masonry bearing on foundation walls, slabs, shelf angles, and steel angles over openings. Install flashings under weep hole courses and as indicated.
 - .2 Carry flashings from front edge of masonry, under outer wythe, then up backing not less than 150 mm, and as follows:
 - .1 For masonry backing embed flashing 25 mm in joint.
 - .3 Lap joints 150 mm and seal with adhesive.

- .8 Install weep hole vents in vertical joints immediately over flashings, in exterior wythes of cavity wall and masonry veneer wall construction, at maximum horizontal spacing of 600 mm on centre.

3.4 REINFORCING AND CONNECTING

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

3.5 BONDING AND TYING

- .1 Tie masonry veneer to backing in accordance with NBC, CAN/CSA-A371, CSA S304.1 and as indicated.

3.6 REINFORCED LINTELS AND BOND BEAMS

- .1 Reinforce masonry lintels and bond beams as indicated.
- .2 Place and grout reinforcement in accordance with CAN/CSA-A179, CAN/CSA-A371 and CSA S304.1.

3.7 GROUTING

- .1 Grout masonry in accordance with CAN/CSA-A179, CAN/CSA-A371 and CSA S304.1 and as indicated.

3.8 ANCHORS

- .1 Supply and install metal anchors as indicated.

3.9 LATERAL SUPPORT AND ANCHORAGE

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

3.10 SITE TOLERANCES

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

3.11 FIELD QUALITY CONTROL

- .1 Inspection and testing will be carried out by Testing Laboratory designated by Departmental Representative.

3.12 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.13 PROTECTION

- .1 Protect masonry and other work from marking and other damage. Protect completed work from mortar droppings. Use non-staining coverings.
- .2 Repair damage to adjacent materials caused by masonry products installation.

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 03 30 00: Cast in Place Concrete.
- .2 Section 05 50 00: Metal Fabrications.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International):
 - .1 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CSA S16-14, Limit States Design of Steel Structures.
 - .3 CSA W47.1-09(R2014), Certification of Companies for Fusion Welding of Steel.
 - .4 CSA W48-18, Filler Metals and Allied Materials for Metal Arc Welding.
 - .5 CSA W59-13, Welded Steel Construction (Metal Arc Welding).
 - .6 CSA W178.1-14, Certification of Welding Inspection Organizations.
 - .7 CSA W178.2-14, Certification of Welding Inspectors.
- .2 ASTM International Inc.:
 - .1 ASTM A123/A123M-17, Standard Specification for Zinc (Hot Dip Galvanized) coating on Iron and Steel Products.
 - .2 ASTM A36/A36M-14, Standard Specification for Carbon Structural Steel.
 - .3 ASTM A992-15, Standard Specification for Structural Steel Shapes.
 - .4 ASTM A500-13, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - .5 ASTM A1085-15, Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections.
 - .6 ASTM F3125-15, Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated.
- .3 The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers (NACE) International:
 - .1 SSPC-SP 1-16, Solvent Cleaning.
 - .2 NACE No.2-06 / SSPC-SP 10-07, Near White Blast Cleaning.
 - .3 SSPC Technology Guide No.14-04 - Guide for the Repair of Imperfections in Galvanized, Organic or Inorganic Zinc-Coated Steel Using Organic Zinc Rich Coating.

1.3 QUALITY ASSURANCE

- .1 In accordance with Section 01 45 00.
- .2 Qualifications
 - .1 Structural steel fabricator to have at least five year experience with structural steel for buildings.
 - .2 Structural steel fabricator and erector to be certified by the Canadian Welding Bureau under the requirements of CSA W47.1, Division 1 or 2 for fusion welding and/or CSA W55.3 for resistance welding of structural steel components, and to have CWB approved procedure for welding rebar (Grade 400W) to structural steel.
 - .3 Welders to be CWB approved, working under supervision of a CWB approved

firm.

.4 Engage a Professional Engineer licensed in the place where the project is located to be responsible for design, detailing and installation of all connections related to structural steel work.

.5 The Professional Engineer designing connections to hold a Certificate of Authorization, and to carry min. \$1,000,000.00 in liability insurance (per occurrence).

1.4 QUALIY CONTROL

.1 Submit in accordance with Section 01 45 00.

.2 Source Quality Control Submittals:

.1 Provide all submittals 4 weeks prior to starting fabrication of structural steel.

.2 Mill test reports:

.1 Mill test reports to include ladle analysis and physical test results, and to show chemical and physical properties and other details of steel to be incorporated in project.

.2 The reports to be correlated to the materials or products to which they pertain.

.3 Tolerances

.1 Conform to the fabrication and erection tolerances of CAN/CSA S16.

.2 Comply with more stringent tolerances if specified elsewhere to suit interfacing materials.

1.5 ACTION AND INFORMATION SUBMITTALS

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

.2 Shop Drawings:

.1 Provide drawings stamped and signed by the Professional Engineer responsible for steel connections.

.2 If additional information is required from the Structural Engineering Consultant, allow a minimum of five working days for the Structural Engineering Consultant to review and respond to the request for information.

.3 Erection drawings:

.1 Submit erection drawings indicating details and information necessary for assembly and erection purposes including:

.1 Description of erection methods.

.2 Sequence of erection.

.3 Details of all field welded connections

.4 Fabrication drawings:

.1 Submit fabrication drawings showing designed assemblies, member sizes, components and connections. Show on drawings:

.1 Material specifications.

.2 Surface preparation.

.3 Shop painting / galvanizing.

.4 Types of shop and field connections.

.5 Net weld lengths.

.2 Substitution of alternative sections will only be allowed provided the new members have equal or greater capacity and stiffness and their dimensions are approved by the Structural Engineering Consultant.

.5 When requested, submit sketches and design calculations stamped and signed by the Professional Engineer responsible for connection design.

PART 2 - PRODUCTS

2.1 DESIGN AND DETAILING REQUIREMENTS

.1 Design details and connections in accordance with requirements of CSA S16 to resist forces and to allow for movements indicated. Consider load effects due to fabrication, erection and handling.

.2 Built-up members:

.1 Connect together double beams and double channels at not more than 1200 mm centres unless the members are welded toe to toe.

2.2 MATERIALS

.1 Structural steel:

.1 Rolled shapes: to CSA G40.20/G40.21 or ASTM A992, refer to drawings.

.2 Hollow structural sections: to ASTM A500, ASTM A1085 or CSA G40.20/G40.21, refer to drawings.

.2 Bolts, nuts and washers: to ASTM F3125, grade A325.

.3 Welding materials: to CSA W48 and CSA W59, certified by Canadian Welding Bureau. For members in seismic force resisting system, refer to additional brittleness requirements in CSA S16.

.4 Hot dip galvanizing: to ASTM A123/A123M, minimum zinc coating of 600 g/m², Coating Grade 85.

2.3 FABRICATION

.1 Fabricate structural steel in accordance with CSA S16 and with reviewed shop drawings.

2.4 SHOP PAINTING

.1 Clean all members to SSPC-SP 1 - Solvent Cleaning, Remove loose mill scale, rust, oil, dirt and foreign matter using any suitable method.

.2 In addition for members receiving zinc rich coating: Clean steel to SSPC-SP 10 Near White Blast Cleaning.

.1 Galvanized members.

.3 Apply galvanizing in the shop to all structural steel located beyond the vapour barrier, including:

.1 Lintels in exterior walls.

- .2 Exposed exterior steel members.
 - .3 Exposed anchor rods.
 - .4 Other steel noted on drawings.
- .4 If galvanized steel is to be painted, use only non passivated galvanizing process (without chromate coating).

PART 3 - EXECUTION

3.1 GENERAL

- .1 Structural steel work: in accordance with CSA S16.
- .2 Welding: in accordance with CSA W59.

3.2 CONNECTION TO EXISTING WORK

- .1 Verify dimensions and condition of existing works prior to start of fabrication. Report discrepancies, modify connection details if required and submit to the Structural Engineering CONSULTANT for review. Determine any potential interference with existing services and report problem areas to the Structural Engineering Consultant for direction before commencing work.
- .2 Take precautions to protect existing works from damage. Provide temporary shoring as required. Repair damage to adjacent materials caused by structural steel installation.

3.3 MODIFICATION/REMOVAL OF EXISTING STEEL WORK

- .1 A set of Structural Drawings of the existing building may be viewed at the offices of the Architect.
- .2 Dismantle and cut existing structural steel as required. Provide temporary shoring and bracing required for these operations. Retain a Professional Engineer to design the temporary shoring and to review this work on site.

3.4 ERECTION

- .1 Erect structural steel in accordance with CSA S16 and reviewed erection drawings.
- .2 Do not field cut or alter any members without the Structural Engineering Consultant's approval.
- .3 Make adequate provision for all loads acting on the structure during erection. Provide erection bracing to keep the structure stable, plumb and in true alignment during construction. For load bearing masonry construction, maintain bracing until completion of masonry work and floor / roof decks which together provide permanent bracing. Do not remove erection bracings without written approval from the Engineer who designed it.
- .4 Provide dissimilar metal separators at connections between aluminum members

and structural steel.

3.5 FIELD PAINTING

- .1 Repair any galvanized surfaces which have been damaged or field welded in accordance with SSPC Technology Guide No.14.

3.6 INSPECTION AND TESTING

- .1 An Inspection and Testing Agency (certified to CSA W178.1 & 2) will be appointed to carry inspection and testing of all structural steel.
- .2 Do not commence fabrication until details of inspection have been worked out with the Agency.
- .3 Assist the Inspection and Testing Agency in its work. Notify as to the Work Schedule and provide safe access to the work area as required.
- .4 The Inspection Agency will submit reports to the Structural Engineering Consultant, Contractor and Municipal Authorities covering the Work inspected and provide details of errors or deficiencies observed.
- .5 Work will be inspected in shop and when erected. Store fabricated members in shop so that they are accessible for inspection.
- .6 Provide Inspection and Testing Agency with a copy of reviewed shop drawings.
- .7 Welding inspection:
 - .1 Welding inspection will be conducted in shop and in field.
 - .2 The Inspector will check welders' CWB certification.
 - .3 The Inspector will review welding procedures for conformance with CWB requirements, manufacturers' requirements and standard practice.
 - .4 The inspector will visually check 20% of all welds for:
 - .1 Size, length and profile
 - .2 Joint preparation, including cleaning and removal of any paint.
 - .3 Fit up and alignment.
 - .4 Penetration and fusion.
 - .5 Slag removal.
 - .6 Distortion.
 - .7 Porosity.
 - .8 Cracks.
 - .5 Test results will be evaluated in accordance with CSA W59.
- .8 Field inspection:
 - .1 Arrange for the Inspector to start field inspection as soon as each section of the Work is completed, plumbed, bolts tightened and field welding finished.
 - .2 The Inspector will sample erection procedures for general conformity with Contract requirements.
 - .3 The Inspector will check general fit-up and tolerances and report any apparent distortions and misalignments.
 - .4 Field inspection will include:
 - .1 Checking individual frame members for twisting, sweep and local damage.
 - .2 Checking levelness of leveling plates.

- .3 Inspection of grouting under base plates and bearing plates.
- .4 Checking bearings on steel and masonry.
- .5 Inspection of bolting, and post installed anchors as described below.
- .6 Inspection of field touch-up.
- .5 Post installed anchor inspection:
 - .1 The Inspector will sample check drilled concrete and masonry anchors.
 - .2 The Inspector will provide full time inspection during installation of post installed adhesive anchors subject to sustained tension loads.
 - .3 The Inspector will randomly select and pull test 5% of all types and sizes of post installed anchors installed on a weekly basis, but not less than one anchor of each type, size and orientation. Pull test to twice the allowable tensile load, or 1.5 times the factored resistance of the anchor given by the manufacturer. Chose anchor locations where proximity to concrete edge does not affect anchor capacity, or use reduced anchor loads per manufacturer's recommendation. Submit reports to the Structural Engineering Consultant within one week of testing. Reports to indicate each anchor location, test load and mode of failure, if applicable. Notify the Structural Engineering Consultant immediately if any anchor fails the pull test.

PART 1 - GENERAL

1.1 REFERENCES

- .1 ASTM International
 - .1 ASTM A123/A123M-17, Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
 - .2 ASTM A307-14e1, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.
- .2 CSA International
 - .1 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding.
 - .3 CSA W59-13, Welded Steel Construction (Metal Arc Welding).
- .3 Green Seal Environmental Standards (GS)
 - .1 GS-11-2015, Edition 3.2, Paints and Coatings.
- .4 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual (2018).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for sections, plates, bolts and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two copies of WHMIS MSDS.
 - .1 For finishes, coatings, primers, and paints applied on site: indicate VOC concentration in g/L.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

1.3 QUALITY ASSURANCE

- .1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse by manufacturer of pallets, crates, padding and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Steel sections and plates: to CSA G40.20/G40.21, Grade 350W, minimum 30% recycled content.
- .2 Welding materials: to CSA W59.
- .3 Welding electrodes: to CSA W48 Series.
- .4 Bolts and anchor bolts: to ASTM A307.
- .5 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

2.2 FABRICATION

- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .2 Use self-tapping shake-proof flat headed screws on items requiring assembly by screws or as indicated.
- .3 Where possible, fit and shop assemble work, ready for erection.
- .4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

2.3 FINISHES

- .1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m², Coating Grade 85, to ASTM A123/A123M.
- .2 Shop coat primer: MPI- EXT 5.1A.

- .3 Zinc primer: zinc rich, ready mix to MPI- EXT 5.2C.

2.4 SHOP PAINTING

- .1 Primer: VOC limit 250 g/L maximum to GS-11.
- .2 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.
- .3 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 degrees C.
- .4 Clean surfaces to be field welded; do not paint.

2.5 ANGLE LINTELS

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

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 ERECTION

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage acceptable to Departmental Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.

- .4 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .5 Supply components for work by other trades in accordance with shop drawings and schedule.
- .6 Weld field connections.
- .7 Deliver items over for building into masonry together with setting templates to appropriate location and construction personnel.
- .8 Touch-up rivets, field welds, bolts and burnt or scratched surfaces with primer after completion of:
 - .1 Primer: maximum VOC limit 250 g/L to GS-11.
- .9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.
 - .1 Primer: maximum VOC limit 250 g/L to GS-11.

3.3 CHANNEL FRAMES

- .1 Install steel channel frames to openings as indicated.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

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

PART 1 - GENERAL

1.1 REFERENCES

- .1 American National Standards Institute/National Association of Architectural Metal Manufacturers (ANSI/NAAMM)
 - .1 ANSI/NAAMM MBG 531-09, Metal Bar Grating Manual.
- .2 ASTM International
 - .1 ASTM A123/A123M-17, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .2 ASTM A307-14e1, Standard Specification for Carbon Steel Bolts, Studs and Threaded Rod, 60,000 PSI Tensile Strength.
 - .3 ASTM F3125/F3125M-15a, Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .4 CSA International
 - .1 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for stairs and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Indicate construction details, sizes of steel sections and thickness of steel sheet.

1.3 QUALITY ASSURANCE

- .1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect stairs from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- .1 Detail and fabricate stairs to NAAMM Metal Stairs Manual.

2.2 MATERIALS

- .1 Steel sections: to CSA G40.20/G40.21 Grade 300 W, minimum 30% recycled content.
- .2 Steel tubing: to CSA G40.20/G40.21, Grade C, round, 3 mm wall thickness, sizes and dimensions as indicated.
- .3 Metal bar grating: welded steel grating to ANSI/NAAMM MBG 531, Type W-15-4, with checker plate abrasive nosings.
- .4 Welding materials: to CSA W59.
- .5 Bolts: to ASTM A307.
- .6 High strength bolts: to ASTM F3125/F3125M.

2.3 FABRICATION

- .1 Fabricate in accordance with NAAMM, Metal Stair Manual.
- .2 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.
- .3 Accurately form connections with exposed faces flush:
 - .1 Make mitres and joints tight.
 - .2 Make risers of equal height.
- .4 Grind or file exposed welds and steel sections smooth.
- .5 Shop fabricate stairs in sections as large and complete as practicable.

2.4 GRATING STAIRS

- .1 Form steel grating treads and landings from metal bar grating with serrated profile and checkered plate nosing, dimensions as indicated on drawings. Secure to stringers and supports as indicated. Form landings of steel grating and reinforce as required.
- .2 Form stringers from MC 310 x 15.8.

2.5 TUBING BALUSTRADES

- .1 Construct balusters and handrails from steel steel tubing.
- .2 Fabricate handrail brackets as indicated on drawings.
- .3 Cap and weld exposed ends of balusters and handrails.
- .4 Terminate at abutting wall with end flange.

2.6 FINISHES

- .1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m², Coating Grade 85, to ASTM A123/A123M.
- .2 Shop coat primer: to MPI# 23. Ecologo certified.
- .3 Zinc primer: zinc rich, ready mix to CAN/CGSB-1.181.

2.7 SHOP PAINTING

- .1 Clean surfaces in accordance with Steel Structures Painting Council Manual Volume 2.
- .2 Apply two coats of primer of different colours to parts inaccessible after final assembly.
- .3 Use primer as prepared by manufacturer without thinning or adding admixtures. Paint on dry surfaces, free from rust, scale, grease, do not paint when temperature is below 7 degrees C.
- .4 Do not paint surfaces to be field welded.

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 INSTALLATION OF STAIRS

.1 Install in accordance with NAAMM, Metal Stair Manual.

.2 Install plumb and true in exact locations, using welded connections wherever possible to provide rigid structure. Provide anchor bolts, bolts and plates for connecting stairs to structure.

.3 Continuously weld connections for railings, and anchor directly to steel stringers.

.4 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.

.5 Do welding work in accordance with CSA W59 unless specified otherwise.

.6 Touch up shop primer to bolts, welds, and burned or scratched surfaces at completion of erection.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.

.1 Leave Work area clean at end of each day.

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

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

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

3.4 CLEANING

.1 Perform cleaning as soon as possible after installation to remove construction and accumulated environmental dirt.

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

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by metal stairs and ladders installation.

PART 1 - GENERAL

1.1 REFERENCES

- .1 ASTM International
 - .1 ASTM A653/A653M-17, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 Canadian Roofing Contractors Association (CRCA)
 - .1 CRCA Roofing Manual, 2011.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA A123.3-05(R2015), Asphalt Saturated Organic Roofing Felt.
 - .2 CAN/CSA-A123.4-04(R2013), Asphalt for Constructing Built-Up Roof Coverings and Waterproofing Systems.
- .4 National Lumber Grades Authority (NLGA)
 - .1 Standard Lumber Grading Rules for Canadian Lumber, 2017.
- .5 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S704-11, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faced.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for masonry products and include systems, materials, and methods of installation proposed for use, showing system and each component. Certify compliance of each component with applicable standards.
- .3 Shop Drawings:
 - .1 Submit shop drawings indicating details of roof system, flashings, control joints, method of tying in existing vapour retarder with new vapour retarder, insulation and similar items.

1.3 QUALITY ASSURANCE

- .1 Qualification: Perform work of this Section by a company that is a member in good standing of the Canadian Roofing Contractors Association (CRCA) and has a minimum of 5 years proven acceptable roofing experience on installations of similar complexity and scope.
- .2 Perform roofing work in accordance with the CRCA Roofing Specifications Manual and in accordance with membrane manufacturer's printed installation instructions.

1.4 PROJECT CONDITIONS

- .1 Interruptions to Departmental Representative's operations will not be permitted.
- .2 Do not remove existing roofing system when weather conditions threaten the integrity of the building contents or intended continued occupancy.

1.5 EXTENDED WARRANTY

- .1 At completion of this work, provide a signed CRCA warranty to the Departmental Representative covering defects of workmanship for a period of 2 years commencing from Contract Completion. Agree to make good promptly any defects which occur or become apparent within the warranty period in conjunction with the membrane manufacturer's warranty. Defects shall include but not be limited to leakage, failure to stay in place, lifting, and deformation.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 General: The existing roofing is an insulated 2-ply modified bitumen in a conventional assembly. Confirm by means of a simple cut test and report to the Departmental Representative result of test. Make good cut areas.
- .2 Roofing system components:
 - .1 Roofing and Flashing Membrane: 2-ply SBS modified bitumen, mopping grade, with granulated cap sheet.
 - .2 Bitumen: Asphalt conforming to CAN/CSA-A123.4, Type 2 for roofing and Type 3 for base flashings and installation of insulation.
 - .3 Insulation: CAN/ULC-S704, Type 3; Closed cell polyisocyanurate. Provide appropriate cover board.
 - .4 Miscellaneous Components: To match existing.
- .3 Prepainted sheet steel: ASTM A653/A653M; Classification LFQ, Grade A, Z275 zinc coating designation, 0.60 mm minimum base steel thickness, commercial quality, with factory applied polyvinylidene fluoride coating in colour to match existing.
- .4 Fasteners: Of same material as sheet metal secured, of type, length and size suitable for the particular conditions.
- .5 Sealant: Compatible with roofing system components.

PART 3 - EXECUTION

3.1 SUBSTRATE EXAMINATION

- .1 Verification of Conditions: examine substrates and immediately inform of Departmental Representative in writing of defects.

- .2 Evaluation and Assessment: prior to beginning of work ensure:
 - .1 Substrates are firm, straight, smooth, dry, free of snow, ice or frost, and swept clean of dust and debris.
 - .2 Drains have been installed at proper elevations relative to finished roof surface.

3.2 PROTECTION

- .1 Provide adequate protection to materials and work of this Section from damage.
- .2 Provide protection covering of 19 mm thick plywood underlaid with 25 mm thick polystyrene board adhered to plywood sheathing. Place protection covering over all roofed areas when working from, or over, such roof surfaces where the roofing membrane is exposed to potential damage.
- .3 Existing Roofing: Do not use existing roof areas as storage or work staging area, except to extent required in accomplishing work. Provide temporary protection boards as previously specified and protect areas of work from precipitation while existing construction is open.

3.3 REMOVAL OF EXISTING ROOF

- .1 Verify that existing roof surface is clear and ready for work of this Section.
- .2 Coordinate work with removal of affected mechanical and electrical equipment and associated roof penetrations.
- .3 Remove only enough existing roofing system materials that can be replaced with new roof system the same day of as the weather will permit in a day.
- .4 Where sections of roof are removed or where new roofing are required. Cut back minimum of 230 mm outside line of opening or removal area to facilitate future flashing.
- .5 Remove membrane, plywood, insulation and vapour retarder over area to be demolished. Cut roof decking with power tools to ensure straight edges. Leave free ends 300 mm maximum in length, unless adequately supported.
- .6 Supply and install plywood catchboard immediately under areas to be cut, to protect structure interior from falling debris. Install catchboard in combination with dust/weather protection.
- .7 Provide temporary protective sheeting over uncovered deck surfaces. Turn sheeting up and over parapets and curbing. Retain sheeting in position with weights or temporary fasteners. Provide for surface drainage from sheeting to existing drains.
- .8 Do not permit traffic over unprotected or repaired deck surface.
- .9 Provide new reinforcing for openings created in existing roof under this Section to support altered roofing assembly as required.

3.4 PREPARATION AND INSTALLATION

- .1 Clean roof back a sufficient distance to perform the cutting of openings and other work on the roof. Clean overlap area free from dirt and loose material with compressed air before proceeding with roofing work.
- .2 After installation of new work, reinstate roofing system.
- .3 Insulation: Place insulation in tight contact with abutting surfaces. Cut insulation board through the board thickness and trim to provide plain butt joints; do not break or tear insulation board to fit detail. Verify method of existing insulation securement. Secure insulation through vapour barrier into steel roof deck ribs to match existing.
- .4 Base sheet roofing installation:
 - .1 Apply base sheet to insulation with Type 3 asphalt.
 - .2 Begin application of the base sheet at the lowest edge or drain. Proceed up the slope from the lowest point. Position and unroll base sheet to achieve correct overlap and alignment. Re-roll one end a minimum of 3000 mm and adhere membrane to substrate. Complete application of remainder of sheet.
 - .3 Apply asphalt hot, so that its mopping temperature is not below 204 0C, when measured at the mop cart to facilitate correct interply thickness, adhesion and uniformity. Unroll membrane into the hot asphalt immediately. Do not mop more than 1200 mm ahead of unrolling. Unroll into asphalt mopped at the rate of 3.2 to 4.8 kg/m³, lapping 75 mm on sides and 150 mm on ends. Observe the presence of a bead of asphalt flowing out the seams.
- .5 Base sheet flashing installation
 - .1 Lay base sheet flashing in vertical strips one metre wide to curb surfaces extending on to flat roof surface minimum 100 mm from toe of cant or curb. Provide 75 mm side laps staggered minimum 100 mm from laps of base sheet of roof membrane.
 - .2 Adhere flashing directly to substrates with Type 3 asphalt, proceeding from bottom to top and therefore resulting in uniform adhesion over entire surface. Nail top leading edge to nailer at 300 mm on centre as applicable.
- .6 Cap sheet roofing installation:
 - .1 Unroll cap sheet membrane dry over base sheet for alignment. Starting from lowest point on roof from perimeter curb, adhere to base sheet with adhesive. Extend cap sheet to base of cant or curb. Observe the presence of asphalt bead pushed out in front of membrane interface as cap sheet is laid.
 - .2 Stagger cap sheet seams from base sheet seams minimum of 300 mm. Provide 75 mm side laps and 150 mm end laps. Embed surface granules on end laps prior to installation of next sheet.
 - .3 During installation take care to avoid asphalt seepage greater than 6 mm at seams.

- .7 Cap sheet flashing installation:
 - .1 Lay cap sheet flashing in strips one metre wide to curb surfaces as shown, extending on to flat roof surface minimum 150 mm from toe of cant. Provide 75 mm side laps staggered minimum 100 mm from cap sheet roofing laps and from base sheet flashing laps.
 - .2 Embed surface granules on laps over cap sheet roofing. Use chalk lines to ensure straight interface line on flat of roof.
 - .3 Adhere cap sheet flashing to cap sheet roofing, and to base sheet flashing with bitumen, proceeding from bottom to top, providing uniform adhesion over entire surface of base flashing. Extend cap sheet as shown.
- .8 Sealant: Apply sealant where required to form weathertight seal between flashing and adjoining surfaces and between flashing and other work of this Section. Use primers and joint filler recommended by sealant manufacturer. Work shall consist of bedding between members where possible and with neatly formed bead where exposed.
- .9 Make all repairs to existing roof as necessary in accordance with CRCA requirements, best standard practice and to complete satisfaction of the Departmental Representative.

3.5 CLEANING

- .1 Remove bituminous markings from finished surfaces.
- .2 In areas where finished surfaces are soiled caused by work of this section, consult manufacturer of surfaces for cleaning advice and complying with their documented instructions.
- .3 Repair or replace defaced or disfigured finishes caused by work of this section.

PART 1 - GENERAL

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A240/A240M-16a, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - .2 ASTM A653/A653M-17, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .3 ASTM D523-14, Standard Test Method for Specular Gloss.
 - .4 ASTM D822/D822M-13, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
- .2 Canadian Roofing Contractors Association (CRCA)
 - .1 Roofing Specifications Manual 2012.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.2 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature for sheet metal flashing systems materials, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two copies WHMIS MSDS - Material Safety Data Sheets.
- .3 Shop Drawings:
 - .1 Shop drawings: submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
- .4 Samples:
 - .1 Submit 50 x 50 mm samples of each type of sheet metal material, finishes and colours.
- .5 Quality assurance submittals: submit following in accordance with Section 01 45 00.
 - .1 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

1.3 QUALITY ASSURANCE

- .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 Section 01 32 16 to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

- .1 Zinc coated steel sheet: 1.2 mm thickness, commercial quality to ASTM A653/A653M, with Z275 designation zinc coating.

2.2 PREFINISHED STEEL SHEET

- .1 Prefinished steel with factory applied polyvinylidene fluoride.
 - .1 Prefinished one side, other to be mill finish.
 - .2 Colour selected by Departmental Representative from manufacturer's standard range.
 - .3 Specular gloss: 30 units +/- in accordance with ASTM D523.
 - .4 Coating thickness: not less than 22 micrometres.
 - .5 Resistance to accelerated weathering for chalk rating of 8, colour fade 5 units or less and erosion rate less than 20% to ASTM D822/D822M as follows:
 - .1 Outdoor exposure period 2500 hours.
 - .2 Humidity resistance exposure period 5000 hours.

2.3 ACCESSORIES

- .1 Isolation coating: alkali resistant bituminous paint.
- .2 Plastic cement: as recommended by steel sheet manufacturer.
- .3 Sealants: in accordance with Section 07 92 00.
- .4 Cleats: of same material, and temper as sheet metal, minimum 50 mm wide. Thickness same as sheet metal being secured.

- .5 Fasteners: of same material as sheet metal, flat head roofing nails of length and thickness suitable for metal flashing application.
- .6 Washers: of same material as sheet metal, 1 mm thick with rubber packings.
- .7 Touch-up paint: as recommended by prefinished material manufacturer.

2.4 FABRICATION

- .1 Fabricate metal flashings and other sheet metal work as indicated.
- .2 Form pieces in 2400 mm maximum lengths.
 - .1 Make allowance for expansion at joints.
- .3 Hem exposed edges on underside 12 mm.
 - .1 Mitre and seal corners with sealant.
- .4 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .5 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

2.5 METAL FLASHINGS

- .1 Form flashings, copings and fascias to profiles indicated of 1.2 mm thick prefinished steel.

2.6 REGLETS AND CAP FLASHINGS

- .1 Form surface mounted reglets and metal cap flashing of 1.2 mm thick sheet metal to be built-in masonry work for base flashings as detailed.
 - .1 Provide slotted fixing holes and steel/plastic washer fasteners.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install sheet metal work as detailed.
- .2 Use concealed fastenings except where approved before installation.
- .3 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs.
 - .1 Flash joints using S-lock forming tight fit over hook strips, as detailed.

- .4 Lock end joints and caulk with sealant.
- .5 Install surface mounted reglets true and level, and caulk top of reglet with sealant.
- .6 Insert metal flashing into reglets and under cap flashing to form weather tight junction.
- .7 Caulk flashing at reglet and cap flashing with sealant.

3.3 CLEANING

- .1 Proceed in accordance with Section 01 74 11.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .3 Leave work areas clean, free from grease, finger marks and stains.

PART 1 - GENERAL

1.1 REFERENCES

- .1 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-S101-14, Standard Methods of for Fire Endurance Tests of Building Construction and Materials.
 - .2 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .3 CAN/ULC-S115-11, Standard Method of Fire Tests of Firestop Systems.

1.2 DEFINITIONS

- .1 Fire Stop Material: device intended to close off opening or penetration during fire or materials that fill openings in wall or floor assembly where penetration is by cables, cable trays, conduits, ducts and pipes and poke-through termination devices, including electrical outlet boxes along with their means of support through wall or floor openings.
- .2 Single Component Fire Stop System: fire stop material that has Listed Systems Design and is used individually without use of high temperature insulation or other materials to create fire stop system.
- .3 Multiple Component Fire Stop System: exact group of fire stop materials that are identified within Listed Systems Design to create on site fire stop system.
- .4 Continuity of Fire Separations: NBC 2015, Division B, Parts 3.1.8 and 3.1.9.1, 9.10.9):
 - .1 Wall, partition or floor assemblies required to be a fire separation shall be: constructed as a continuous element; have a fire resistance rating; have openings protected by a closure; and have penetrations sealed by a firestop.

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit shop drawings to show location, proposed material, reinforcement, anchorage, fastenings and method of installation.
 - .2 Construction details should accurately reflect actual job conditions.
- .4 Samples:
 - .1 Submit duplicate 300 x 300 mm samples showing actual fire stop material proposed for project.

- .5 Quality assurance submittals: submit following in accordance with Section 01 45 00.
 - .1 Test reports: in accordance with CAN/ULC-S101 for fire endurance and CAN/ULC-S102 for surface burning characteristics.
 - .1 Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with specifications for specified performance characteristics and physical properties.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.
 - .4 Manufacturer's Field Reports: submit to manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

1.4 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: company specializing in fire stopping installations with 5 years documented.
 - .2 All fire stopping material shall be from one manufacturer.
 - .3 All fire stopping installation work for entire project shall be by a single contractor experienced in firestopping. Individual disciplines shall NOT fire stop their own work.
- .2 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section, with contractor's representative and Departmental Representative in accordance with Section 01 32 16 to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.
- .3 Site Meetings: as part of Manufacturer's Services described in PART 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed.
 - .1 After delivery and storage of products, and when preparatory Work is complete, but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of Work, after cleaning is carried out.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with Section 01 61 00.
 - .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 indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.
- .3 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PREPARATION

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

3.3 INSTALLATION

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

3.4 SEQUENCES OF OPERATION

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

3.5 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.
- .2 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.6 CLEANING

- .1 Proceed in accordance with Section 01 74 11.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .3 Remove temporary dams after initial set of fire stopping and smoke seal materials.

3.7 SCHEDULE

- .1 Fire stop and smoke seal at:
 - .1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.
 - .2 Top of fire-resistance rated masonry and gypsum board partitions.
 - .3 Openings and sleeves installed for future use through fire separations.
 - .4 Around mechanical and electrical assemblies penetrating fire separations.
 - .5 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.

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Materials, preparation and application for caulking and sealants.
- .2 Text to complete other various Sections containing sealant or caulking specifications, including Section 07 52 00.

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C920-18, Standard Specification for Elastomeric Joint Sealants.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-19.24-M90, Multi-component, Chemical Curing Sealing Compound.
- .3 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act, 1999 (CEPA).
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).

1.3 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00.
- .2 Manufacturer's product to describe.
 - .1 Caulking compound.
 - .2 Primers.
 - .3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.
- .3 Submit samples in accordance with Section 01 33 00.
- .4 Submit duplicate samples of each type of material and colour.
- .5 Cured samples of exposed sealants for each color where required to match adjacent material.
- .6 Submit manufacturer's instructions in accordance with Section 01 33 00.
 - .1 Instructions to include installation instructions for each product used.

1.4 QUALITY ASSURANCE/MOCK-UP

- .1 Construct mock-up in accordance with Section 01 45 00.

- .2 Construct mock-up to show location, size, shape and depth of joints complete with back-up material, primer, caulking and sealant.
- .3 Mock-up will be used:
 - .1 To judge workmanship, substrate preparation, operation of equipment and material application.
- .4 Locate where directed.
- .5 Allow 24 hours for inspection of mock-up by Departmental Representative before proceeding with sealant work.
- .6 When accepted, mock-up will demonstrate minimum standard of quality required for this Work. Approved mock-up may remain as part of finished Work.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, handle, store and protect materials in accordance with Section 01 61 00.
- .2 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Place materials defined as hazardous or toxic in designated containers.
- .5 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.
- .6 Unused sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
- .7 Divert unused joint sealing material from landfill to official hazardous material collections site approved by Departmental Representative.
- .8 Empty plastic joint sealer containers are not recyclable. Do not dispose of empty containers with plastic materials destined for recycling.
- .9 Fold up metal banding, flatten, and place in designated area for recycling.

1.7 PROJECT CONDITIONS

- .1 Environmental Limitations:
 - .1 Do not proceed with installation of joint sealants under following conditions:
 - .1 When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4°C.
 - .2 When joint substrates are wet.
 - .2 Joint-Width Conditions:
 - .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.

1.8 ENVIRONMENTAL REQUIREMENTS

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Labour Canada.
- .2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
- .3 Departmental Representative will arrange for ventilation system to be operated on maximum outdoor air and exhaust during installation of caulking and sealants.

PART 2 - PRODUCTS

2.1 SEALANT MATERIALS

- .1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.
- .2 When low toxicity caulks are not possible, confine usage to areas which offgas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize offgas time.
- .3 Where sealants are qualified with primers use only these primers.

2.2 SEALANT MATERIAL DESIGNATIONS

- .1 Urethanes Two Part '2'.
 - .1 Self-Leveling to CAN/CGSB-19.24, Type 1, Class B.
- .2 Silicones One Part '3'.
 - .1 To ASTM C920, primerless, Type S, Grade NS, Class 50, SWRI validated.

- .3 Acoustical Sealant '6'.
 - .1 To ASTM C920, primerless, Type S, Grade NS, Class 100, SWRI validated.
- .4 Preformed Compressible and Non-Compressible back-up materials.
 - .1 Polyethylene, Urethane, Neoprene or Vinyl Foam.
 - .1 Extruded open or closed cell foam backer rod.
 - .2 Size: oversize 30 to 50%.
 - .2 Neoprene or Butyl Rubber.
 - .1 Round solid rod, Shore A hardness 70.
 - .3 High Density Foam.
 - .1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m³ density, or neoprene foam backer, size as recommended by manufacturer.
 - .4 Bond Breaker Tape.
 - .1 Polyethylene bond breaker tape which will not bond to sealant.

2.3 SEALANT SELECTION

- .1 Perimeters of exterior openings where frames meet exterior facade of building (i.e. brick, block): Sealant type: 2.
- .2 Control and expansion joints in exterior surfaces of unit masonry walls: Sealant type: 2.
- .3 Seal interior perimeters of exterior openings as detailed on drawings: Sealant type: 2.
- .4 Control and expansion joints on the interior of exterior surfaces of unit masonry walls: Sealant type: 2.
- .5 Perimeters of interior frames, as detailed and itemized: Sealant type: 2.
- .6 Interior masonry vertical control joints (block-to-block, block-to-concrete, and intersecting masonry walls): Sealant type: 3.
- .7 Exposed interior control joints in drywall: Sealant type: 6.

2.4 JOINT CLEANER

- .1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant recommended by sealant manufacturer.
- .2 Primer: as recommended by manufacturer.

PART 3 - EXECUTION

3.1 PROTECTION

- .1 Protect installed Work of other trades from staining or contamination.

3.2 SURFACE PREPARATION

- .1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.
- .2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.
- .3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.
- .4 Ensure joint surfaces are dry and frost free.
- .5 Prepare surfaces in accordance with manufacturer's directions.

3.3 PRIMING

- .1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.
- .2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

3.4 BACKUP MATERIAL

- .1 Apply bond breaker tape where required to manufacturer's instructions.
- .2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

3.5 MIXING

- .1 Mix materials in strict accordance with sealant manufacturer's instructions.

3.6 APPLICATION

- .1 Sealant.
 - .1 Apply sealant in accordance with manufacturer's written instructions.
 - .2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
 - .3 Apply sealant in continuous beads.
 - .4 Apply sealant using gun with proper size nozzle.
 - .5 Use sufficient pressure to fill voids and joints solid.
 - .6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
 - .7 Tool exposed surfaces before skinning begins to give slightly concave shape.
 - .8 Remove excess compound promptly as work progresses and upon completion.

- .2 Curing.
 - .1 Cure sealants in accordance with sealant manufacturer's instructions.
 - .2 Do not cover up sealants until proper curing has taken place.

- .3 Cleanup.
 - .1 Clean adjacent surfaces immediately and leave Work neat and clean.
 - .2 Remove excess and droppings, using recommended cleaners as work progresses.
 - .3 Remove masking tape after initial set of sealant.

PART 1 - GENERAL

1.1 REFERENCES

- .1 ASTM International
 - .1 ASTM A123/A123M-17, Standard Specification for Zinc (Hot-Dip galvanized) Coatings on Iron and Steel Products.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-12.1-2017, Safety Glazing.
 - .2 CAN/CGSB-12.3-M91 (R2017), Flat, Clear Float Glass.
 - .3 CAN/CGSB-12.8-2017, Insulating Glass Units.
- .3 CSA Group
 - .1 AAMA/WDMA/CSA 101/I.S.2/A440-11(R2016), NAFS - North American Fenestration Standard for Windows, Doors, and Skylights.
 - .2 CAN/CSA-A440.2-14/A440.3-14, Fenestration energy performance/User guide to CSA A440.2-14, Fenestration energy performance.
- .4 Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual - [current edition].
 - .1 MPI #79, Primer, Alkyd, Anti-Corrosive for Metal.
- .5 South Coast Air Quality Management District (SCAQMD)
 - .1 SCAQMD Rule 1168-A2017, Adhesives and Sealants.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for windows and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Indicate materials and details in full size scale for head, jamb and sill, profiles of components, interior and exterior trim, elevations of unit, anchorage details, location of isolation coating, description of related components and exposed finishes, fasteners, and caulking. Indicate location of manufacturer's nameplates.
- .4 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Samples will be returned for inclusion into work.
 - .3 Submit one representative model of each type window.
 - .4 Include frame, sash, sill, glazing and weatherproofing method, surface finish and hardware. Show location of manufacturer's nameplates.

.5 Include 150 mm long samples of head, jamb, sill, and mullions to indicate profile.

.5 Test and Evaluation Reports:

.1 Submit test reports from approved independent testing laboratories, certifying compliance with specifications.

.2 All test reports that reference the NAFS must include, on the first page, a summary of the results including, at minimum:

.1 The product manufacturer.

.2 The type of product.

.3 The model number/series number.

.4 The primary product designation.

.5 The secondary product designation.

.1 Positive design pressure.

.2 Negative design pressure.

.3 Water penetration resistance test pressure.

.4 Canadian air infiltration and exfiltration levels.

.6 The test completion date.

.3 The report will also contain the following information:

.1 Test dates.

.2 Report preparation dates.

.3 Test information retention period.

.4 Location of testing facilities.

.5 Full description of test samples, including:

.1 Anodized finish, weathering characteristics.

.2 Condensation resistance.

.3 Mullion deflection - combination and composite windows.

.6 Complete description of amendments, as applicable.

.7 Conclusion.

.8 Drawings signed by the testing laboratory, if provided.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00.

.2 Operation and Maintenance Data: submit operation and maintenance data for windows for incorporation into manual.

1.4 QUALITY ASSURANCE

.1 Certifications: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect windows from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Materials: to AAMA/WDMA/CSA 101/I.S.2/A440 supplemented as follows:
- .2 All windows by same manufacturer.
- .3 Sash: aluminum.
- .4 Main frame: aluminum.
- .5 Glass:
 - .1 Insulating glass units: to CAN/CGSB-12.8, double unit, 25 mm overall thickness.
 - .1 Glass: to CAN/CGSB-12.3, CAN/CGSB-12.1 and CAN/CGSB-12.8.
 - .2 Glass thickness: 3 mm each light.
 - .3 Inter-cavity space thickness: 20 mm with low conductivity spacers.
 - .4 Glass coating: surface number 3, low "E".
 - .5 Inert gas fill: argon.
- .6 Isolation coating: alkali resistant bituminous paint.
- .7 Sealants:
 - .1 VOC limit 250 g/L maximum to SCAQMD Rule 1168.

2.2 WINDOW TYPE AND CLASSIFICATION

- .1 Product type:
 - .1 FW- Fixed window.
- .2 Classification rating: to AAMA/WDMA/CSA 101/I.S.2/A440.
 - .1 Primary designation:
 - .1 Performance classes: CW.
 - .2 Performance categories: 30.
 - .2 Secondary designation:
 - .1 Positive design pressure: 960 Pa.
 - .2 Negative design pressure: 960 Pa.
 - .3 Water penetration resistance test pressure: 180 Pa.
 - .4 Canadian air infiltration and exfiltration levels: A2.
 - .3 Surface condensation control: compliant with standard CAN/CSA-A440.2/A440.3.
 - .4 Ancillary properties (Energy rating).
 - .1 Overall coefficient of heat transfer (U-factor): 1.99 W/(m².K).
 - .2 Solar heat gain coefficient (SHGC): 0.35.
 - .3 Visible transmittance (VT): 0.51-0.60.

- .4 Specific Energy Rating (ERS): -33.
- .5 Energy rating (ER): 31.

2.3 FABRICATION

- .1 Fabricate in accordance with AAMA/WDMA/CSA 101/I.S.2/A440 supplemented as follows:
- .2 Fabricate units square and true with maximum tolerance of plus or minus 1.5 mm for units with a diagonal measurement of 1800 mm or less and plus or minus 3 mm for units with a diagonal measurement over 1800 mm.
- .3 Face dimensions detailed are maximum permissible sizes.
- .4 Brace frames to maintain squareness and rigidity during shipment and installation.
- .5 Finish steel clips and reinforcement with shop coat primer to MPI #79, 380 g/m² zinc coating to ASTM A123/A123M.

2.4 ALUMINUM FINISHES

- .1 Finish exposed surfaces of aluminum components in accordance with Aluminum Association Designation System for Aluminum Finishes.
 - .1 Clear anodic finish: designation AA-M12C22A31.

2.5 ISOLATION COATING

- .1 Primers: in accordance with manufacturer's recommendations for surface conditions.
- .2 Isolate aluminum from following components, by means of isolation coating:
 - .1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.
 - .2 Concrete, mortar and masonry.

2.6 GLAZING

- .1 Glaze windows in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.

2.7 AIR BARRIER AND VAPOUR RETARDER

- .1 Equip window frames with site installed air barrier and vapour retarder material for sealing to building air barrier and vapour retarder as follows:
 - .1 Material: identical to, or compatible with, building air barrier and vapour retarder materials to provide required air tightness and vapour diffusion control throughout exterior envelope assembly.
 - .2 Material width: adequate to provide required air tightness and vapour diffusion control to building air barrier and vapour retarder from interior.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Window installation:
 - .1 Install in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.
 - .2 Arrange components to prevent abrupt variation in colour.
- .2 Sill installation:
 - .1 Install metal sills with uniform wash to exterior, level in length, straight in alignment with plumb upstands and faces. Use one piece lengths at each location.
 - .2 Cut sills to fit window opening.
 - .3 Secure sills in place with anchoring devices located at ends of continuous sills and evenly spaced 600 mm on centre in between.
 - .4 Fasten drip deflectors with self tapping stainless steel screws.
 - .5 Maintain 6 to 9 mm space between butt ends of continuous sills. For sills over 1200 mm in length, maintain 3 to 6 mm space at each end.
- .3 Caulking:
 - .1 Seal joints between windows and window sills with sealant. Bed sill expansion joint cover plates and drip deflectors in bedding compound. Caulk between sill upstand and window-frame. Caulk butt joints in continuous sills.
 - .2 Apply sealant in accordance with Section 07 92 00. Conceal sealant within window units except where exposed use is permitted by Departmental Representative.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

3.4 PROTECTION

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

PART 1 - GENERAL

1.1 REFERENCES

- .1 ASTM International
 - .1 ASTM C475/C475M-17, Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - .2 ASTM C645-14e1, Standard Specification for Nonstructural Steel Framing Members.
 - .3 ASTM C840-17a, Standard Specification for Application and Finishing of Gypsum Board.
 - .4 ASTM C1002-16, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - .5 ASTM C1047-14a, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
 - .6 ASTM C1396/C1396M-17, Standard Specification for Gypsum Board.
 - .7 ASTM E2638-10(2017), Standard Test Method for Objective Measurement of the Speech Privacy Provided by a Closed Room.
- .2 Association of the Wall and Ceilings Industries International (AWCI)
 - .1 AWCI Levels of Gypsum Board Finish 101a-15.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for gypsum board assemblies and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Samples will be returned for inclusion into work.
 - .3 Submit duplicate 300 mm long samples of corner and casing beads.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

- .3 Storage and Handling Requirements:
 - .1 Store gypsum board assemblies materials level off ground, indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect gypsum board assemblies from nicks, scratches, and blemishes.
 - .3 Protect from weather, elements and damage from construction operations.
 - .4 Handle gypsum boards to prevent damage to edges, ends or surfaces.
 - .5 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse by manufacturer of pallets, crates, padding and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 20.

1.4 AMBIENT CONDITIONS

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

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Standard board: to ASTM C1396/C1396M, minimum 40% recycled content, regular, 12.7 mm thick and fire-rated, 15.9 mm thick, 1200 mm wide x maximum practical length, ends square cut, edges squared.
- .2 Metal furring runners, inserts, anchors: to ASTM C645.
- .3 Drywall furring channels: 0.5 mm core thickness galvanized steel channels for screw attachment of gypsum board.
- .4 Resilient drywall furring: 0.5 mm base steel thickness galvanized steel for resilient attachment of gypsum board.
- .5 Steel drill screws: to ASTM C1002.
- .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.
- .7 Sealants: in accordance with Section 07 92 00.
- .8 Polyethylene: to CAN/CGSB-51.34, Type 2.

- .9 Insulating strip: rubberized, moisture resistant, 3 mm thick closed cell neoprene strip, 12 mm wide, with self-sticking permanent adhesive on one face, lengths as required.
- .10 Joint compound: to ASTM C475/C475M, asbestos-free.
- .11 Joint tape: paper tape to ASTM C475/C475M.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 ERECTION

- .1 Do application and finishing of gypsum board to ASTM C840 except where specified otherwise.
- .2 Install work level to tolerance of 1:1200.
- .3 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers and grilles.
- .4 Install 19 x 64 mm furring channels parallel to, and at exact locations of steel stud partition header track.
- .5 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.
- .6 Install wall furring for gypsum board wall finishes to ASTM C840, except where specified otherwise.
- .7 Furr openings and around built-in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.
- .8 Furr duct shafts, beams, columns, pipes and exposed services where indicated.

3.3 APPLICATION

- .1 Apply gypsum board after bucks, anchors, blocking, sound attenuation, electrical and mechanical work have been approved.
- .2 Apply single layer gypsum board to metal furring or framing using screw fasteners. Maximum spacing of screws 300 mm on centre.
 - .1 Single-Layer Application:
 - .1 Apply gypsum board on ceilings prior to application of walls to ASTM C840.
 - .2 Apply gypsum board vertically or horizontally, providing sheet lengths that will minimize end joints.
- .3 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 and ducts, in partitions where perimeter sealed with acoustic sealant.
- .4 Install gypsum board on walls vertically to avoid end-butt joints. At high walls, install boards horizontally with end joints staggered over studs, except where local codes or fire-rated assemblies require vertical application.
- .5 Install gypsum board with face side out.
- .6 Do not install damaged or damp boards.
- .7 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

3.4 INSTALLATION

- .1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm on centre.
- .2 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.
- .3 Install insulating strips continuously at edges of gypsum board and casing beads abutting metal window and exterior door frames, to provide thermal break.
- .4 Construct control joints of two back-to-back casing beads set in gypsum board facing and supported independently on both sides of joint.
- .5 Provide continuous polyethylene dust barrier behind and across control joints.
- .6 Locate control joints at changes in substrate construction.

- .7 Install control joints straight and true.
- .8 Splice corners and intersections together and secure to each member with 3 screws.
- .9 Install access doors to electrical and mechanical fixtures specified in respective sections.
 - .1 Rigidly secure frames to furring or framing systems.
- .10 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.
- .11 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with AWCI Levels of Gypsum Board Finish:
 - .1 Levels of finish:
 - .1 Level 0: no tapping, finishing or accessories required.
 - .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.
 - .3 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.
- .12 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.
- .13 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.
- .14 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.
- .15 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
 - .1 Leave Work area clean at end of each day.
 - .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

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

PART 1 - GENERAL

1.1 REFERENCES

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .2 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual.
 - .2 Maintenance Repainting Manual.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for paint and coating products and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit 2 copies of WHMIS MSDS.
- .3 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Samples will be returned for inclusion into work.
 - .3 Submit duplicate 200 x 300 mm sample panels of each paint with specified paint or coating in colours, gloss/sheen and textures required to MPI Painting Specification Manual standards.
- .4 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Provide and maintain dry, temperature controlled, secure storage.
 - .2 Store painting materials and supplies away from heat generating devices.
 - .3 Store materials and equipment in well ventilated area within temperature as recommended by manufacturer.
- .4 Fire Safety Requirements:
 - .1 Supply 1 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.
- .5 Packaging Waste Management: remove for reuse by manufacturer of pallets, crates, padding and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 20.

1.4 SITE CONDITIONS

- .1 Heating, Ventilation and Lighting:
 - .1 Ventilate enclosed spaces in accordance with Section 01 51 00.
 - .2 Co-ordinate use of existing ventilation system with Departmental Representative and ensure its operation during and after application of paint as required.
 - .3 Provide minimum lighting level of 323 Lux on surfaces to be painted.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
 - .1 Apply paint finishes when ambient air and substrate temperatures at location of installation can be satisfactorily maintained during application and drying process, within MPI and paint manufacturer's prescribed limits.
 - .2 Test concrete, masonry and plaster surfaces for alkalinity as required.
 - .3 Apply paint to adequately prepared surfaces, when moisture content is below paint manufacturer's prescribed limits.
- .3 Additional application requirements:
 - .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
 - .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 Supply paint materials for paint systems from single manufacturer.
- .2 Conform to latest MPI requirements for painting work including preparation and priming.
- .3 Materials in accordance with MPI - Architectural Painting Specification Manual and MPI - Maintenance Repainting Manual "Approved Product" listing.
 - .1 Use MPI listed materials having E2 rating where indoor air quality requirements exist.

- .4 Colours:
.1 Submit proposed Colour Schedule to Departmental Representative for review.
.2 Base colour schedule on selection of 5 base colours and 3 accent colours.
- .5 Mixing and tinting:
.1 Perform colour tinting operations prior to delivery of paint to site, in accordance with manufacturer's written recommendations. Obtain written approval from Departmental Representative for tinting of painting materials.
.2 Use and add thinner in accordance with paint manufacturer's recommendations.
.1 Do not use kerosene or similar organic solvents to thin water-based paints.
.3 Thin paint for spraying in accordance with paint manufacturer's written recommendations.
.4 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.
- .6 Gloss/sheen ratings:
.1 Paint gloss is defined as sheen rating of applied paint, in accordance with following values:

Gloss Level-Categor	Gloss @ 60 degrees	Sheen @ 85 degrees
<u>Y</u> Gloss Level 1 - Matte Finish	Max. 5	Max. 10
Gloss Level 2 - Velvet	Max.10	10 to 35
Gloss Level 3 - Eggshell	10 to 25	10 to 35
Gloss Level 4 - Satin	20 to 35	min. 35
Gloss Level 5 - Semi-Gloss	35 to 70	
Gloss Level 6 - Gloss	70 to 85	
Gloss Level 7 - High Gloss	More than 85	

- .2 Gloss level ratings of painted surfaces as indicated.
- .7 Exterior painting:
.1 Structural Steel and Metal Fabrications: columns, beams, joists and miscellaneous metal.
.1 EXT 5.1D - Alkyd satin finish.
.2 Galvanized Metal: high contact/high traffic areas (doors, frames, railings and handrails, etc.).
.1 EXT 5.3B - Alkyd satin finish.

- .8 Exterior re-painting:
 - .1 Structural Steel and Metal Fabrications: columns, beams, joists and miscellaneous metal.
 - .1 REX 5.1D - Alkyd satin.
 - .2 Galvanized Metal: high contact/high traffic areas (doors, frames, railings and handrails, etc.).
 - .1 REX 5.3B - Alkyd satin.
- .9 Interior painting:
 - .1 Structural Steel and Metal Fabrications: columns, beams, joists and miscellaneous metal.
 - .1 INT 5.1E Alkyd - satin finish.
 - .2 Galvanized Metal: high contact/high traffic areas (doors, frames, railings and handrails, etc.).
 - .1 INT 5.3C - Alkyd satin finish (over cementitious primer).
 - .3 Plaster and gypsum board: gypsum wallboard, drywall, "sheet rock" type material, etc.
 - .3 INT 9.2M - Institutional low odour/low VOC eggshell finish.
- .10 Interior re-painting:
 - .1 Concrete vertical surfaces: ceilings.
 - .1 INT 3.1A - Latex satin.
 - .2 Concrete horizontal surfaces: floors.
 - .1 INT 3.2G - Sealer, water based, for concrete floors.
 - .3 Structural Steel and Metal Fabrications: columns, beams, joists and miscellaneous metal.
 - .1 RIN 5.1E - Alkyd semi-gloss.
 - .4 Galvanized Metal: high contact/high traffic areas (doors, frames, railings and handrails, etc.).
 - .1 RIN 5.3C - Alkyd semi-gloss.
 - .5 Plaster and Gypsum Board: gypsum wallboard, drywall, "sheet rock" type material, etc.
 - .1 RIN 9.2A - Latex eggshell.

PART 3 - EXECUTION

3.1 GENERAL

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheets.
- .2 Perform preparation and operations for interior painting in accordance with MPI - Architectural Painting Specifications Manual and MPI - Maintenance Repainting Manual except where specified otherwise.

3.2 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.

3.3 PREPARATION

- .1 Protection of in-place conditions:
 - .1 Protect existing building surfaces and adjacent structures from paint splatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Departmental Representative.
 - .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
 - .3 Protect factory finished products and equipment.
- .2 Surface Preparation:
 - .1 Remove electrical cover plates, light fixtures, surface hardware on doors, and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.
 - .2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
 - .3 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Departmental Representative.
 - .4 Clean and prepare surfaces in accordance with MPI - Architectural Painting Specification Manual and MPI - Maintenance Repainting Manual specific requirements and coating manufacturer's recommendations.
 - .5 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.
 - .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.
 - .8 Touch up of shop primers with primer as specified.

3.4 APPLICATION

- .1 Paint only after prepared surfaces have been accepted by Departmental Representative.
- .2 Use method of application approved by Departmental Representative.
 - .1 Conform to manufacturer's application recommendations.
- .3 Apply coats of paint in continuous film of uniform thickness.
 - .1 Repaint thin spots or bare areas before next coat of paint is applied.

- .4 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
- .5 Sand and dust between coats to remove visible defects.
- .6 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.
- .7 Mechanical/Electrical Equipment:
 - .1 Paint conduits, piping, hangers, ductwork and other mechanical and electrical equipment exposed in finished areas, to match adjacent surfaces, except as indicated.
 - .2 Do not paint over nameplates.
 - .3 Keep sprinkler heads free of paint.
 - .4 Paint fire protection piping red.
 - .5 Paint disconnect switches for fire alarm system and exit light systems in red enamel.
 - .6 Paint natural gas piping yellow.
 - .7 Paint both sides and edges of backboards for telephone and electrical equipment before installation.
 - .1 Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
- .4 Place paint and primer defined as hazardous or toxic waste, including tubes and containers, in containers or areas designated for hazardous waste.

PART 1 - GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for fans, grilles, fire dampers, balance dampers, flexible connectors, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.
 - .2 Indicate on drawings:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
 - .3 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.
 - .4 In addition to transmittal letter referred to in Section 01 33 00: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.
- .4 Testing, adjusting and air balancing report (TAB report):
 - .1 All test forms shall be standard 8-1/2 x 11-inch (A4 size)
 - .2 Show results in SI units.
 - .3 Include project record drawings.
 - .4 Include system schematics.
 - .5 Submit TAB Report to Department Representative for verification and approval, complete with index tabs

1.2 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00.
- .2 Operation and Maintenance Data: submit operation and maintenance data for fans
 - .1 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.

- .2 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.
- .3 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 31 13.01.
- .4 As-built drawings:
 - .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 Department Representative for approval and make corrections as directed.
 - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
 - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .5 Submit copies of as-built drawings for inclusion in final TAB report.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials and protect all equipment against weather, damage, and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area. Take particular care with corrodible and electrical equipment. Store mechanical equipment in an area heated to a minimum of 10 degree C. If extended storage time is required, perform periodic maintenance in accordance with Manufacturers' instruction.
 - .2 Store and protect all equipment from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 HYDRONIC HEATING PIPE, FITTINGS AND JOINTS

1. Black Steel - Screwed Joint
 - .1 Mild black carbon steel, Grade B ASTM A53, complete with Class 125 cast iron threaded fittings to ANSI/ASME B16.4 and screwed joints
2. Black Steel - Welded Joints
 - .1 Mild black carbon steel, Grade B ASTM A53, mill or site bevelled complete with factory made seamless carbon steel butt welding fittings to ASTM A234, Grade WPB long sweep pattern wherever possible, and welded joints.
3. Soft Copper Pipe
 - .1 Type "L" seamless soft copper to ASTM B77.

2.2 HYDRONIC PIPING UNIONS

- .1 Screwed steel piping
 - .1 Malleable iron, ground joint, brass to iron or bronze seat screwed unions and union elbows with a minimum pressure rating of 1725 kPa and 260 °C
- .2 Welded Steel Piping
Forged carbon steel slip-on type raised welding flange unions to ASTM A105, 105lb Class.

2.3 SHUT OFF VALVES

- .1 Ball Type
Class 600, 4140 kPa WOG rated full port ball valve, each complete with a forged brass or bronze body and cap, blowout-proof stem, solid forged brass chrome plated ball, "Teflon" or "PTFE" seat, threaded ends, and removable level handle. Provide stem extensions to clear insulation if required.

2.4 HYDRONIC MANUAL AIR VENT

- .1 Brass body chrome-plated. O-ring of NBR rubber.
- .2 Maximum operating pressure 16 bar, maximum operating temperature 95°C.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for equipment and ductwork installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate.
 - .2 Inform Department 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 Department Representative.

3.2 PAINTING REPAIRS AND RESTORATION

- .1 Do painting in accordance with Section 09 91 99.
- .2 Prime and touch up marred finished paintwork to match original.
- .3 Restore to new condition, finishes which have been damaged.

3.3 SYSTEM CLEANING

- .1 Vacuum interior of ductwork.

3.4 TAB FOR AIR SYSTEMS

- .1 Standard: TAB to be to most stringent of TAB standards of AABC.
- .2 Do TAB of systems specified in Division 23 for the new ventilation system SF-1 and return grilles in the open space.
- .3 Qualifications: personnel performing TAB to be current member in good standing of AABC.
- .4 Quality assurance: Perform TAB under direction of supervisor qualified by AABC.
- .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, fan.
 - .2 The two balancing dampers on the return ducts shall be balanced as per the design flow rates under both maximum system flow and minimum system flow conditions of AC-3 & AC-4. The final opening of each damper shall allow the air flows close to the design flow at the both conditions as far as possible. Record the flows in the both system flow conditions.
- .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).

3.5 HYDRONIC SYSTEMS

- .1 Definitions: for purposes of this section, to include low pressure hot water heating.
- .2 Standard: TAB to be to most stringent of TAB standards of AABC.
- .3 Do TAB of hot water heating system for the heating radiators in the Open space.

- .4 Qualifications: personnel performing TAB to be current member in good standing of AABC.
- .5 Quality assurance: Perform TAB under direction of supervisor qualified by AABC.
- .6 Measurements: to include, but not limited to, following for all heating radiators in the Work area: Flow rate, static pressure, pressure drop (or loss), temperature.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

PART 1 - GENERAL

1.1 REFERENCES

- .1 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
- .2 ASTM International
 - .1 ASTM A653/A653M-17, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- .3 National Fire Protection Association (NFPA)
 - .1 NFPA 90A-18, Standard for the Installation of Air-Conditioning and Ventilating Systems.
 - .2 NFPA 90B-18, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
- .4 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
 - .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2005.
 - .2 SMACNA HVAC Air Duct Leakage Test Manual, 2012.
 - .3 IAQ Guideline for Occupied Buildings Under Construction 2007.
- .5 UL/cUL 507 Standard for Electric Fans 2017.
- .6 CAN/ULC-S112-10 (R2016) Standard Method of Fire Test of Fire Damper Assemblies.

1.2 RELATED SECTIONS

- .1 23 05 00 - Common Work Results for HVAC

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 and 23 05 00.

PART 2 - PRODUCTS

2.1 SEAL CLASSIFICATION

- .1 Classification as follows:

<u>Maximum Pressure Pa</u>	<u>SMACNA Seal Class</u>
500	C
250	C
125	C
- .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, tape or combination thereof.

.3 Class C: transverse joints and connections made air tight with gaskets, sealant, tape or combination thereof. Longitudinal seams unsealed.

2.2 SEALANT

.1 Sustainability Characteristics:

.1 Adhesives and sealants: in accordance with Section 07 92 00.

.2 Sealant: oil resistant, water borne, polymer type flame resistant duct sealant. Temperature range of minus 30 degrees C to plus 93 degrees C.

2.3 TAPE

.1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide.

2.4 DUCT LEAKAGE

.1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

2.5 FITTINGS

.1 Fabrication: to SMACNA.

.2 Radiused elbows:

.1 Rectangular: centreline radius: 1.5 times width of duct.

.3 Branches:

.1 Rectangular main and branch: with 45 degrees entry on branch.

.2 Provide volume control damper in branch duct near connection to main duct.

.4 Main duct branches: with splitter damper.

.4 Transitions:

.1 Diverging: 20 degrees maximum included angle.

.2 Converging: 30 degrees maximum included angle.

2.6 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.

2.7 GALVANIZED STEEL

.1 Lock forming quality: to ASTM A653/A653M, zinc coating.

.2 Thickness, fabrication and reinforcement: to SMACNA.

.3 Joints: to SMACNA.

2.8 HANGERS AND SUPPORTS

- .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 following table:

Duct Size	Angle Size	Rod Size
(mm)	(mm)	(mm)
up to 750	25 x 25 x 3	6
- .4 Upper hanger attachments:
 - .1 For concrete: manufactured concrete inserts.
 - .2 For steel beams: manufactured beam clamps.

2.9 FLEXIBLE CONNECTIONS

- .1 Frame: galvanized sheet metal frame 0.6 mm thick with fabric clenched by means of double locked seams.
- .2 Material:
 - .1 Fire resistant, self extinguishing, neoprene coated glass fabric, temperature rated at minus 40 degrees C to plus 90 degrees C, density of 1.3 kg/m².

2.10 SINGLE BLADE BALANCING DAMPERS

- .1 Fabricate from same material as duct, but one sheet metal thickness heavier. V-groove stiffened.
- .2 Size and configuration to recommendations of SMACNA, except maximum height 100 mm.
- .3 Locking quadrant with shaft extension to accommodate insulation thickness.
- .4 Inside and outside nylon end bearings.
- .5 Channel frame of same material as adjacent duct, complete with angle stop.

2.11 Fire Dampers

- .1 Curtain blade type, dynamic, galvanized steel fusible link dampers, ULC classified to CAN/ULC-S112 and in accordance with NFPA 90A requirements, factory tested for closure under airflow, 1-1/2 hour or 3 hour rated as required, and complete with a constant force type 301 stainless steel closure spring, a blade lock assembly, a steel sleeve, retaining angles, and, unless otherwise specified, a 74° C (165° F) rated standard fusible link.
- .2 Fusible link dampers are to be Type "B" or Type "C" (as required) with folded curtain blade out of air stream except where damper size or location requires use of type "A" dampers with curtain blade in air stream.

2.12 Acoustical Lining

- .1 Completely cover internal duct areas with acoustical duct lining on the interior of ducts where shown.
- .2 Ducts with acoustical lining do not require exterior thermal insulation.
- .3 Rigid, glass fibreboard coated on one side with black neoprene latex to prevent fibre loss.
- .4 Internal Duct Lining: flexible Duct Liner conforming to ASTM C 1071 Type I and NFPA 90A & 90B; Greenguard compliant, or Rigid Plenum Liner complying with ASTM C 1071 Type II and NFPA 90A & 90B. All materials to meet the following hazard classifications stated in accordance with UL-723:
 - Flame Spread: Maximum 25
 - Fuel Contributed: Maximum 50
 - Smoke Developed: Maximum 50
- .5 'K' ('ksi') Value: ASTM C 177, 0.24 at 75° F. (0.035 at 24° C) mean temperature.
- .6 Noise Reduction Coefficient (NRC): ASTM C 423 Type A Mounting, 0.45 or higher for 12 mm product, 0.70 or higher for 25 mm product
- .7 Maximum Air Velocity: 6000 FPM (1829 mpm) for Type I product, 5000 FPM (1524 mpm) for Type II product.
- .8 Attachment Method: Install in accordance with SMACNA Duct Liner Application Standard Manual. Cover liner surface with latex coating exposed to air stream. Make transverse joints tightly butted with no gaps. Seal edges with adhesive. Cut duct liner to assure tight, overlapped corner joints with top pieces supported by sidepieces. Secure liner with adhesive using 100% coverage. Additionally install metal fasteners at 375 mm o.c. and provide fasteners within 75 mm of edges and joints.

PART 3 - EXECUTION

3.1 GENERAL

- .1 Do work in accordance with NFPA 90A, NFPA 90B, ASHRAE and SMACNA.
- .2 Do not break continuity of insulation vapour barrier with hangers or rods.
 - .1 Insulate strap hangers 100 mm beyond insulated duct. Ensure diffuser is fully seated.
- .3 Support risers in accordance with ASHRAE and 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.

3.3 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:

Duct Size (mm)	Spacing (mm)
up to 1500	3000
1501 and over	2500

3.4 SEALING AND TAPING

- .1 Apply sealant in accordance with SMACNA and to manufacturer's recommendations.
- .2 Bed tape in sealant and recoat with minimum of 1 coat of sealant to manufacturers recommendations.

3.5 FLEXIBLE CONNECTIONS

- .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.

3.6 Installation of Fire Dampers

- .1 Provide fusible link dampers. Ensure damper rating (1-% or 3 hr.) is suitable for fire barrier it is associated with.
- .2 Install dampers with retaining angles on all 4 sides of sleeve on both sides of damper and connect with ductwork in accordance with damper manufacturer's instructions and details, and Code requirements.
- .3 Provide expansion clearance between damper or damper sleeve and opening in which damper is required. Ensure openings are properly sized and located, and all voids between damper sleeve and opening are properly sealed to maintain rating of fire barrier.

3.6 TESTING, ADJUSTING AND BALANCING FOR AIR SYSTEMS

- .1 Standard: TAB to be to most stringent of section 23 05 00 Common Work Results for HVAC or TAB standards of AABC.
- .2

3.7 LEAKAGE TESTS

- .1 In accordance with SMACNA HVAC Duct Leakage Test Manual.
- .2 Do not install additional ductwork until trial test has been passed.
- .3 Complete test before performance insulation or concealment Work.

3.8 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

PART 1 - GENERAL

1.1 REFERENCES

- .1 Definitions:
 - .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.
- .2 Reference Standards:
 - .1 CSA Group
 - .1 CSA C22.1-18, Canadian Electrical Code, Part 1 (24th Edition), Safety Standard for Electrical Installations.
 - .2 Ontario Electrical Safety Code (OESC) 26th Edition, 2015.
 - .3 National Building Code of Canada (NBC) - 2015
 - .4 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
 - .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.
 - .5 CAN3-C235-83 (R2015) - Preferred Voltage Levels for AC Systems, 0 to 50000 V.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for review and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Submit for review single line electrical diagrams under plexiglass and locate as indicated.
 - .1 Electrical distribution system in main electrical room.
- .4 Shop drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.
 - .3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
 - .4 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.
 - .5 Submit two number of copies of 600 x 600 mm minimum size drawings and product data to inspection authorities.
 - .6 If changes are required, notify Departmental Representative of these changes before they are made.

- .6 Certificates:
 - .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 test results of installed electrical systems and instrumentation.
 - .4 Permits and fees: in accordance with General Conditions of contract.
 - .5 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
 - .6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.

- .7 Manufacturer's Field Reports: submit to Departmental Representative 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.

1.3 CLOSEOUT SUBMITTALS

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

- .2 Operation and Maintenance Data: submit operation and maintenance data for for incorporation into manual.
 - .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
 - .2 Operating instructions to include following:
 - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
 - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
 - .3 Safety precautions.
 - .4 Procedures to be followed in event of equipment failure.
 - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
 - .3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.
 - .4 Post instructions where directed.
 - .5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
 - .6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

- .3 Storage and Handling Requirements:

- .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect materials from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan and Waste Reduction Workplan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Construction Waste Management Plan and Waste Reduction Workplan in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 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.

2.2 MATERIALS AND EQUIPMENT

- .1 Provide material and equipment in accordance with Section 01 61 00.
- .2 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 - ACTION AND INFORMATIONAL SUBMITTALS.
- .3 Factory assemble control panels and component assemblies.

2.3 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 indicated on mechanical drawings.

2.4 WARNING SIGNS

- .1 Warning Signs: in accordance with requirements of Departmental Representative.

- .2 Porcelain enamel signs, minimum size 175 x 250 mm.

2.5 WIRING TERMINATIONS

- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.6 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates and labels as follows:
.1 Nameplates: Lamicoid matt white finish face, black 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 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.
- .3 Wording on nameplates and labels to be approved by Departmental Representative prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per nameplate and label.
- .5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .6 Identify equipment with Size 3 labels engraved "ASSET INVENTORY NO." as directed by Departmental Representative.
- .7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .8 Terminal cabinets and pull boxes: indicate system and voltage.
- .9 Transformers: indicate capacity, primary and secondary voltages.

2.7 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, numbered and 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.

2.8 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	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow

2.9 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.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

3.3 NAMEPLATES AND LABELS

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.4 CONDUIT AND CABLE INSTALLATION

- .1 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .2 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.5 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.

3.6 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: 1400 mm.
 - .2 Wall receptacles:
 - .1 General: 300 mm.
 - .2 Above top of continuous baseboard heater: 200 mm.

3.7 CO-ORDINATION OF PROTECTIVE DEVICES

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.
- .2 Ensure the loading on the panels or branches, doesn't exceed 80% of the upstream breaker rating.

3.8 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 - ACTION AND INFORMATIONAL 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 in accordance with Section 01 45 00.
 - .1 Circuits originating from branch distribution panels.
 - .2 Lighting and its control.
 - .3 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
 - .4 Systems: Fire alarm, power and Lighting.
 - .5 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.
- .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 - ACTION AND INFORMATIONAL 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.

3.9 SYSTEM STARTUP

- .1 Instruct Departmental Representative and operating personnel 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.

3.10 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.11 Project General Notes:

- .1 All electrical works under this contract to meet Canadian Electrical Code CSA 22.1, Ontario Electrical Safety Code (OESC) and National Building Code (NBC) requirements.
- .2 Paint and patch up all remaining walls with removing electrical equipment.
- .3 All wiring to be installed in conduit and exposed wires or cables is not acceptable. All conduit accessories including bends and joints shall be pre-manufactured by factory. For conduit types, refer to specifications.
- .4 All costs associated with this contract to complete all required activities including supply material/equipment, installation, test, verification, start up for demolition and new installation to be included in the contract cost.

PART 1 - GENERAL

1.1 REFERENCES

- .1 CSA International
 - .1 CSA C22.1-18 (24th Edition)- Canadian Electrical Code
 - .2 CSA C22.2 No.18.1-13, Metallic outlet boxes (Tri-national standard, with UL 514A and ANCE NMX- J-023/1).
 - .3 CSA C22.2 No.18.2-06(R2016), Nonmetallic Outlet Boxes.
 - .4 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.18.4-15, Hardware for the Support of Conduit, Tubing, and Cable (Bi-National standard, with UL 2239).
 - .6 CSA C22.2 No. 18.5-13, Positioning devices (Bi-national standard, with UL 1565).
 - .7 CSA C22.2 NO. 65-13, Wire connectors (Tri- national standard, with UL 486A-486B and NMX-J-543-ANCE).
- .2 National Electrical Manufacturers Association (NEMA)
- .3 Ontario Electrical Safety Code (OESC), 2015

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 CLOSEOUT SUBMITTALS

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

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials 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.

- .4 Develop Construction Waste Management Plan and Waste Reduction Workplan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Construction Waste Management Plan and Waste Reduction Workplan in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Pressure type wire connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.
- .2 Fixture type splicing connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
- .3 Clamps or connectors for non-metallic sheathed cable as required to: CSA C22.2 No.18.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Remove insulation carefully from ends of conductors and cables and:
 - .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
 - .2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65.
 - .3 Install fixture type connectors and tighten to CSA C22.2 No.65. Replace insulating cap.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.

- .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

PART 1 - GENERAL

1.1 PRODUCT DATA

- .1 Provide product data in accordance with Section 01 33 00.

1.2 DELIVERY, STORAGE AND HANDLING

- .1 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 20.

1.3 REFERENCES

- .1 CSA C22.1-2018, Canadian Electrical Code (CEC)
- .2 National Electrical Manufacturers Association (NEMA)
- .3 Ontario Electrical Safety Code (OESC), 2015

PART 2 - PRODUCTS

2.1 BUILDING WIRES

- .1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2 Copper conductors: size as indicated, with 600 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE, Non Jacketted.

2.2 CONTROL CABLES

- .1 Type: LVT: 2 soft annealed copper conductors, sized as indicated:
 - .1 Insulation: thermoplastic.
 - .2 Sheath: thermoplastic jacket and armour of closely wound aluminum wire.
- .2 Type: low energy 300 V control cable: stranded annealed copper conductors sized as indicated LVT: 2 soft annealed copper conductors, sized as indicated:
 - .1 Insulation: PVC.
 - .2 Shielding: braid over each pair.
 - .3 Overall covering: PVC jackets.
- .3 Type: 600 V stranded annealed copper conductors, sizes as indicated:
 - .1 Insulation: cross-linked polyethylene type RW90 (x-link).
 - .2 Shielding: magnetic tape over each pair of conductors.
 - .3 Overall covering: PVC.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00.
- .2 Perform tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

- .1 Terminate cables in accordance with Section 26 05 20.
- .2 Cable Colour Coding: to Section 26 05 00.
- .3 Conductor length for parallel feeders to be identical.
- .4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.
- .5 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.
- .6 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.
- .7 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.3 INSTALLATION OF BUILDING WIRES

- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 26 05 34.

3.4 INSTALLATION OF CONTROL CABLES

- .1 Install control cables in conduit.
- .2 Ground control cable shield (if applicable).

PART 1 - GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-18, Canadian Electrical Code, Part 1, 24rd Edition.
- .2 Ontario Electrical Safety Code (OESC), 2015
- .3 CSA C22.2 No. 40-17, Junction and Pull Boxes

1.2 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Provide shop drawings: in accordance with section 01 33 00.
 - .1 Provide drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with section 01 74 20.

PART 2 - PRODUCTS

2.1 JUNCTION AND PULL BOXES

- .1 Construction: welded steel enclosure.
- .2 Covers Flush Mounted: 25 mm minimum extension all around.
- .3 Covers Surface Mounted: screw-on flat covers.

2.2 CABINETS

- .1 Construction: welded sheet steel as indicated hinged door, handle, latch lock 2 keys 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 fir plywood backboard.

PART 3 - EXECUTION

3.1 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.

3.2 IDENTIFICATION

- .1 Equipment Identification: to Section 26 05 00.
- .2 Identification Labels: size 2 indicating system name, voltage and phase or as indicated.

PART 1 - GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-18, Canadian Electrical Code, Part 1, 24th Edition.
- .2 Ontario Electrical safety Code (OESC), 2015

1.2 SUBMITTALS

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

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 OUTLET AND CONDUIT BOXES GENERAL

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 GALVANIZED STEEL OUTLET BOXES

- .1 One-piece electro-galvanized construction.
- .2 Single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
- .3 Utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.
- .4 102 mm square or octagonal outlet boxes for lighting fixture outlets.

- .5 Extension and plaster rings for flush mounting devices in finished plaster or tile walls.

2.3 MASONRY BOXES

- .1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.

2.4 OUTLET BOXES FOR NON-METALLIC SHEATHED CABLE

- .1 Electro-galvanized, sectional, screw ganging steel boxes, minimum size 76 x 50 x 63 mm with two double clamps to take non-metallic sheathed cables.

2.5 FITTINGS - GENERAL

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 35 mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.
- .5 Vacuum clean interior of outlet boxes before installation of wiring devices.
- .6 Identify systems for outlet boxes as required.

PART 1 - GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-18, Canadian Electrical Code (CEC), 24th Edition
 - .2 CSA C22.2 NO. 18.1-13, Metallic Outlet Boxes.
 - .3 CSA C22.2 NO. 18.2-06(R2016), Nonmetallic Outlet Boxes.
 - .4 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. 18.4-15, Hardware for the Support of Conduit, Tubing, and Cable.
 - .6 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).
 - .7 CSA C22.2 No. 56-13, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit
 - .8 CSA C22.2 No. 83-M1985(R2013), Electrical Metallic Tubing.
 - .9 CSA C22.2 No. 211.2-06(R2016), Rigid PVC (Unplasticized) Conduit.
 - .10 CSA C22.2 No. 227.3-15, Mechanical protection tubing (MPT) and fittings (Bi-national standard, with UL 1696)
- .2 Ontario Electrical Safety Code (OESC) 2015

1.2 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product data: submit manufacturer's printed product literature, specifications and datasheets.
 - .1 Submit cable manufacturing data.
- .3 Quality assurance submittals:
 - .1 Test reports: submit certified test reports.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Instructions: submit manufacturer's installation instructions.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

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PART 2 - PRODUCTS

2.1 CONDUITS

- .1 Rigid metal conduit: to CSA C22.2 No. 45, hot dipped galvanized steel threaded.
- .2 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings and with expanded ends.
- .3 Flexible metal conduit: to CSA C22.2 No. 56, galvanized steel, liquid-tight.

2.2 CONDUIT FASTENINGS

- .1 One hole steel straps to secure surface conduits 50 mm and smaller.
 - .1 Two hole steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits.
- .4 Threaded rods, 6 mm diameter, to support suspended channels.

2.3 CONDUIT FITTINGS

- .1 Fittings: to CSA C22.2 No. 18.3 and CSA C22.2 No. 18.4, manufactured for use with conduit specified. Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT.
 - .1 Set-screws are not acceptable.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

- .1 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 FISH CORD

- .1 Polypropylene.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install conduits to conserve headroom in exposed locations and cause minimum

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interference in spaces through which they pass.

- .2 Conceal conduits except in mechanical and electrical service rooms or in unfinished areas.
- .3 Surface mount conduits except on the walls with drywall. All installation on exterior wall or gypsum walls or under the concrete ceiling to be surface mounted.
- .4 Use rigid hot dipped galvanized steel threaded conduit except where specified otherwise.
- .5 Use electrical metallic tubing (EMT) above 3 m not subject to mechanical injury.
- .6 Use flexible metal conduit for connection to motors in dry areas, connection to surface or recessed lighting fixtures.
- .7 Minimum conduit size for lighting and power circuits: 19 mm.
- .8 Bend conduit cold:
 - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .9 Mechanically bend steel conduit over 19 mm diameter.
- .10 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .11 Install fish cord in empty conduits.
- .12 Remove and replace blocked conduit sections.
 - .1 Do not use liquids to clean out conduits.
- .13 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible on suspended or surface channels.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS

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- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.
- .3 Do not install conduits in terrazzo or concrete toppings.

3.5 CLEANING

- .1 Proceed in accordance with Section 01 74 11.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

PART 1 - GENERAL

1.1 REFERENCES

- .1 CSA International
 - .1 CSA C22.1-18, Canadian Electrical Code, Part 1 (24th Edition), Safety Standard for Electrical Installations.
- .2 Ontario Electrical Safety Code (OESC), 2015.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for photoelectric devices and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Submit 1 sample of each component proposed for inclusion into system.
 - .2 Components will be returned for incorporation into work.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect photoelectric devices from nicks, scratches, and blemishes.
 - .3 Protect metal accessories and trim from being bent or damaged.
 - .4 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan and Waste Reduction Workplan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Construction Waste Management Plan and Waste Reduction Workplan in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 PHOTOELECTRIC LIGHTING CONTROL

- .1 Photoelectric Lighting Controls: to CSA C22.1.
 - .1 Cabinet, Wall mounting.
 - .2 Capable of switching 1800W of lighting at 120 V.
 - .3 Voltage variation: plus or minus 10%.
 - .4 Temperature range: minus 40 degrees C to plus 40 degrees C.
 - .5 Switching on lights at 10 lx.
 - .6 Switching off lights at 50 lx.
 - .7 Rated for 5000 operations.
 - .8 Options:
 - .1 Lightning arrester.
 - .2 Fail-safe circuit completed when relay de-energized.
 - .3 Twist-lock type receptacle.
 - .4 Terminal strip.
 - .5 Sensitivity adjustment.
 - .9 Switching time delay of 30 s.
 - .10 Wall mounting bracket.
 - .11 Colour coded leads: size 10 AWG, 460 mm long.

2.2 CONTACTOR

- .1 Contactor: to CSA C22.1.
 - .1 Cabinet mounting.
 - .2 Capable of switching multiple lamp circuits with total lighting load of 6000 W.
 - .3 Waterproof enclosure, for exterior installations.
 - .4 Manual override.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Install photoelectric controls in accordance with manufacturer's written instructions and to CSA C22.1.

3.3 CLEANING

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

- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

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

PART 1 - GENERAL

1.1 REFERENCES

- .1 CSA International
 - .1 CSA C22.1-18, Canadian Electrical Code (CEC), 24th Edition
- .2 Ontario Electrical safety Code (OESC), 2015

1.2 SYSTEM DESCRIPTION

- .1 Low voltage control system designed to provide remote switching of lighting loads by use of:
 - .1 Low voltage momentary contact switches
 - .2 Low voltage relays.
 - .3 Control transformers
 - .4 Low voltage rectifiers
 - .5 Manual switch control.

1.3 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit maintenance data in accordance with Section 01 78 00.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 20, and with 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.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Control system: by one manufacturer and assembled from compatible components.

2.2 LOW VOLTAGE RELAYS

- .1 Electrically operated by momentary impulse, mechanically latched until activated.
- .2 Two coil solenoid type with one coil to close relay contacts and one coil to open relay contacts.

- .3 Operating voltage: 24V, AC.
- .4 Load contacts: 20A, 120V, AC.
- .5 Auxiliary contacts for pilot light.
- .6 Coloured pre-stripped leads.

2.3 CONTROL TRANSFORMER

- .1 Low voltage power Class 2, input 120 V, AC, 60Hz, output 50 VA at 24V.

2.4 MANUAL CONTROL

- .1 individual remote control switches as indicated.
- .2 Eight circuit manual master selector switch mounted in 100 mm square box with:
 - .1 Master lock-out switch
 - .2 Individual red jewelled pilot lights.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Locate and install equipment in accordance with manufacturer's recommendations and as indicated.

3.2 TESTS

- .1 Perform tests in accordance with Section 26 05 00.
- .2 Actuate control units in presence of Departmental Representative to demonstrate lighting circuits are controlled as designated.

PART 1 - GENERAL

1.1 REFERENCES

- .1 CSA International
 - .1 CSA C22.1-18, Canadian Electrical Code (CEC), 24th Edition
 - .2 CSA C22.2 No.42-10(R2015), General Use Receptacles, Attachment Plugs and Similar Devices.
 - .3 CSA C22.2 No.42.1-13, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
 - .4 CSA C22.2 No.55-15, Special Use Switches.
 - .5 CSA C22.2 No.111-10(R2015), General-Use Snap Switches (Bi-national standard, with UL 20).
- .2 Ontario Electrical safety Code (OESC), 2015

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for wiring devices and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .1 Indicate on drawings:
 - .1 The electrical information, dimensions, physical and color information, any note for installation.

1.3 CLOSEOUT SUBMITTALS

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

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials 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.

- .4 Develop Construction Waste Management Plan and Waste Reduction Workplan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Construction Waste Management Plan and Waste Reduction Workplan in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 SWITCHES

- .1 20 A, 120 V, single pole, three-way (if indicated) 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 and or heating loads.
- .4 Switches of one manufacturer throughout project.

2.2 RECEPTACLES

- .1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA C22.2 No.42 with following features:
 - .1 Ivory urea moulded housing.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Break-off links for use as split receptacles.
 - .4 Eight back wired entrances, four side wiring screws.
 - .5 Triple wipe contacts and rivetted grounding contacts.
- .2 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground with following features:
 - .1 Ivory 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.

2.3 COVER PLATES

- .1 Cover plates for wiring devices to: CSA C22.2 No.42.1.
- .2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

- .3 plastic ivory cover plates, thickness 2.5 mm for wiring devices mounted in flush-mounted outlet box.
- .4 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.
- .5 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.
- .6 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.

2.4 SOURCE QUALITY CONTROL

- .1 Cover plates from one manufacturer throughout project.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Switches:
 - .1 Install single throw switches with handle in "UP" position when switch closed.
 - .2 Install switches in gang type outlet box when more than one switch is required in one location.
 - .3 Mount toggle switches at height in accordance with Section 26 05 00 as indicated.
- .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 as indicated.
 - .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
 - .4 Install GFI type receptacles as indicated.
- .3 Cover plates:

- .1 Install suitable common cover plates where wiring devices are grouped.
- .2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
- .3 Repair damage to adjacent materials caused by wiring device installation.

PART 1 - GENERAL

1.1 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI C82.1-2004(R2015), Lamp Ballasts - Line Frequency Fluorescent Lamp Ballasts.
 - .2 ANSI C82.4-2002, Ballasts for High-Intensity Discharge and Low-Pressure Sodium (LPS) Lamps (Multiple-Supply Type).
- .2 Institute of Electrical and Electronics Engineers (IEEE)
 - .1 IEEE C62.41-2002, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- .3 ASTM International Inc.
 - .1 ASTM F1137-11e1, Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
- .4 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-18, Canadian Electrical Code (CEC), 24th Edition
- .5 ICES-005-Issue 4-2015, Lighting Equipment.
- .6 Ontario Electrical Safety Code (OESC), 2015

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Departmental Representative.
 - .3 Photometric data to include: VCP Table where applicable and spacing criterion.
- .3 Quality assurance submittals: provide following in accordance with Section 01 45 00.
 - .1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, cleaning procedures.

1.3 QUALITY ASSURANCE

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

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 20.
- .4 Divert unused metal materials from landfill to metal recycling facility.
- .5 Disposal and recycling of fluorescent lamps as per national and local regulations.
- .6 Disposal of old PCB filled ballasts.

PART 2 - PRODUCTS

2.1 LAMPS

- .1 As indicated.

2.2 FINISHES

- .1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

2.3 OPTICAL CONTROL DEVICES

- .1 As indicated.

2.4 LUMINAIRES

- .1 As indicated on the drawings and luminaire schedule.
- .2 Approved vendors: Eaton, Philips, Lithonia or approved equivalent.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Locate and install luminaires as indicated.
- .2 Provide adequate support to suit ceiling system.

3.2 WIRING

- .1 Connect luminaires to lighting circuits:
 - .1 Install flexible or rigid conduit for luminaires as indicated.

3.3 LUMINAIRE SUPPORTS

- .1 For suspended ceiling installations support luminaires independently of ceiling.
- .2 install the suspended lighting fixtures in the area with the same mounting height as the existing fixtures.

3.4 LUMINAIRE ALIGNMENT

- .1 Align luminaires mounted in continuous rows to form straight uninterrupted line.
- .2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

3.5 CLEANING

- .1 Clean in accordance with Section 01 74 11.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

PART 1 - GENERAL

1.1 PURPOSE

- .1 To verify that installations are in accordance with project requirements.
- .2 To ensure proper system operation.
- .3 The scope of work includes:
 - .1 Removal of existing Fire Alarm detectors in demolishing loading dock,
 - .2 Update the Fire Alarm Zoning in the building regarding removal of the Fire Alarm detectors.
 - .3 Remove the wiring and the exposed conduits for removed detectors.
 - .4 Verification of the existing circuit associated with removed detectors,
 - .5 Verification of the other Fire Alarm devices on the same circuit of removed detectors,
 - .6 Update the program in Fire Alarm control panel,
 - .7 Update the Fire Alarm Annunciator Panel,
 - .8 Update the passive graphic display,
 - .9 Verification on all modified or updated Fire Alarm devices, panels and circuits.

1.2 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-S524-14, Standard for the Installation of Fire Alarm Systems.
 - .2 CAN/ULC-S525-16, Audible Signal Device for Fire Alarm Systems.
 - .3 CAN/ULC-S526-07, Visual Signal Devices for Fire Alarm Systems.
 - .4 CAN/ULC-S527-11, Control Units.
 - .5 CAN/ULC-S528-14, Manual Pull Stations for Fire Alarm Systems.
 - .6 CAN/ULC-S529-16, 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.
 - .9 CAN/ULC-S536-13, Inspection and Testing of Fire Alarm Systems.
 - .10 CAN/ULC-S537-13, Verification of Fire Alarm Systems.
 - .11 CAN/ULC-S1001-11, Standard for Integrated Systems Testing of Fire Protection and Life Safety Systems.
- .3 National Fire Protection Agency
 - .1 NFPA 72-16, National Fire Alarm Code.
 - .2 NFPA 90A-18, Installation of Air Conditioning and Ventilating Systems.
- .4 CSA C22.1-18, Canadian Electrical Code, 24th Edition
- .5 Ontario Electrical safety Code, 2015,
- .6 National Building Code of Canada, 2015

.7 National Fire Code of Canada, 2015

1.3 COMMISSIONING ORGANIZATIONS

.1 Certified member of ECAO or CFAA.

1.4 RELATED SECTIONS

.1 Section 01 91 00 - Commissioning.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 PROCEDURES

- .1 Follow manufacturer's recommendations for testing.
- .2 Inspect wiring connections to all devices comprising the system.
- .3 Verify supervision of wiring at every device connection to a supervised circuit.
- .4 Test operation of every device on a system to verify its function.
- .5 Examine equipment for any apparent damage or tampering that may interfere with its intended operation.
- .6 Test equipment with capabilities for field adjustment to establish that it functions as intended under the conditions prevailing at its point of installation.
- .7 Examine devices for evidence of damage or obstructions which may interfere with their operating mechanisms.
- .8 Test automatic devices by simulating an operating condition.
- .9 Wiring:
 - .1 Inspect every device and test to demonstrate that disconnection of the device from the circuit or malfunction of the equipment or wiring activates the required supervisory signals. Inspection shall include verification that:
 - .1 Supervisory signals operate in response to open circuits, short circuits, ground faults and disconnection of plug-in components;
 - .2 Terminations of conductors entering and leaving equipment have been made;
 - .3 Circuit polarities are in accordance with the system design, where applicable.
 - .2 In addition, test to establish that the power supplied to any device

is within its recommended operating range and that the required voltage levels are maintained and that the fusing is correct.

- .10 Initiating Devices - Manual:
 - .1 Inspect manual alarm stations in consideration of the following:
 - .1 The device shall be mounted with sufficient clearance to facilitate ease of access and proper operation;
 - .2 Operate each manual alarm station, toggle switch and key switch to verify proper functions.
- .11 Automatic heat detectors:
 - .1 Use a heat source reproducible in its intensity, as recommended by the manufacturer of the device, to initiate an alarm.
 - .2 Test equipment - Heat lamp or Air heater. DO NOT USE AN OPEN FLAME HEAT SOURCE.
 - .3 Apply heat source as to not damage or operate fusible disc parts.
- .12 Automatic smoke detectors - area type:
 - .1 Test by introducing smoke into its detecting chamber. This may consist of actual smoke from burning materials or artificially generated smoke aerosol spray as recommended by the manufacturer. The sensitivity should be noted and adjusted if necessary.
- .13 Annunciators, printers and workstations:
 - .1 Inspect and operate to establish that their operation in conjunction with the control equipment and other system components, is as intended. The equipment shall be inspected to ensure:
 - .1 The zone of each alarm initiating device is properly indicated;
 - .2 The legend is clearly visible;
 - .3 Adequate voltage under local conditions is present;
 - .4 Wiring connections have been made in a workmanlike manner.
 - .5 Proper care must be taken to establish that each item is complete and satisfactory.
- .14 Standby power supplies - batteries:
 - .1 Examine batteries for possible damage and consideration of the following:
 - .1 The charging system functions as intended;
 - .2 The installation has not resulted in the bypassing of a fuse or a similar protective device;
 - .3 The installation protects the batteries from accidental or mechanical damage.
 - .4 The batteries must be able to operate the fire alarm system with the charger input disconnected for one rated load cycle.
- .19 Control equipment and transponders:
 - .1 Test to establish that they function as intended. The following examinations and tests shall be performed:
 - .1 A visual and physical inspection of all cables, plug interconnections, plug-in circuit components, lamps, sockets and controls to establish that their mechanical and electrical connections and mounting are as required for intended function and, where applicable, to confirm electrical supervision;

- .2 Verification that all field wiring is terminated in a workman-like manner;
 - .3 All lamps and indicators shall be tested for operation and intended function;
 - .4 All keypad functions shall be tested for operation and intended function;
 - .5 All control unit functions shall be operated to verify appropriate response including all software routines and programmed functions are simulated;
 - .6 Simulation of open circuits, short circuits and ground faults on all relevant internal circuits in order to confirm the appropriate supervisory response;
- .2 Commissioning Report:
- .1 Provide in accordance with requirements of Section 01 91 00, supplemented as specified herein.
 - .2 Report to include relevant information of the system including:
 - .3 Each system part described.
 - .4 How the system is operated.
 - .5 What functions the system performs.
 - .6 Requirements for tests and service.
 - .7 Itemization of all devices connected on the system, their general location.
 - .8 The date of the performed tests.
 - .9 All pertinent details of the report sheets requested.
- .3 Verification:
- .1 The Commissioning Report to be submitted to the Commissioning Manager upon completion of commissioning and will be subject to verification by the Commissioning Manager.

PART 1 - GENERAL

1.1 SUMMARY

The scope of work includes:

- .1 Removal of existing Fire Alarm detectors in demolishing loading dock,
- .2 Update the Fire Alarm Zoning in the building regarding removal of the Fire Alarm detectors.
- .3 Remove the wiring and the exposed conduits for removed detectors.
- .4 Verification of the existing circuit associated with removed detectors,
- .5 Verification of the other Fire Alarm devices on the same circuit of removed detectors,
- .6 Update the program in Fire Alarm control panel,
- .7 Update the Fire Alarm Annunciator Panel,
- .8 Update the passive graphic display,
- .9 Verification on all modified or updated Fire Alarm devices, panels and circuits.

1.2 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-S524-14, Standard for the Installation of Fire Alarm Systems.
 - .2 CAN/ULC-S525-16, Audible Signal Device for Fire Alarm Systems.
 - .3 CAN/ULC-S526-07, Visual Signal Devices for Fire Alarm Systems.
 - .4 CAN/ULC-S527-11, Control Units.
 - .5 CAN/ULC-S528-14, Manual Pull Stations for Fire Alarm Systems.
 - .6 CAN/ULC-S529-16, 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.
 - .9 CAN/ULC-S536-13, Inspection and Testing of Fire Alarm Systems.
 - .10 CAN/ULC-S537-13, Verification of Fire Alarm Systems.
 - .11 CAN/ULC-S1001-11, Standard for Integrated Systems Testing of Fire Protection and Life Safety Systems.
- .3 National Fire Protection Agency
 - .1 NFPA 72-16, National Fire Alarm Code.
 - .2 NFPA 90A-18, Installation of Air Conditioning and Ventilating Systems.
- .4 CSA C22.1-18, Canadian Electrical Code, 24th Edition
- .5 Ontario Electrical safety Code, 2015,
- .6 National Building Code of Canada, 2015
- .7 National Fire Code of Canada, 2015

1.3 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00.
 - .1 Submit two copies of Workplace Hazardous Materials Information

System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00.

- .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00.
 - .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: submit following in accordance with Section 01 33 00.
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .2 Instructions: submit manufacturer's installation instructions.
 - .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 Section 01 78 00 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 two 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 all new equipment including devices, panels, wiring, conduits. Mark data which describe more than one type of item to indicate which type will be provided. Submit one 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 for existing system and 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.

1.4 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 Departmental Representative approval.
- .4 Extra Materials:
 - .1 Provide maintenance materials in accordance with Section 01 78 00.
 - .2 Include:
 - .1 Two 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.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with Section 01 61 00.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 SUSTAINABLE REQUIREMENTS

- .1 Materials and products in accordance with Section 01 47 15.

2.2 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.

2.3 SYSTEM OPERATION

- .1 Provide complete, electrically supervised, code 3 temporal common 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 fire alarm transmitter and monitoring station.
 - .3 Zone of alarm device to be indicated on control panel and remote annunciator.
 - .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.

- .5 Capability to program smoke detector status change confirmation on any or zones in accordance with CAN/ULC-S527, Appendix C.

2.4 CONDUIT

- .1 Rigid Steel Conduit, hot-dip galvanized steel.
- .2 Electrical Metallic Tubing (EMT) for indoor installation above 3m, not subject to Mechanical injury.

2.5 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 Wire for connection to base telegraphic alarm loop: No. 10 AWG minimum solid copper conductor.
- .5 Insulation 90 degrees C minimum with nylon jacket.
- .6 Colour code wiring.

2.6 LOW VOLTAGE SURGE SUPPRESSOR

- .1 Provide surge suppression for circuits which leave building shell.
- .2 When circuits interconnect 2 or more buildings, provide arrestor at circuit entrance to each building.
- .3 Suppressor: UL 497B listed with maximum 30 volt clamping level and maximum response time of 5 nanoseconds.
- .4 Suppressor: multi-stage construction and both differential and common mode protection.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

- .1 All installation to be in accordance with CAN/ULC-S524 and TB OSH Chapter 3-04.

- .2 Remove the detectors in demolishing area complete with wiring and conduit and patch up the ceiling.
- .3 Identify the Zoning and verify the Fire Alarm devices on the same circuits as removed detectors.
- .4 Verify the Audible devices in the demolishing area.
- .5 Update the Remote Fire Alarm Annunciator Panel.
- .6 Update the circuits and program in existing Fire Alarm Control Panel.
- .7 Identify Zoning and verify the panel.
- .8 Identify Zoning and verify the device if located on the same circuit as removed detectors.
- .9 Update and verify the Remote Fire Alarm Annunciator Panel.

3.3 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, sprinkler system transmit alarm to control panel and actuate general alarm and ancillary devices.
 - .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 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.

3.4 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.

3.5 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.

PART 1 - GENERAL

1.1 REFERENCES

- .1 Asphalt Institute (AI)
 - .1 AI MS-2-2015, Mix Design Methods for Asphalt Concrete and Other Hot-Mixes.
- .2 ASTM International
 - .1 ASTM D698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m³).
- .3 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS 302-November 2007, Construction Specification for Priming Granular Base.
 - .2 OPSS 310-November 2012, Construction Specification for Hot Mixed Asphalt.
 - .3 OPSS 314-November 2013, Construction Specification for Untreated Granular, Subbase, Base, Surface Shoulder and Stockpiling.
 - .4 SP 110S13-2010, Amendment to OPSS.PROV 1010, Material Specification for Aggregates, Granular A, B, M and Select Subgrade Material.
 - .5 OPSS 1103-November 2012, Material Specification for Emulsified Asphalt.
 - .6 OPSS 1150-November 2010, Material Specification for Hot Mixed Asphalt.
- .4 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual - 2018.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for asphalt mixes and aggregate and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit viscosity-temperature chart for asphalt cement to be supplied showing either Saybolt Furol viscosity in seconds or Kinematic Viscosity in centistokes, temperature range 105 to 175 degrees C, 4 weeks prior to beginning Work.
- .3 Samples:
 - .1 Inform Departmental Representative of proposed source of aggregates and provide access for sampling 4 weeks prior to beginning Work.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

- .2 When necessary to blend aggregates from one or more sources to produce required gradation, do not blend in stockpiles.
- .3 Stockpile fine aggregate separately from coarse aggregate, although separate stockpiles for more than two mix components are permitted.
- .4 Provide approved storage, heating tanks and pumping facilities for asphalt cement.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Aggregates to: SP 110S13.
 - .1 Granular A.
 - .2 Granular B Type I.
 - .3 Select subgrade.
- .2 Prime coat: SS-1 to OPSS 1103.
- .3 Tack coat: SS-1 to OPSS 1103.
- .4 Asphalt concrete: to OPSS 1150.
- .5 Traffic paint: white to MPI # 32.
- .6 Paint thinner: to industry standard.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for asphalt paving 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 FOUNDATIONS

- .1 Foundations for parking lots to comprise:
 - .1 Granular base A 20-0, in thickness to match existing.

- .2 Construction of granular foundations: OPSS 314.
- .3 Compaction: compact each lift of granular material to 100% maximum density to ASTM D698. Maximum lift thickness: 150 mm.

3.3 PAVEMENT THICKNESS

- .1 Pavements for parking lots:
 - .1 Wear course: HL3, in thickness to match existing.

3.4 PAVEMENT CONSTRUCTION

- .1 Application of prime coat: OPSS 302.
- .2 Construction of asphalt concrete: OPSS 310.

3.5 TRAFFIC MARKINGS

- .1 Paint parking space divisions and other pavement markings in accordance with manufacturers recommendations and as indicated.
- .2 Use paint thinner in accordance with manufacturer's requirements.

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.