SPECIFICATIONS

FOR

LAURIER HOUSE NATIONAL HISTORIC SITE
GENERATOR PURCHASE, INSTALLATION
AND EXISTING CONCRETE PAD REMOVAL
AND REPLACEMENT

OTTAWA, ONTARIO
PARKS CANADA

ISSUED FOR CONSTRUCTION

Project No.: 45369810 **2017-03-31**

PARKS CANADA
OTTAWA ON
LAURIER HOUSE N.H.S.C.

GENERATOR PURCHASE, INSTALLATION
AND EXISTING CONCRETE PAD REMOVAL
AND REPLACEMENT

	
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List of Drawings

Civil

C-01 – SITE CONSTRUCTION / LOCATION PLAN AND NO-GO ZONES

Electrical

E-01 - ELECTRICAL PLANS, LEGEND AND GENERAL NOTES
E-02 - POWER DISTRIBUTION SINGLE LINE DIAGRAM & SCHEMATICS
E-03 - ELECTRICAL PARTIAL PLANS
E-04 – DETAILS AND ELECTRICAL SCHEDULES

END OF SECTION

PART 1 - GENERAL

1.1 PRECEDENCE

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

1.2 DESCRIPTION OF WORK

.1 The work under this Contract covers the furnishing of all labour, materials and equipment required for the purchase, installation, removal and replacement of a generator and concrete pad of the Laurier House National Historic Site located in Ottawa, Ontario. The project includes but is not limited to the following:

.1 Condition survey of existing buildings and surface features which may be affected by Work including acknowledgement of areas identified and delineated by Parks Canada Departmental Representative as No-Go Zones prior to Work.

.2 Demolition and removal of existing electricsal installations associated with accessibility lift including all equipment,conduit, wiring and panels.

.3 Demolition and removal of existing generator including all equipment, conduit, wiring, panels and equipment pads.

.4 Protection of existing building elements, surface features, heritage landscape, asphalt and concrete pavements, and archaeological sensitive areas from damage while Work is in progress.

.5 Demolition and removal of existing snow melting control system including equipment, panels, wiring and conduits.

.6 Temporary removal and reinstatement of existing electrical installations on east window cover to allow for the replacement of cover.

.7 Supply and construction of new and reinforced concrete generator slab-on-grade.

.8 Supply and installation of new generator including all electrical wiring, conduit and natural gas lines.

1.2 DESCRIPTION OF WORK (Cont'd)

.1 (Cont'd)

.9 Supply and installation of automatic transfer switch, battery charger and associated power distibution equipment including conduits and wiring.

.10 Minimize extents of excavation of in-situ material within area of work and off-site disposal of surplus and unsuitable materials.

.11 Supply and compaction of engineered fill (granular base and subbase) as backfill.

.12 Supply and installation of rigid insulation, geotextiles, as indicated.

.13 Surface treatment and protection, including topsoil (stockpile and imported), seeding, sodded, and fertilizing.

.14 Removal of waste materials and debris; clean and reinstate areas affected by Work.

.15 Supply and installation of snow melting control system and associated panel including conduits and wiring.

.16 Supply and installation of new receptacles including conduits and wiring.

1.3 CODES

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

.2 Conform to the latest revision of any referenced standard as re-affirmed or revised to the date of specification. Standards or codes not dated shall be deemed editions in force on the date of tender advertisement.

1.4 DOCUMENTS REQUIRED

.1 Maintain at job site, one copy of each of the following:

.1 Contract Drawings;
.2 Specifications;
.3 Addenda;
.4 Reviewed shop drawings;
.5 List of outstanding shop drawings;
.6 Change orders;
.7 Other modifications to Contract;
.8 Field test reports;
.9 Copy of approved work schedule;

1.4 DOCUMENTS REQUIRED (Cont'd)

.1 (Cont'd)

.10 Health and safety plan and other safety related documents.

.11 Other documents specified;

.12 Manufacturer's installation and application instructions; and

.13 All testing results.

1.5 WORK SCHEDULE

.1 Provide within 5 working days after Contract Award, construction schedule showing anticipated progress stages and final completion of work within time period required by Contract Documents and as specified herein.

.2 Interim reviews of work progress based on work schedule will be conducted as decided by Departmental Representative and schedule updated by Contractor in conjunction with and to approval of the Departmental Representative.

.3 All work at the Laurier House National Historic Site tio be coordinated with Departmental Representative in accordance tothe site's operational needs.

.1 Schedule to indicate all calendar dates from commencement to completion of all work within the time stated in the accepted bid.

.2 Provide sufficient details in schedule to clearly illustrate entire implementation plan, depicting efficient coordination of tasks and resources, to achieve completion of work on time and permit effective monitoring of work progress in relation to established milestones.

.3 Work schedule must take into consideration and reflect the work phasing.

.4 Completed schedule shall be approved by Departmental Representative. When approved, take necessary measures to complete work within scheduled time. Do not change schedule without Departmental Representative's approval.

.5 Ensure that all subtrades and subcontractors are made aware of the work restraints and operational restrictions specified.

.6 Schedule Updates:

1.5 WORK SCHEDULE (Cont'd)

.3 (Cont'd)

.6 (Cont'd)

.1 Submit when requested by Departmental Representative.

.2 Provide information and pertinent details explaining reasons for necessary changes to implementation plan.

.3 Identify problem areas, anticipated delays, impact on schedule and proposed corrective measures to be taken.

.7 Departmental Representative will make interim reviews and evaluate progress of work based on approved schedule. Frequency of such reviews will be as decided by Departmental Representative. Address and take corrective measures on items identified by reviews and as directed by Departmental Representative. Update schedule accordingly.

.8 In every instance, change or deviation from the Work Schedule, no matter how minimal the risk or impact on safety or inconvenience to users or public might appear, will be subject to prior review and approval by the Departmental Representative.

1.6 CONTRACTOR'S USE OF SITE

.1 Contractor's use of site for trailers storage and preparatory work shall be limited to an area within limits defined by project layout. Any additional areas required shall be approved by the Departmental Representative prior to use.

.2 Maintain the site in a tidy condition free from the accumulation of waste products and debris. Upon substantial performance of the work, remove surplus products, tools, machinery and equipment from the site. Completion of clean-up is required for total performance of the work.

.3 Provide any and all traffic control services required for the project.

.4 Main vehicular access routes and staging areas to be restricted to present-day roadways, parking lots and pathways.

1.6 CONTRACTOR'S USE OF SITE (Cont'd)

.5 Obtain all necessary permits to perform work and to comply with all permit requirements and conditions.

.6 Maintain work during construction. Undertake continuous maintenance each day. Maintain roadway and structures in a safe and tidy condition.

1.7 PROJECT MEETINGS

.1 Departmental Representative will arrange project meetings and assume responsibility for setting times and recording and distributing minutes.

.2 The Departmental Representative shall make available, with adequate notice, meeting facilities for regular project meetings.

.3 Attend project meetings as specified. Arrange for and ensure applicable project sub-trades attend meetings as required.

1.8 SETTING OUT OF WORK

.1 HCCD (Parks) to delineate no-go zones. All surface modifications are restricted to the identified construction limits.

.2 Assume full responsibility for and execute complete layout of work to locations, lines and elevations indicated.

.3 Provide devices needed to lay out and construct work.

.4 Supply such devices as straight edges and templates required to facilitate Departmental Representative's inspection of work.

.5 Provide coordinates, elevations and dimensions from site as required by the Departmental Representative.

.6 No construction activities to occur in zones identified and delineated by Parks Canada Departmental Representatives as No-Go Zones without prior Departmental approval and ground protection measures (i.e. plywood) in place.

1.9 EXISTING SERVICES

.1 Where Work involves breaking into or connecting to existing services, carry out work at times directed by authorities having jurisdiction.

.2 Work that involves temporary disruption of services will be scheduled through the Departmental Representative. Give Departmental Representative minimum 72 hours notice of any disruption of services.

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

.4 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility. Adhere to approved schedule and provide notice to affected parties.

.5 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.

.6 Record locations of maintained re-routed and abandoned service lines.

.7 Confirm all inverts and critical elevations in the field prior to construction.

1.10 ADDITIONAL DRAWINGS

.1 Departmental Representative may furnish additional drawings for clarification. These additional drawings have same meaning and intent as if they were included with plans referred to in the Contract Documents.

1.11 CONSTRUCTION SAFETY MEASURES

.1 The Contractor must submit a Safety Plan prior to the pre-construction meeting.

.2 The Contractor must submit a Parks Canada Occupational health and Safety (OHS) Attestation Form, see Appendix A for form.

1.12 EXCAVATION

.1 Prior to commencing any excavation, check for and become aware of all buried utilities and submit findings for review and approval by Departmental Representative.

.2 Minimize extents of excavation within area of work. Refer to Section 01 35 29.06 - Health and Safety Requirements.

.3 No excavation is permitted during the installation and removal of the ground protection measures of the No-Go Zones.

.4 Archaeological monitoring, to be provided by PCA, is required for the excavation of the new generator pad. Contractor to expect 1 hour delay per excavation operating day for archeological monitoring.

.5 In the event that significant features (structural remains and/or high artifact concentrations) are encountered during construction activities, excavation should cease in the immediate area and Parks Canada Department Representatives to be informed.

.6 Refer to 1.8, SETTING OUT WORK, Item 1.8.6.

1.13 STANDARD HOURS

.1 The Contractor must maintain existing site hours for the work unless otherwise authorized by Departmental Representative.

1.14 SITE CONDITIONS

.1 Promptly notify Departmental Representative if subsurface conditions differ materially from those indicated in Contract Documents or a reasonable assumption of probable conditions based thereon.

.2 Contractor shall visit Laurier House National Historic Site and review existing site conditions prior to starting the work. Site visits and timeline to be confirmed by Parks Canada.

1.15 WORK WITHIN HISTORIC SITE BOUNDARIES

.1 The Work is within a National Historic Site. It is essential that all lands remain as undisturbed as possible. Use standards and methods beyond those for normal construction in order to protect the environment and ensure aesthetics of the Work. Strictly adhere to contract limits and take every precaution to minimize environmental damage and disruption to vegetation and structures or existing services, both on construction and storage sites.

.1 If damage occurs during construction, bear the expense to immediately restore such damaged areas to the satisfaction of the Departmental Representative.

.2 If restoration fails to satisfy specified requirements, the Departmental Representative may complete repairs at the Contractor's expense.

.3 Ensure no damage will be done to aerial or underground electrical /communications cables.

.4 Follow Provincial requirements regarding: pit and Quarry guidelines; and Environmental Construction Practice Specifications.

.5 Make arrangements with authorities or owners of private properties for quarrying and transporting materials and machinery over properties and roads. Obtain associated permits and pay associated fees.

1.16 NOISE

.1 Fit all construction equipment with standard noise suppression devices. Maintain devices in accordance with manufacturer's requirements. Use smaller, less-disturbing equipment where possible.

.2 Apply the most stringent of 1.14.1 - STANDARD HOURS or the City of Ottawa Noise By-Law No. 2004-253.

.3 See Appendix B for Designated Substances Report, Repair of Interior and Exterior Finishes, Laurier House, Corner of Laurier and Chapel Streets, Ottawa, ON Summary Report.

1.17 AIR QUALITY

.1 Implement an anti-idling policy for trucks and machinery.

.2 Submit dust control measures to Departmental Representative prior to starting Work. Apply dust control measures during periods of dust generation.

1.18 RELICS ANTIQUES AND WILDLIFE HABITAT

.1 Protect relics, antiquities, items of historical or scientific interest such as cornerstones and contents, commemorative plaques, inscribed tablets, and similar objects found during course of work.

.2 Give immediate notice to Departmental Representative and await Departmental Representative's written instructions before proceeding with work in this area.

.3 Relics, antiquities and items of historical or scientific interest remain her Majesty's property.

1.19 NATIONAL PARKS ACT

.1 For projects within boundaries of National Historic Sites, perform work in accordance with National Parks Act.

1.20 PERMITS/ AUTHORITIES

.1 Obtain and pay for permits from authorities as required for the Work. Comply with pertinent regulations of authorities having jurisdiction over the Work. Provide copies of permits to Departmental Representative prior to starting the Work.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not used.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 31 23 33.01 - Excavating, Trenching and Backfilling.

1.2 ACCESS AND EGRESS

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

.1 For design of any temporary structures, submit design and supporting data at least 2 weeks prior to beginning work.

.2 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Province of Ontario, Canada.

1.3 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.

1.4 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING SITE

.1 Execute work with least possible interference or disturbance to public and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.

1.5 EXISTING SERVICES

.1 Notify, Departmental Representative and utility companies of intended interruption of services and obtain required permission.

.2 Provide for personnel, pedestrian and vehicular traffic.

1.5 EXISTING SERVICES (Cont'd)

.3 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.6 SPECIAL REQUIREMENTS

.1 All work at the Laurier House National Historic Site shall be completed from October 2017 to May 2018. Refer to Section 01 11 00 - WORK SCHEDULE, Item 1.5.3. Exact dates of work to be confirmed and approved by Parks Canada prior to construction.

.2 Access to the Laurier House National Historic Site by heavy and construction vehicles shall be limited. Refer to Section 01 11 00, 1.8, SETTING OUT OF WORK, Item 1.8.6.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

.1 The form of Tender includes one lump sum priced item.

.2 The Total Tendered price shall be the sum of the lump sum item.

.3 The quantities listed in the Form of Tender are approximate only and are for the purpose of tendering. Payment to the Contractor will be based on actual quantities of work completed in accordance with the drawings and specifications.

.4 The requirement for items indicated as Provisional will not be determined until the time of construction. Provisional items shall mean that the unit prices as tendered shall be included in the Tender Price and that the Departmental Representative reserves the right to delete or modify the quantities of these items. Any part of a provisional item not expended shall be deducted in whole from the Total Tendered Price.

.5 The submitted tender prices will be inclusive of all costs for the complete supply and installation of all materials, labour and equipment required to complete the work. No separate payment will be made for any testing, inspections, quality control and approvals required by Contractor.

.6 All measurement shall be along a horizontal plane unless otherwise indicated.

1.2 LUMP SUM ITEM

.1 No separate measurement for payment shall be made for any work completed under this item.

.2 The work of each lump sum item below shall be considered to include, but not necessarily be limited to the following:

1.2 LUMP SUM ITEM (Cont'd)

.2 (Cont'd)

.1 Mobilization and demobilization to the site, access to the site, temporary utilities, construction facilities and temporary barriers and enclosures.

.2 Protection of all cultural and archaeologically significant features/ resources.

.3 All environmental protection, including erosion controls, sedimentation controls, de-watering, dust control, and ground protection measures.

.4 Pre and post construction condition surveys of all existing features adjacent to the area of work.

.5 Field surveys for layout of the construction work items and for collection of as-built condition information.

.6 Cleaning of work site, including removal of waste, debris and recyclable materials.

.7 Testing, inspections and permits from all regulatory agencies and groups required to complete work.

.8 Design, construction and maintenance of all temporary structures (shoring, bracing, underpinning, scaffolding, etc.) required to complete the work.

.9 Removal of all surplus materials from the site at completion of work.

.10 Preparation and submission of all closeout submittals, maintenance manuals and as-built drawings.

.11 Restoration of all areas disturbed by construction activities to equivalent original condition or better.

.12 All other works which are required for completion of the project, exclusive of those covered by the unit priced items.

.3 Generator Replacement:

.1 Demolition and removal of existing generator including equipment, conduit, wiring, and concrete pad.

.2 Cutting and disposal of all trees and brush from areas as required for work and approved by Departmental Representative.

1.2 LUMP SUM ITEM (Cont'd)

.3 (Cont'd)

.3 Stripping of any topsoil and stockpiling for re-use, excavation to lines and elevations indicated and approved by Departmental Representative, and disposal of surplus or unsuitable material. Material deemed suitable for re-use shall be stockpiled on site with proper ground protection measures in place.

.4 Excavation to lines and elevations indicated on drawings and approved by Departmental Representative, and disposal of surplus or unsuitable material. Material deemed suitable for re-use shall be stockpiled on site with proper ground protection measures in place.

.5 Supply, placement and compaction of base and sub-base graved as indicated.

.6 Supply and placement of topsoil and maintenance of materials.

.7 Preparation of subgrade, supply and installation of formwork, reinforcement, cast-in-place concrete and finishing for concrete equipment pad.

.8 Supply and installation of new natural gas generator including all equipment, conduit, wiring, piping.

1.3 UNIT PRICE ITEMS

.1 Not Used.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

.1 Particular requirements for inspection and testing to be carried out by testing laboratory designated by Departmental Representative are specified under various sections.

1.2 APPOINTMENT AND PAYMENT

.1 Departmental Representative will appoint and pay for services of testing laboratory except as follows:
.1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
.2 Inspection and testing performed exclusively for Contractor's convenience.
.3 Testing, adjustment and balancing of equipment and systems.
.4 Mill tests and certificates of compliance.
.5 Tests specified to be carried out by Contractor under the supervision of Departmental Representative.
.6 Additional tests specified in the following paragraph.

.2 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, pay costs for additional tests or inspections as required by Departmental Representative to verify acceptability of corrected work.

1.3 CONTRACTOR'S RESPONSIBILITIES

.1 Provide labour, equipment and facilities to:
.1 Provide access to Work to be inspected and tested.
.2 Facilitate inspections and tests.
.3 Make good Work disturbed by inspection and test.
.4 Provide storage on site for laboratory's exclusive use to store equipment and cure test samples.

.2 Notify Departmental Representative sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.

1.3 CONTRACTOR'S RESPONSIBILITIES (Cont'd)

.3 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.

.4 Pay costs for uncovering and making good Work that is covered before required inspection or testing is completed and approved by Departmental Representative.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 DEFINITIONS

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

.2 Bar Chart (GANTT Chart). A 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 an activity or other Project element. Usually expressed as workdays or workweeks.

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

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

1.1 DEFINITIONS (Cont'd)

.8 Project Schedule: The planned dates for performing activities and the planned dates for meeting milestones. A 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 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

1.3 SUBMITTALS

.1 Submit to Departmental Representative within 5 working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.

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

1.4 PROJECT MILESTONES

.1 Project milestones to form targets for Project Schedule.
.1 Period to reach substantial completion to match 2-year work schedule provided. Refer to Section 01 11 00, Part 1.5 PROJECT SCHEDULE, Item 1.5.3.

1.4 PROJECT MILESTONES (Cont'd)

.1 (Cont'd)

.2 Ensure city noise by-laws are respected in reaching project milestones.

1.5 MASTER PLAN

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

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

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

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

1.6 PROJECT SCHEDULE

.1 Develop detailed Project Schedule derived from Master Plan.

.2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:

.1 Award.
.2 Shop Drawings, Samples.
.3 Permits.
.4 Mobilization.
.5 Excavation.
.6 Backfill/Embankment.
.7 Masonry.

1.7 PROJECT SCHEDULE REPORTING

.1 Update Project Schedule every 2 weeks 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, 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.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not used.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 01 11 00 -General Instructions.

.2 Section 01 45 00 - Quality Control.

.3 Section 01 78 00 - Closeout Submittals.

1.2 ADMINISTRATIVE

.1 Submit to Departmental Representative submittals listed for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work. Failure to submit 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.

.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 shall be 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 coordinated.

1.2 ADMINISTRATIVE (Cont'd)

.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 Make any changes in submissions which Departmental Representative may require consistent with Contract Documents and resubmit as directed by Departmental Representative.

.12 Notify Departmental Representative, in writing, when resubmitting of any revisions other than those requested by Departmental Representative.

1.3 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 that are specific to project requirements.

.2 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 coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.3 Allow 10 working days for Departmental Representative's review of each submission.

1.3 SHOP DRAWINGS AND PRODUCT DATA (Cont'd)

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

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

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

.7 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 Relationship to adjacent work.

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

1.3 SHOP DRAWINGS AND PRODUCT DATA (Cont'd)

.9 Submit 1 PDF digital file or 6 prints of shop drawings for each requirement requested in the Specification sections and as Departmental Representative may reasonably request.

.10 Submit 1 PDF digital file or 6 copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.

.11 Delete information not applicable to project.

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

.13 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.

1.4 SAMPLES

.1 Samples: examples of materials, equipment quality, finishes, workmanship.

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

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

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

1.4 SAMPLES (Cont'd)

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

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

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

1.5 PROGRESS PHOTOGRAPHS

.1 Submit electronic and hard copy of colour digital photographs in "jpg" format.

.2 Identification: name and number of project and date of exposure indicated.

.3 Number of view points: locations of view points determined by Departmental Representative.

.4 Frequency: monthly and at completion excavation and services before concealment.

1.6 CERTIFICATES AND TRANSCRIPTS

.1 Immediately after award of Contract, submit Workers' Compensation Board status.

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

1.7 WORK SCHEDULE

.1 Provide within 5 working days after contract award, schedule showing anticipated progress stages and final completion of work within time period required by Contract Documents.

.2 Interim reviews of work progress based on work schedule will be conducted as decided by Departmental Representative and schedule updated by Contractor in conjunction with and to approval of Departmental Representative.

PART 2 - PRODUCTS

2.1 NOT USED .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal procedures.

1.2 REFERENCES

.1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations.

.2 Province of Ontario
.1 Occupational Health and Safety Act, and regulations for noise and construction projects, R.S.O. 1990, c.0.1 as amended 2016, c.2, Sched. 4.0. Reg. 381/15 and O. R213/91 as amended - updated 2016.

1.3 SUBMITTALS

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

.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 Submit 2 copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative weekly.

.4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.

.5 Submit copies of incident and accident reports.

.6 Submit Material Safety Data Sheets (MSDS) to Departmental Representative.

1.3 SUBMITTALS (Cont'd)

.7 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 7 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 7 days after receipt of comments from Departmental Representative.

.8 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 full responsibility for construction Health and Safety.

.9 Medical Surveillance: Where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.

.10 On-site Contingency and Emergency Response Plan: Address standard operating procedures to be implemented during emergency situations.

.11 Submit other data, information and documentation upon request as stipulated elsewhere in this section.

.12 Refer to Section 01 11 00, 1.12 - CONSTRUCTION SAFETY MEASURES, Item 1.12.2.

1.4 FILING OF NOTICE

.1 File Notice of Project and other Notices with provincial authorities prior to commencement of Work.

.2 Upon request, Departmental Representative will provide name and mailing address of provincial department to whom the Notice of Project shall be sent.

1.5 HAZARD ASSESSMENT

.1 Implement and carry out a health and safety hazard assessment program as part of the work. Program to include:

1.5 HAZARD ASSESSMENT (Cont'd)

.1 (Cont'd)

.1 Initial hazard assessment carried out immediately upon notification of contract award prior to commencement of Work.

.2 Ongoing hazard assessments performed during the progress of work identifying new or potential health risks and safety hazards not previously known. As a minimum, hazard assessments shall be carried out when:

.1 New sub-trade work, new subcontractor(s) or new workers arrive at the site to commence another portion of the work.

.2 The scope of the work has been changed by Change Order.

.3 Potential hazard or weakness in current health and safety practices are identified by Departmental Representative or by an authorized safety representative.

.3 Hazard assessments to be project and site specific, based on review of contract documents, site and weather conditions.

.4 Each hazard assessment to be made in writing. Keep copies of assessments on site for duration of work. Upon request, make available to Departmental Representative for inspection.

1.6 MEETINGS

.1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work. Have Contractor's Site Superintendent in attendance. Departmental Representative will advise of time and location.

.2 Provide site safety orientation session to all workers and other authorized persons prior to granting them access to work site. Brief persons on site conditions and on the minimum site safety rules in force at the site.

.3 Conduct site-specific occupational health and safety meetings during the entire work as follows:

.1 Formal meetings on a minimum monthly basis.

1.6 MEETINGS (Cont'd)

.3 (Cont'd)
.2 Informal "tool box" meetings on a regular basis from a predetermined schedule.

.4 Keep workers informed of anticipated hazards, on safety practices and procedures to be followed and of other pertinent safety information related to:
.1 Progress of work;
.2 New sub-trades arriving on site, and;
.3 Changes in site and project conditions.

.5 Record and post minutes of meeting. Make copies available to Departmental Representative upon request.

1.7 GENERAL REQUIREMENTS

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

.2 Health and Safety Plan shall contain the following three (3) parts:
.1 Part 1: List of individual health risks and safety hazards identified by hazard assessments.
.2 Part 2: List of specific measures to control or mitigate each hazard and risk identified in part one of Plan. Describe the engineering controls, personnel protective equipment and safe work practices to be implemented and followed when performing work related to each identified hazard or risk.
.3 Part 3: Emergency Measures and Communications Procedures as follows:

1.7 GENERAL REQUIREMENTS (Cont'd)

.2 (Cont'd)

.3 (Cont'd)

.1 Emergency Measures: on-site operating procedures, evacuation measures and emergency response to be implemented in the occurrence of an incident. Procedures to be specific and relevant to identified hazards. Measures to complement and be integrated with the facility and tenants Emergency Response Plans in place at site. Obtain information on existing emergency and evacuation plans from Departmental Representative and incorporate appropriate data.

.2 Communication Procedures:

.1 List of names and telephone numbers of designated officials, to be contacted should an incident or emergency situation occur, including the following.

.1 General Contractor and all Subcontractors. Federal and Provincial Departments and local emergency resources organizations, as resources organizations, as applicable laws and regulations.

.2 Officials from Parks Canada Agency. Departmental Representative will provide list of names to be included.

.2 Procedures implemented at site to communicate and share information between workers, subcontractors, and General Contractor on work activities and in particular those which might endanger workers and Facility employees.

1.7 GENERAL REQUIREMENTS (Cont'd)

.2 (Cont'd)

.3 (Cont'd)

.3 List of critical construction activities to be communicated with the Facility Manager and designated tenant representatives which could affect facility and tenant operations, or pose a risk to the health and safety of their employees and to the general public. Develop list in consultation with the Departmental Representative.

.3 Prepare Health and Safety Plan in a three column format, addressing the three parts specified above, as follows:

Column 1 Identified Hazard	Column 2 Control Measures Implemented	Column 3 Emergency Measures and Communications Procedures

.4 Develop Health and Safety Plan in collaboration with all subcontractors. Address all work and activities of subcontractors as they arrive on site. Immediately update Plan and submit to Departmental Representative.

.5 Implement, maintain and enforce compliance with requirements of the Health and Safety Plan until final completion of work and demobilization from site.

.6 As work progresses, review and update Plan addressing additional health risks and safety hazards identified by on-going hazard assessments.

.7 Submit revised versions of Plan to Departmental Representative.

.8 Post a typed written copy, including all updates of the Health and Safety Plan in a common visible location at work site.

1.7 GENERAL REQUIREMENTS (Cont'd)

.9 Submission of the Health and Safety Plan, and updates to the Departmental Representative is for review and information purposes only. Its submission shall not be construed to imply approval by Departmental Representative, be interpreted as a warranty of being complete, accurate and legislate compliant and shall not relieve the Contractor of his legal obligations for the provision Health and Safety of the Construction Project.

.10 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.8 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.

1.9 COMPLIANCE REQUIREMENTS

.1 Comply with Ontario Occupational Health and Safety Act, R.S.O. 1990, c.0.1 and Ontario regulations for construction projects, O. Reg. 213/91.

.2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations made under part II of the Canada Labour Code.

.3 Observe and enforce construction safety measures required by:
.1 2010 National Building Code of Canada, Part 8;
.2 Provincial Worker's compensation Board;
.3 Municipal Statutes and ordinances.

1.9 COMPLIANCE REQUIREMENTS (Cont'd)

.4 In event of conflict between any provisions of above authorities the most stringent provision shall apply. Should a dispute arise in determining the most stringent requirement, Departmental Representative will advise on the course of action to be followed.

.5 A copy of the Canada Labour Code Part II may be obtained by contacting:

Canadian Government Publishing
Public Works & Government Services Canada
Ottawa, ON, K1A 0S9
Tel: (819) 956-4800 or 1-800-635-7943

1.10 UNFORESEEN HAZARDS

.1 Should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of Work, and follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction. Advise Departmental Representative verbally and in writing.

1.11 HEALTH AND SAFETY CO-COORDINATOR

.1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-coordinator. Health and Safety Co-ordinator must:

.1 Have minimum 2 years' site-related working experience specific to activities.

.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.

1.12 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 having jurisdiction, and in consultation with Departmental Representative.

.2 Post all permits on site. Submit copies to Departmental Representative.

1.13 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.

1.14 BLASTING

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

1.15 POWDER ACTUATED DEVICES

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

1.16 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.

1.17 SITE CONTROL AND ACCESS

.1 Control work site and entry points. Grant and allow entry to only workers and other persons so authorized. Immediately stop unauthorized persons from circulating within construction areas and remove from site.

1.17 SITE CONTROL AND ACCESS (Cont'd)

.2 Implement procedures for granting permission to enter into work site to all persons who require access. Procedures to include the provision of a site safety orientation session.

.3 Delineate and isolate construction areas from other areas of site by use of appropriate means. Erect barricades, fences, hoarding and temporary lighting as required.

.4 Erect signage at entry points and at other strategic locations around site, clearly identifying construction area(s) as being "off limits" to unauthorized persons. Signage must be professionally made in both official languages or by use of well-understood graphic symbols.

.5 Secure site at night time or provide security guard(s) as deemed necessary to protect site against entry.

.6 Ensure persons granted access are fitted and wear appropriate personnel protective equipment (PPE). Be responsible for the provision of such PPE to persons who require access to conduct work or perform inspections.

1.18 PROTECTION

.1 Provide temporary facilities for protection and safe passage of public pedestrians and vehicular traffic around adjacent work site.

.2 Provide safety barricades, lights and signage on work site as required to provide a safe working environment for workers.

.3 Carry out work placing emphasis on health and safety of public, site personnel and protection of the environment.

.4 Should unforeseen or peculiar safety related hazard or condition become evident during performance of work, immediately take measures to rectify the situation and prevent damage or harm. Advise Departmental Representative verbally and in writing.

1.19 PERMITS

.1 Obtain permits, licenses and compliance certificates, at appropriate times and frequency as stipulated by authorities having jurisdiction.

.2 Where particular permit or compliance certificate cannot be obtained at the required stage of work, notify Departmental Representative in writing and obtain Departmental Representative's approval to proceed prior to carrying out that portion of the work.

1.20 MINIMUM SITE SAFETY RULES

.1 Notwithstanding the requirement to abide by federal and provincial health and safety regulations, the following safety rules shall be considered minimum requirements at the work site and obeyed by all persons granted access:
.1 Wear personal protective equipment (PPE) appropriate to function and task on site; the minimum requirements being hard hat and safety footwear. Wear eye protection where appropriate.
.2 Immediately report unsafe activities, conditions, near-miss accidents, injuries and damages.
.3 Maintain site in tidy condition.
.4 Obey warning signs and safety tags.

.2 Brief workers on site safety rules, and on the disciplinary measures to be taken for violation or non-compliance of such rules. Post such information on site.

1.21 TOOLS AND EQUIPMENT SAFETY

.1 Implement and follow a scheduled tool and equipment inspection/maintenance program at work site. Regularly check tools, equipment and machinery for safe operation and perform maintenance at pre-established time and frequency intervals as recommended by manufacturer. Include subcontractors equipment as part of the inspection process.

.2 Use standardized checklists to ensure established safety checks are stringently followed.

1.21 TOOLS AND EQUIPMENT SAFETY (Cont'd)

.3 Immediately tag and remove items found faulty or defective off site.

.4 Maintain written documentation on each inspection. Make available to Departmental Representative upon request.

1.22 HAZARDOUS PRODUCTS

.1 Comply with requirements of Workplace Hazardous Materials Information Systems (WHMIS).

.2 Keep MSDS data sheets on site. Provide copies of all data sheets to Departmental Representative upon receipt of materials on site.

.3 Put all MSDS data sheets on site, in a common area, visible to workers.

1.23 PROJECT / SITE CONDITIONS

.1 The following are known or potential project related safety hazards at site:
.1 Overhead Power Lines.
.2 Excavations and Trenches.
.3 Environment (Extreme weather).
.4 Working at heights.

.2 Obtain from Departmental Representative, copy of MSDS Data sheets of existing hazardous materials stored on site or being used by Facility and Tenant personnel in the course of their operations.

.3 Above lists shall not be construed as being complete and inclusive of safety and health hazards encountered as a result of Contractor's operations during the course of work. Include above items into the hazard assessment program specified herein.

1.24 ACCIDENT REPORTING

.1 Investigate and report incidents and accidents as outlined in Provincial Occupational Safety and Health Act and Regulations.

1.24 ACCIDENT REPORTING (Cont'd)

.2 Investigate and immediately report to Departmental Representative incidents and accidents which results, or has the potential of resulting in:
.1 Injuries requiring medical aid.
.2 Property damage in excess of $5,000.00.
.3 Required notification to Workers Compensation Board or other regulatory agencies as stipulated by applicable regulations.

.3 Medical aid in above clause shall have the same meaning as the term "medical aid injury" as defined in the Canadian Dictionary of Safety Terms - 1987 issue, from the Canadian Society of Safety Engineers (C.S.S.E.) as follows:
.1 Medical Aid Injury: any minor injury for which medical treatment was provided and the cost of which is covered by Workers' Compensation Board of the province in which the injury was incurred.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not used.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

.1 This Section describes requirements for the protection of the environment that apply to the Work. These requirements apply to all Sections of this Specification, without limiting the conditions and approvals imposed by statute.

.2 Control work to provide effective environmental. Departmental Representative will monitor environmental protection measures and will identify whenever such protection is found to be ineffective. Change protective measures or work procedures as directed by Departmental Representative to ensure environmental.

1.2 SUBMITTALS

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

.2 Prior to commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Departmental Representative.
.1 Environmental Protection Plan to present comprehensive overview of known or potential environmental issues to be addressed during construction.
.2 Environmental Protection Plan to be prepared in accordance with requirements of Federal, Provincial and Municipal laws and regulations.

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

.4 Environmental Protection Plan to include:
.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.

1.2 SUBMITTALS (Cont'd)

.4 (Cont'd)

.4 Description of environment protection personnel training program.

.5 Erosion, sediment and dust control plan which identifies type and location of erosion, sediment and dust controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion, sediment and dust control plan, Federal, Provincial, and Municipal laws and regulations.

.6 Drawings showing locations of proposed temporary excavations or embankments for haul roads, 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 Work area plan showing proposed activity in each portion of area identifying No-Go zones as identified by Parks Canada.

.1 Work area plan to include measures for marking limits of use areas including methods for protection of features (i.e. ground protection system in No-Go zones) to be preserved within authorized work areas.

.8 Spill Control Plan: including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.

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

.10 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, do not become air borne and are contained on project site.

.11 Contaminant prevention plan that: identifies potentially hazardous substances to be used on job site; identifies intended actions to prevent introduction of such materials into air, water, or ground; and details provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.

1.2 SUBMITTALS (Cont'd)

.4 (Cont'd)

.12 Waste water management plan that identifies methods and procedures for management and discharge of waste waters which are directly derived from construction activities, such as dewatering of lock, concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water and water used in flushing of lines.

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

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

.5 Product Data: Submit manufacturer's instructions, printed product literature, data sheets and WHMIS MSDS sheets.

1.3 EXPLOSIVES

.1 Use of explosives is prohibited.

1.4 FIRES

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

1.5 DEFINITIONS

.1 Dripline: location on the ground surface directly beneath a theoretical line described by the tips of the outermost branches of the trees.

.2 Barrier: fence consisting of approved material, supported by steel posts and being a minimum of 1.8m high, without breaks or unsupported sections.

1.6 EROSION, SEDIMENT AND DUST PROTECTION

.1 Prior to starting work that will create dust or debris, such as improvements to access, concrete sawing, removal, excavation or backfilling, install effective mitigation techniques for erosion, sediment, dust and debris control in accordance with Federal, Provincial and Municipal laws and regulations. Maintain these protective measures at all times, including during shut down periods.

.2 Maintain effective surface drainage and direct runoff away from work areas and into adequately vegetated areas.

.3 Excavation to cease during periods of heavy rainfall, unless runoff is contained from entering waterway.

.4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.

1.7 PLANT AND TREE PROTECTION

.1 Care shall be taken to protect existing landscape and plant material including trees, plants, garden vegetation on site and adjacent properties.

.2 Limit clearing, grubbing, and tree-branch removal to areas of work or access indicated on approved shop drawings.

.3 Provide barriers around trees and gardens which may be affected by work, including staging areas.
.1 Locate barrier 1 metre beyond Drip line.
.2 Barrier to consist of protective wood framework covered with plastic construction fence material, extending from grade level to a height of 2 metres.
.3 Maintain barriers in good repair throughout duration of Work.
.4 Remove barriers upon completion of Work.

.4 Damage to trees due to Contractor's operations;

1.7 PLANT AND TREE PROTECTION (Cont'd)

.4 (Cont'd)

.1 Broken branches 25 mm or greater in diameter: cut back cleanly at break, or to within 10 mm of their base, if substantial portion of branch is damaged Departmental Representative will direct.

.2 Exposed roots 25 mm or larger: cut back cleanly to soil surface within five calendar days of exposure.

.3 Damaged bark: neatly trim back to uninjured bark, without causing further injury, within five calendar days of damage.

.5 Reduce soil displacement and compaction by using heavy machinery in designated areas with proper ground protection system or on existing vehicle paths.

.6 Replace damaged lawn and gardens to pre-construction state with topsoil and sod and/or sod.

.7 Avoid using heavy machinery on saturated ground.

.8 Use equipment of low bearing weight and low pressure tires wherever possible.

.9 Provide plan protection measures of the gardens as part of the commemorative integrity of Laurier House for review by Nature Conservancy Canada and Departmental approval.

1.8 WILDLIFE MITIGATION

In the event that a species at risk is found on site or encountered during construction activities, all work will cease and a Parks Canada representative will be contacted immediately to assist with mitigation measures.

.1 Prepare a list of species at risk most likely to be encountered on site for review by Departmental Representative prior to work.

1.9 OPERATION AND MAINTENANCE OF EQUIPMENT

.1 Equipment and heavy machinery to meet or exceed applicable emission requirements.

.2 Leave machinery running only while in actual use, except where extreme temperatures prohibit shutting machinery down.

.3 Vehicle and equipment maintenance and refueling to be conducted over impermeable/absorptive material situated at a designated area that is located at least 30 m away from nearest waterway.

1.10 REMOVED MATERIALS

.1 Unless otherwise specified, materials designated for removal become Contractor's property. Remove these from site.

1.11 HAZARDOUS MATERIALS

.1 Place materials defined as hazardous or toxic waste in designated containers.

.2 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 Human Resources Development Canada, Labour Program.

.3 Store Hazardous Materials in secure areas on impermeable pads, provide berms if necessary.

1.12 CLEAN-UP

.1 Clean up work area continuously as work progresses.

.2 At end of each work period, and more often if ordered by Departmental Representative, remove debris from site, neatly stack material for use, and clean up generally.

.3 Permit no amount of debris, trash or garbage to accumulate on-site.

.4 Do not bury rubbish on site.

1.12 CLEAN-UP (Cont'd)

.5 Separate and recycle materials that can be recycled.

.6 Dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner by taking them to special designated waste facility. Do not dump these into storm or sanitary sewers.

.7 Ensure emptied containers are sealed and stored safely for disposal away from children.

.8 Spills:
.1 Have environmental emergency response plan in place, spill kit and other materials readily available on-site to respond quickly if spills occur.
.2 Report spills immediately to Departmental Representative and Ontario Ministry of Environment Spills Action Centre (Telephone No. 1-800-268-6060).
.3 Secure source of spill to stop flow of spill and isolate area of spill.
.4 Using appropriate safety precautions, collect liquid or solidify liquid with an inert, noncombustible material, or absorbent pads.
.5 Clean-up, remove and dispose of contaminated materials in accordance with MSDS or as directed by Ontario Ministry of Environment.
.6 Be responsible for costs of cleaning up spills to satisfaction of Departmental Representative.

1.13 CLEANING OF CONCRETE EQUIPMENT

.1 Departmental Representative will designate cleaning area for equipment and tools to limit water use and control runoff.

.2 Cleaning area to be no closer than 30 m from waterway to prevent contamination.

.3 Where no safe cleaning area is available, Contractor to provide settling pond for area where equipment to be cleaned.

1.13 CLEANING OF CONCRETE EQUIPMENT (Cont'd)

.4 Alkali water, such as concrete wash water, to be collected and disposed off-site in accordance with federal, provincial, and local authority requirements.

.5 Use only trigger operated spray nozzles for water hoses.

1.14 DISPOSAL OF WASTE MATERIALS

.1 Waste subject to Ontario Environmental Protection Act to be transported with valid "Certificate of Approval for a Waste management System" to site approved by Ontario Ministry of the Environment to accept that waste.

.2 Obtain and submit Waste Generator Numbers, perm its, manifests, and other paperwork necessary to comply.

1.15 NOISE CONTROL

.1 Refer to Section 01 11 00 GENERAL INSTRUCTIONS, 1.17 - NOISE.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not used.

END OF SECTION

PART 1 - GENERAL

1.1 REFUELING

.1 Refueling of equipment to be performed in locations as directed by Departmental Representative.

.2 Do not refuel equipment within 30 metres of any storm water catch basin unless protection against spills is in place and location is approved by Departmental Representative.

.3 Use petroleum containers approved for products with no spill fill spouts for dispensing fuels. The sure pour nozzle to have self closing valve, prevent any flow of fuel until the nozzle is inserted into the receiving container. On removal from the receiving container the slide valve closes to eliminate any fuel spill. Nozzle to be equipped with its own automatic vent eliminating the need for the user to open or close air inlets on the pouring container.

.4 Nozzle to support the weight of the pouring container. Nozzles to automatically stop the flow when the receiving container becomes full. The nozzle to be such that it reduces evaporative losses of volatile organic compounds during the fuel transfer.

.5 All spills of hydrocarbon based products such as gasoline, kerosene, naphtha, lubricating oils, engine oils, greases and de-icing fluids or antifreeze no matter how large or small to be reported to Departmental Representative and the Park Canada's Environmental Protection Officer (EPO).

.6 Oil changes or equipment repairs in the field or on Parks Canada land are not permitted.

.7 Refueling to be performed on level surfaces, PCC Portland cement concrete or HMAC surfaces when approved by the Departmental Representative unless otherwise directed.

1.1 REFUELING (Cont'd)

.8 Contractor to have drip pans sized for amounts of product to be recovered and customized to fit under pieces of equipment to perform routine maintenance to equipment while maintaining equipment on property. Drip Pans to be used whenever leaving equipment on site or parking overnight when not in use.

.9 Parking of equipment on site to be on level ground with approved ground protection as approved by Departmental Representative. Equipment with leaks or poor mechanical repair to be removed from site when so ordered by Departmental Representative.

.10 No refueling to be conducted on Laurier Building Property.

1.2 SPILL CONTROL KIT

.1 Contractor to have at the work site a spill control kit consisting of the following minimum types of equipment:
.1 a spaded shovel;
.2 a stable broom;
.3 a broad nosed shovel;
.4 a container(s) suitable, compatible to and of sufficient size to contain petroleum products being used with equipment;
.5 absorbents;
.6 rags;
.7 metal container for soiled rags;
.8 Booms when working next to a watercourse that will traverse the width of the watercourse by two times; and
.9 Spill control kit to be inspected and approved by both the Ontario Department of Environment and the Departmental Representative prior to Work commencing. Spill control kits to be available to Contractor employees at all areas where Work of the Contract is being performed and at all times during the course of the Contract.
.10 Contractor employees to be trained in the use of the spill control kit and the equipment they contain.

1.3 SPILLS

.1 Disposal of spilled materials to be off Parks Canada property and at approved locations for materials to be disposed of.

.2 When parking of equipment on site, the equipment is to be secured from entry, inspected for leaks and the ground protected from leaks.

.3 Contractor to protect all wells, catch basins, drywells, drains and watercourses from contamination in event of a spill.

.4 All equipment to be used for the Work of the Contract to be inspected by the Departmental Representative for leaks. Equipment not in good repair to be removed/repaired when directed by Departmental Representative.

.5 Spills in excess of 74 litres to be reported immediately to Departmental Representative, the Park's Environmental Protection Officer (EPO) and the Ontario Department of Environment.

.6 Contractor to immediately remove as much or all of the contaminated soils as possible, from any spills created from Work of the Contractor.

.7 Contaminated soils/materials to be placed in containers compatible to the contaminants.

.8 Any remaining clean-up to be performed at no extra cost to Parks Canada. Clean-up to be to the Departmental Representative's satisfaction.

1.4 REFERENCE DOCUMENTS

.1 See Appendix B for Designated Substances Report, Repair of Interior and Extrior Finishes, Laurier House, Corner of Laurier and Chapel Streets, Ottawa, ON Summary Report.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not used.

END OF SECTION

PART 1 - GENERAL

1.1 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 Provide 48 hour notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions.

.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.

1.2 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Departmental Representative.

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

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

1.2 INDEPENDENT INSPECTION AGENCIES (Cont'd)

.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 re-inspection.

1.3 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.

1.4 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.

1.5 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.

1.5 REJECTED WORK (Cont'd)

.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 Price difference in value between Work performed and that called for by Contract Documents, amount of which shall be determined by Departmental Representative.

1.6 REPORTS

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

.2 Provide copies to Subcontractor of work being inspected or tested.

1.7 MILL TESTS

.1 Submit mill test certificates as required of specification Sections.

1.8 TESTS AND MIX DESIGN

.1 Furnish test results and mix designs 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.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 INSTALLATION AND REMOVAL

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

.2 Remove from site all such work after use or as directed by Departmental Representative.

1.2 DEWATERING

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

.2 Ensure discharge is not contaminated with sediment, oil, etc.

1.3 TEMPORARY HEATING AND VENTILATION

.1 Pay for costs of temporary heat, and pumping used during construction, including costs of supply, installation, fuel, operation, maintenance, and removal of equipment, if applicable.

.2 Maintain strict supervision of operation of temporary heating and pumping equipment:
.1 Conform with applicable codes and standards.
.2 Enforce safe practices.
.3 Prevent abuse of services.
.4 Prevent damage to finishes.

.3 Provide temporary heating and hoarding 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 environmental.

.4 Hoard, heat and provide protection for curing concrete in accordance with Section 03 30 00 - Cast In Place Concrete.

1.3 TEMPORARY HEATING AND VENTILATION (Cont'd)

.5 Allow Departmental Representative to Inspect methods for fire safety.

1.4 TEMPORARY POWER AND LIGHT

.1 Departmental Representative will not provide or pay for temporary power during construction for temporary lighting and operating of power tools.

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

.3 Temporary power for electric cranes and other equipment requiring in excess of above is responsibility of Contractor.

.4 Provide and maintain temporary lighting throughout project.

.5 Coordinate with all Parks Canada Staff.

.6 Supply and install temporary facilities for power to approval of local power supply authorities.

.7 Provide and pay for temporary power and lights for use of Departmental Representative site office.

1.5 TEMPORARY COMMUNICATION FACILITIES

.1 Provide and pay for temporary telephone, fax and data hook up, line(s) and equipment as necessary for own use.

1.6 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.

1.7 SANITARY FACILITIES

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

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

1.8 STORAGE SHEDS

.1 Provide adequate weathertight sheds with raised floors, for storage of materials, tools and equipment which are subject to damage by weather.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian General Standards Board (CGSB)
- .1 CGSB 1-GP-189M-2000, Primer, Alkyd, Wood, Exterior.
- .2 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.

.2 Canadian Standards Association (CSA International)
- .1 CAN3-A23.1-/A23.2-09 (R2014) Concrete Materials and Methods for Concrete Construction/ Method of Test for Concrete.
- .2 CSA-0121-CSA O121-08 (R2013), Douglas Fir Plywood.
- .3 CAN/CSA-Z321-96 (R2006), Signs and Symbols for the Occupational Environment.

1.2 INSTALLATION AND REMOVAL

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

.2 Remove from site all such work after use.

.3 Refer to site location plan indicting approved locations of area to be used by Contractor for trailer(s) and temporary washroom facilities. Prepare site plan for review indicating exact location and dimensions of area to be used, avenues of ingress/egress and details of fence installation.

.4 Indicate use of supplemental or other staging area.

1.3 SCAFFOLDING

.1 Not Applicable.

1.4 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.

1.5 SITE STORAGE/LOADING

.1 Contractor's use of site storage and loading shall be limited to an area within limits of traffic diversion. Any conditional areas required shall be approved by Departmental Representative prior to use.

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

1.6 CONSTRUCTION PARKING

.1 Designated parking will be limited to two (2) spaces as directed by Parks Canada for Contractor vehicles and equipment required to carry out work only.

.2 Provide and maintain adequate access to project site.

.3 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.

.4 Limit parking on public roadways as to avoid congestion during operational hours.

1.7 SECURITY

.1 Contractor shall provide and pay for responsiblesecurity personnel to guard site and contents of site after working hours and during holidays, if applicable.

1.8 OFFICES

.1 Provide office space for own use as required. Locate office on site to satisfaction of Departmental Representative.

.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. Location of these offices to be to the satisfaction of the Departmental Representative.

1.9 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.

1.10 SANITARY FACILITIES

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

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

1.11 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 CAN3-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.

1.12 CLEAN-UP

.1 Clean continuously as work progresses.

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

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

.4 Store materials resulting from demolition activities that are salvageable.

.5 Stack stored new or salvaged material not in construction facilities.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 01 51 00 - Temporary Utilities.

.2 Section 01 52 00 - Construction Facilities.

1.2 REFERENCES

.1 Public Works Government Services Canada (PWGSC) Standard Acquisition clauses and conditions (SACC) - ID: R0202D, Title: General Conditions 'c', in effect as of May 14, 2004.

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

.3 Canadian Standards Association (CSA International)
.1 CSA-O121-MO121-08 (R2013), Douglas Fir Plywood.

1.3 INSTALLATION AND REMOVAL

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

.2 Remove from site all such work after use.

1.4 GUARD RAILS AND BARRICADES

.1 Provide secure, rigid guard rails and barricades around deep excavations.

.2 Provide as required by governing authorities.

1.5 ACCESS TO SITE

.1 Provide and maintain access roads, as may be required for access to Work.

1.6 PUBLIC TRAFFIC FLOW

.1 Provide and maintain competent Traffic Control Persons, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect the public.

1.7 FIRE ROUTES

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

1.8 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.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

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

.2 Conform to these reference 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 Cost for such testing will be borne 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 Tenders, except where specific date or issue is specifically noted.

1.2 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.

1.2 QUALITY (Cont'd)

.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 project site.

.5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions.

1.3 AVAILABILITY

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

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

.3 If only 1 product is approved and listed in a specification section but is no longer available, a proposed alternate must meet all the cirteria of the specified product and be approved by Departmental Representative.

1.4 STORAGE, HANDLING AND PROTECTION

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

1.4 STORAGE, HANDLING AND PROTECTION (Cont'd)

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

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

1.5 TRANSPORTATION

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

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

1.6 MANUFACTURER'S INSTRUCTIONS

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

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

1.6 MANUFACTURER'S INSTRUCTIONS (Cont'd)

.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 Price or Contract Time.

1.7 QUALITY OF WORK

.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify 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.

1.8 CO-ORDINATION

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

1.9 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.

1.10 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 pedestrian and vehicular traffic.

1.10 EXISTING UTILITIES (Cont'd)

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

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Identification of existing survey control points and property limits as indicated.

1.2 QUALIFICATION OF SURVEYOR

.1 Qualified registered land surveyor, licensed to practice in Province of Ontario, acceptable to Departmental Representative.

.2 Refer to Section 01 11 00 - General Instructions, Part 1.8 - SETTING OUT OF WORK, Item 1.8.6.

1.3 SURVEY REFERENCE POINTS

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

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

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

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

1.4 SURVEY REQUIREMENTS

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

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

.3 Stake for grading, fill and topsoil placement.

.4 Stake slopes.

1.4 SURVEY REQUIREMENTS (Cont'd)

.5 Establish pipe invert elevations and location of any exposed pipe not being removed under this contract.

.6 Record elevation and location of all existing and installed end caps of abandoned underground services.

1.5 EXISTING SERVICES

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

1.6 RECORDS

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

.2 On completion of site works, prepare a certified survey showing dimensions, locations, angles and elevations of Work.

.3 Record locations of maintained, re-routed and abandoned service lines.

1.7 SUBMITTALS

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

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

.3 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform with Contract Documents.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Departmental Representative 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.

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

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

.8 Dispose of waste materials, and debris off site at approved facilities.

1.2 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.

1.2 FINAL CLEANING (Cont'd)

.4 Remove waste products and debris other than that caused by Departmental Representative 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 Sweep and wash clean paved areas.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 DEFINITIONS

.1 Materials Source Separation Program (MSSP): Consists of series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.

.2 Recyclable: Ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse by others.

.3 Recycle: Process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.

.4 Recycling: Process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

.5 Reuse: Repeated use of product in same form but not necessarily for same purpose. Reuse includes:
.1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
.2 Returning reusable items including pallets or unused products to vendors.

.6 Salvage: Removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.

.7 Separate Condition: Refers to waste sorted into individual types.

.8 Source Separation: Acts of keeping different types of waste materials separate beginning from first time they became waste.

1.2 DOCUMENTS

.1 Maintain at job site, one copy of following documents:
.1 Material Source Separation Plan.

1.3 SUBMITTALS

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

.2 Prepare and submit following prior to project start-up:
.1 Submit 2 copies of Materials Source Separation Program (MSSP) description.

1.4 WASTE REDUCTION WORKPLAN (WRW)

.1 Prepare Waste Reduction Work plan.

.2 Structure WRW to prioritize actions and follow as first priority Reuse, then followed by Recycle.

.3 Describe management of waste.

.4 Post workplan or summary where workers at site are able to review its content.

1.5 MATERIALS SOURCE SEPARATION PROGRAM (MSSP)

.1 Prepare MSSP and have ready for use prior to project start-up. The DWA with related weight bills and/or receipt must be submitted on a monthly basis with the Contractor's monthly Progress claim.

.2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by Departmental Representative.

.3 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.

.4 Provide containers to deposit reusable and recyclable materials.

.5 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.

1.5 MATERIALS SOURCE SEPARATION PROGRAM (MSSP) (Cont'd)

.6 Locate separated materials in areas which minimize material damage.

.7 Collect, handle, store on-site, and transport off-site, salvaged materials in separate condition.
.1 Transport to approved and authorized recycling facility.

1.6 STORAGE, HANDLING AND PROTECTION

.1 Store, materials to be reused, recycled and salvaged in locations as specified in MSSP.

.2 Unless specified otherwise, materials for removal become Contractor's property.

.3 Protect, stockpile, store and catalogue salvaged items.

.4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.

.5 Protect structural components not removed for demolition from movement or damage.

.6 Support affected structures. If safety of road is endangered, cease operations and immediately notify Departmental Representative.

.7 Protect surface drainage and electrical from damage and blockage.

.8 Separate and store materials produced during dismantling of structures in designated areas.

.9 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.
.1 On-site source separation is recommended.
.2 Remove co-mingled materials to off-site processing facility for separation.
.3 Provide waybills for separated materials.

1.7 DISPOSAL OF WASTES

.1 Do not bury rubbish or waste materials.

.2 Do not dispose of waste, volatile materials, mineral spirits, or oil into waterways, storm, or sanitary sewers.

.3 Keep records of construction waste including:
- .1 Number and size of bins.
- .2 Waste type of each bin.
- .3 Total weight generated.
- .4 Weight reused or recycled.
- .5 Reused or recycled waste destination.

.4 Remove materials from deconstruction as deconstruction/disassembly Work progresses.

.5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.

1.8 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to normal use of premises.

1.9 SCHEDULING

.1 Coordinate Work with other activities at site to ensure timely and orderly progress of Work.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 APPLICATION

.1 Do Work in compliance with WRW.

.2 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

3.2 CLEANING

.1 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.

.2 Clean-up work area as work progresses.

.3 Source separate materials to be reused/recycled into specified sort areas.

END OF SECTION

PART 1 - GENERAL

1.1 INSPECTION AND DECLARATION

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

.2 Departmental Representative's Inspection: Departmental Representative and Contractor will perform inspection of Work to identify obvious defects or deficiencies. 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 Systems have been tested and are fully operational.
.4 Operation of systems have been demonstrated to Departmental Representative.
.5 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.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 SUBMISSION

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

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

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

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

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

.6 Pay costs of transportation.

1.2 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.

1.2 FORMAT (Cont'd)

.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 dxf or dwg and pdf format on USB Memory Stick or CD.

1.3 CONTENTS - EACH VOLUME

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

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

.3 Product Data: mark each sheet to 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 - Quality Control.

1.4 AS-BUILTS AND SAMPLES

.1 Maintain at the site for Departmental Representative one record copy of:
.1 Contract Drawings.
.2 Specifications.
.3 Addenda.
.4 Change Orders and other modifications to the Contract.
.5 Reviewed shop drawings, product data, and samples.

1.4 AS-BUILTS AND SAMPLES (Cont'd)

.1 (Cont'd)
.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.

1.5 RECORDING ACTUAL SITE CONDITIONS

.1 Record information on set of opaque drawings, provided by Departmental Representative.

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

.3 Contract Drawings and shop drawings: legibly mark each item to record actual construction, including:
.1 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
.2 Field changes of dimension and detail.
.3 Changes made by change orders.
.4 Details not on original Contract Drawings.
.5 References to related shop drawings and modifications.

.4 Specifications: legibly mark each item to record actual construction, including:

1.5 RECORDING ACTUAL SITE CONDITIONS (Cont'd)

.4 (Cont'd)
.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
.2 Changes made by Addenda and change orders.

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

1.6 FINAL SURVEY

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

1.7 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 Departmental Representative's permission, leave date of beginning of time of warranty until the Date of Substantial Performance is determined.

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

.6 Co-execute submittals when required.

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

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 74 21 - Construction/Demolition Management and Disposal.

.2 Section 03 20 00 - Concrete Reinforcing.

.3 Section 03 30 00 - Cast-in-Place Concrete.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CSA-O86-05, Engineering Design in Wood.
- .3 CSA O121-08(R2013), Douglas Fir Plywood.
- .4 CSA O151-09, Canadian Softwood Plywood.
- .5 CSA O153-13, Poplar Plywood.
- .6 CAN/CSA-O325.0-07(R2012), Construction Sheathing.
- .7 CSA S269.1-1975(R2003), Falsework for Construction Purposes.
- .8 CAN/CSA-S269.3-M92(R2013), Concrete Formwork.

.2 Council of Forest Industries of British Columbia (COFI)
- .1 COFI Exterior Plywood for Concrete Formwork.

.3 Underwriters' Laboratories of Canada (ULC).
- .1 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.3 ACTION AND INFORMATIONAL SUBMITTAL

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

.2 Submit shop drawings for formwork and falsework stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada if requested by Departmental Representative.

1.3 ACTION AND INFORMATIONAL SUBMITTAL (Cont'd)

.3 Submit WHMIS MSDS - Material Safety Data Sheets.

.4 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings Comply with CAN/CSA-S269.3 for formwork drawings.

.5 Indicate formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms.

.6 Indicate sequence of erection and removal of formwork/falsework as directed by Departmental Representative.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:
.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
.2 Place materials defined as hazardous or toxic in designated containers.
.3 Divert wood materials from landfill to a recycling facility as approved by Departmental Representative.
.4 Divert plastic materials from landfill to a recycling facility as approved by Departmental Representative.
.5 Divert unused form release material from landfill to an official hazardous material collections site as approved by Departmental Representative.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Formwork materials:
.1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121, CAN/CSA-O86 and CSA-A23.1/A23.2.

2.1 MATERIALS (Cont'd)

.1 (Cont'd)
.2 For concrete with special architectural features, use formwork materials to CSA-A23.1/A23.2.
.3 Rigid insulation board: to CAN/ULC-S701.

.2 Form ties:
.1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.

.3 Form release agent: non-toxic biodegradable, low VOC.

.4 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 15 to 24 mm^2 /s at 40 degrees C, open cup.

.5 Falsework materials: to CSA-S269.1.

PART 3 - EXECUTION

3.1 FABRICATION AND ERECTION

.1 Verify lines, levels and column centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.

.2 Obtain Departmental Representative's approval for use of earth forms and framing openings not indicated on drawings.

.3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.

.4 Fabricate and erect falsework in accordance with CSA S269.1 and COFI exterior plywood for concrete formwork.

.5 Refer to architectural drawings for concrete members requiring architectural exposed finishes.

.6 Do not place shores and mud sills on frozen ground.

3.1 FABRICATION AND ERECTION (Cont'd)

.7 Provide site drainage to prevent washout of soil supporting mud sills and shores.

.8 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.

.9 Align form joints and make watertight.
.1 Keep form joints to minimum.

.10 Locate horizontal form joints for walls and pilasters below top of finished grade.

.11 Use 25 mm chamfer strips on external corners and 25 mm fillets at interior corners, joints, unless specified otherwise.

.12 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

.13 Build in achors, sleeves, and other inserts required to accommodate Work specified in other sections.
.1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

.14 Clean formwork in accordance with CSA A23.1/A23.2 before placing concrete.

.15 During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out completed forms, unless formwork and concrete construction proceed within a heated enclosure.

3.2 REMOVAL AND RESHORING

.1 Leave formwork in place for following minimum periods of time after placing concrete.
.1 24 hours for foundations.

3.2 REMOVAL AND RESHORING (Cont'd)

.2 Remove formwork when concrete has reached 70% of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.

.3 Provide necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.

.4 Space reshoring in each principal direction at not more than 3000 mm apart.

.5 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 21 - Construction/Demolition Management and Disposal.

.3 Section 03 30 00 - Cast-in-Place Concrete.

.4 Section 03 10 00 - Concrete Forming and Accessories.

1.2 REFERENCES

.1 American Concrete Institute (ACI)
.1 SP-66-04, ACI Detailing Manual 2004.

.2 ASTM International
.1 ASTM A143/A143M-07, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
.2 ASTM A1064/A1064M-13, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

.3 CSA International
.1 CSA-A23.109/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
.2 CAN/CSA-A23.3-04(R2009), Design of Concrete Structures.
.3 CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement.
.4 CSA-G40.20/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel.
.5 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
.6 CSA W186-M1990(R2012), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.4 Reinforcing Steel Institute of Canada (RSIC)
.1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Prepare reinforcement drawings in accordance with RSIC Reinforcing Steel Manual of Standard Practice and ACI 315. General Contractor to sign drawings indicating coordination with other trades.

.3 Shop Drawings:

.1 Indicate placing on reinforcement and:

.1 Bar bending details.

.2 Lists.

.3 Quantities of reinforcement.

.4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.

.5 Indicate sizes, spacings and locations of chairs, spaces and hangers.

.2 Detail lap lengths and bar development lengths to CAN/CSA-A23.3, unless otherwise indicated.

.1 Provide type B tension lap splices, unless otherwise indicated.

1.4 QUALITY ASSURANCE

.1 Submit in accordance with Section 01 45 00 - Quality Control and as described in PART 2 - SOURCE QUALITY CONTROL.

.1 Mill Test Report: provide Departmental Representative with certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.

.2 Submit in writing to Departmental Representative proposed source of reinforcement material to be supplied.

1.5 DELIVERY, STORAGE AND HANDLING

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

1.5 DELIVERY, STORAGE AND HANDLING (Cont'd)

.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 Develop Construction Waste Management Plan and Waste Reduction Workplan related to work of this Section.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Substitute different size bars only if permitted in writing by Departmental Representative.

.2 Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.

.3 Reinforcing steel: weldable low alloy steel, grade 400W, deformed bars to CSA-G30.18.

.4 Cold-drawn annealed steel wire ties: to ASTM A1064/A1064M.

.5 Welded steel wire fabric: to ASTM A1064/A1064M.
.1 Provide flat sheets only.

.6 Welded deformed steel wire fabric: to ASTM A1064/A1064M.

.7 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2, non staining and of adequate strength for support of reinforcing during construction conditions.

.8 Mechanical splices: subject to approval of Departmental Representative.

2.1 MATERIALS (Cont'd)

.9 Plain round bars: to CSA-G40.20/G40.21.

2.2 FABRICATION

.1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2, SP-66 and Reinforcing Steel Manual of Standard Practice by Reinforcing Steel Institute of Canada.

.2 Obtain Departmental Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.

.3 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186.

.4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

2.3 SOURCE QUALITY CONTROL

.1 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to commencing reinforcing work.

.2 Upon request inform Departmental Representative of proposed source of material to be supplied.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Examine work related to this section and report discrepancies to Departmental Representative.

.2 Commencement of work shall imply acceptance of conditions.

3.2 FIELD BENDING

.1 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.

3.2 FIELD BENDING (Cont'd)

.2 When field bending is authorized, bend without heat, applying a slow and steady pressure.

.3 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 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.

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

.4 Concrete bricks may be used in place of metal chairs for support of lower reinforcing mat in slabs on grade.

3.4 CLEANING

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

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

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 35 29.06 - Health and Safety Requirements.

.3 Section 01 74 21 - Construction/Demolition Management and Disposal.

.4 Section 03 10 00 - Concrete Forming.

.5 Section 03 20 00 - Concrete Reinforcing.

.6 Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.7 All mechanical sections.

.8 All electrical sections.

1.2 REFERENCES

.1 Abbreviations and Acronyms:

.1 Portland Cement: hydraulic cement, blended hydraulic cement (XXb - b denotes blended) and Portland-limestone cement.

.1 Type GU, GUb and GUL - General use cement.

.2 Type MS and MSb - Moderate sulphate-resistent cement.

.3 Type MH, MHb and MHL - Moderate heat of hydration cement.

.4 Type HE, HEb and HEL - High early-strength cement.

.5 Type LH, LHb and LHL - Low heat of hydration cement.

.6 Type HS and HSb - High sulphate-resistent cement.

.2 Fly ash:

.1 Type F - with CaO content less than 15%.

.2 Type CI - with CaO content ranging from 15 to 20%.

.3 Type CH - with CaO greater than 20%.

.4 GGBFS - Ground, granulated blast-furnace slag.

.2 Reference Standards:

1.2 REFERENCES (Cont'd)

.2 (Cont'd)

.1 American Concrete Institute (ACI)

.1 ACI 117-10, Standard Tolerances for Concrete Construction and Materials.

.2 American Society for Testing and Materials, International (ASTM)

.1 ASTM C109/C109M-13, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens).

.2 ASTM C260/C260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.

.3 ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.4 ASTM C494/C494M-13, Standard Specification for Chemical Admixtures for Concrete.

.5 ASTM C920/C920M-14a, Standard Specification for Elastomeric Joint Sealants.

.6 ASTM C939/C939M-10, Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).

.7 ASTM C1017/C1017M-13, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.

.8 ASTM D412-06a(2013), Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.

.9 ASTM D624-00 (2012), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.

.10 ASTM D1751-04 (2013) E1, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (nonextruding and Resilient Bituminous Types).

.11 ASTM G180-13, Standard Test Method for Corrosion Inhibiting Admixtures for Steel in Concrete by Polarization Resistance in Cementitious Slurries.

1.2 REFERENCES (Cont'd)

.2 (Cont'd)

.2 (Cont'd)

.12 ASTM G109-07 (2013), Standard Specification for Determining Effects of Chemical Admixtures on Corrosion of Embedded Steel Reinforcement in Concrete Exposed to Chloride Environments.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

.4 CSA International

.1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA A283-06(R2011), Qualification Code for Concrete Testing Laboratories.

.3 CSA A3000-13, Cementitious Materials Compendium

.5 Guide for Surface Finish of Formed Concrete, American Society of Concrete Construction.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Pre-installation Meeting: convene pre-installation meeting minimum fifteen (15) days prior to beginning concrete works to review mix designs, verify project requirements and discuss proposed methods and procedures to achieve required concrete properties. Send pre-installation meeting agenda to attendees ten (10) days prior to scheduled date of meeting.

.2 Ensure key personnel and representatives of all parties concerned with concrete work attend, including but not limited to:

.1 Contractor's site superintendent.

.2 Representative from laboratory responsible for concrete mix design.

.3 Representative from laboratory responsible for field quality control.

.4 Concrete subcontractor.

.5 Ready mix concrete producer.

.6 Admixture manufacturer supplier.

.7 Concrete pumping contractor.

.8 Project structural engineer.

.9 Departmental Representative.

1.3 ADMINISTRATIVE REQUIREMENTS (Cont'd)

.3 Verify project requirements.

.4 Record minutes of meeting and distribute within five (5) days of meeting.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Provide testing inspection results and reports for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.

.3 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3.3 - EXECUTION.

.4 Concrete hauling time: provide for review by Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.

.5 Provide two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements and Section 01 35 43 - Environmental Procedures.

1.5 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

.2 Provide Departmental Representative, minimum 4 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.
.1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.

1.5 QUALITY ASSURANCE (Cont'd)

.3 Minimum 4 weeks prior to starting concrete work, submit proposed quality control procedures for review by Departmental Representative on following items:
.1 Falsework erection.
.2 Hot weather concrete.
.3 Cold weather concrete.
.4 Curing.
.5 Finishes.
.6 Formwork removal.
.7 Joints.

.4 Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.

.5 Sustainability Standards Certification:
.1 Construction Waste Management: provide copy of plan.
.2 Recycled Content:
.1 Provide listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer and pre-consumer content, and total cost of materials for projects.
.2 When Supplementary Cementing Materials (SCMs) are used, provide evidence to certify reduction in cement from Base Mix to Actual SCMs Mix, as percentage.

1.6 DELIVERY, STORAGE AND HANDLING

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

1.6 DELIVERY, STORAGE AND HANDLING (Cont'd)

.1 (Cont'd)
.1 (Cont'd)
.2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

.2 Packaging Waste Management: remove for reuse and return by manufacture of pallets, crates, padding and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

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

2.2 PERFORMANCE CRITERIA

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

2.3 MATERIALS

.1 Portland cement: to CSA A3001, Type GU.

.2 Blended hydraulic cement: Type GUb to CSA A3001.

.3 Supplementary cementing materials: Type "F" fly ash replacement by mass of total cementitious materials to CSA A3001. Content as per Table 2.1 MIXES.

.4 Water: to CSA-A23.1.

.5 Aggregates: to CSA-A23.1/A23.2.

.6 Admixtures:
.1 Air entraining admixture: to ASTM C260.

2.3 MATERIALS (Cont'd)

.6 (Cont'd)
.2 Chemical admixture: to ASTM C494 or ASTM C1017. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.
.3 Corrosion-inhibiting admixture: to ASTM G108 or ASTM G190.

.7 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland Cement, water-reducing and plasticizing agents to CAN/CSA A23.1/A23.2.
.1 Compressive strength: 50 MPa at 28 days.
.2 Net shrinkage at 28 days: maximum 2%.

.8 Curing compound: to CSA A23.1/A23.2 and ASTM C309, low VOC, water based.
.1 Curing compound to be compatible with applied finishes and hardener.

.9 Premoulded joint fillers:
.1 Bituminous impregnated fiber board: to ASTM D175.
.2 Sponge rubber: to ASTM D1752, Type I, firm grade.
.3 Closed cell polyethylene with removeable strip.

.10 Weep hole tubes: galvanized steel or plastic.

.11 Dovetail anchor slots: minimum 0.6 mm thick galvanized steel with insulation filled slots.

.12 Dampproof membrane:
.1 Polyethylene membrane:
.1 Plain: 15 mil thick polyethylene film.
.2 Membrane adhesive: as recommended by membrane manufacturer.
.2 Bitumen impregnated protection board.
.3 Cavity drainage board with geotextile filter fabric.

.13 Dampproofing:

2.3 MATERIALS (Cont'd)

.13 (Cont'd)
.1 Emulsified asphalt, mineral colloid type, unfilled: to CAN/CGSB-37.2.

.14 Polyethylene film: to CAN/CGSB-51.34.

2.4 MIXES

.1 Alternative 1 - performance Method for specifying concrete: to meet performance criteria to CSA A23.1/A23.2, specified in Table 2.1.
.1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.
.2 Provide quality management plan to ensure verification of concrete quality to specified performance.
.3 Concrete supplier's certification: both batch plant and materials meet CSA A23.1 requirements.

.2 Slump values given are before addition of plasticizer. Add plasticizer as approved by Departmental Representative to achieve workability. Contractor to pay for admixtures required to achieve workability. Do not increase water content above amount specified.

.3 Submit concrete mix designs to Departmental Representative for approval, one (1) month prior to commencing concrete work. No concrete shall be placed before mix designs are approved.

.4 Provide quality management plan to ensure verification of concrete quality to specified performance.

.5 Concrete supplier's certification: both batch plant and materials meet CSA A23.1 requirements.

Table 2.1

Mix Type	Exterior sidewalks, ramps, pads, Slab-On-Grade hardstands, aprons and concrete pavement
Minimum compressive strength at 28 days	35 MPa
Exposure Classification	C-1
Portland Cement Type	GU
Maximum W/C ratio	0.40
Slump at time of discharge	75 mm ±20 mm
Nominal size of coarse aggregate	20 mm
Air content	5-8%
Type F Flyash Replacement by mass of total cementitious material*	10% min for concrete containing corrosion inhibitor

* Read in conjunction with Part 2.4 – Mixes for additional requirements.

PART 3 - EXECUTION

3.1 PREPARATION

.1 Obtain Departmental Representative's approval before placing concrete.
.1 Provide 24 hours minimum notice prior to placing of concrete.

.2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.

.3 During concreting operations:
.1 Development of cold joints not allowed.
.2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.

.4 Pumping of concrete is permitted only after approval of equipment and mix.

.5 Ensure reinforcement and inserts are not disturbed during concrete placement. Secure anchor bolts with templates.

.6 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.

.7 Protect previous work from staining.

.8 Clean and remove stains prior to application for concrete finishes.

.9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

.10 Do not place load upon new concrete until authorized by Departmental Representative.

.11 Bond fresh concrete to hardened concrete to CSA A23.1 Clause 7.2.

.12 Do cast-in-place concrete work to CSA A23.1/A23.2.

3.1 PREPARATION (Cont'd)

.13 Drainage holes and weep holes:
.1 Form weep holes and drainage holes in accordance with Section 03 10 00 - Concrete Forming and Framework Accessories.

.14 Grout under machinery using procedures in accordance with manufacturer's recommendations which result in 100% contact over grouted area. Place grout to cover steel shims.

.15 Finishing and curing:
.1 Finish concrete to CSA A23.1/A23.2.
.2 Cure concrete to CSA A23.1/A23.2.
.3 Use curing compounds compatible with applied finish on concrete surfaces. Provide written declaration that compounds used are compatible. Moisture cure where finishes are incompatible with curing compound. Wet cure slab-on-grade.
.4 Protect concrete from adverse conditions such as premature drying and temperature extremes. Cure at temperature of at least 10°C for minimum three (3) days.
.5 Curing Type in accordance with specified exposure classification unless more stringent requirements noted otherwise.
.6 Concrete slab-on-grade: Curing Type 2, wet cure for minimum seven (7) days at 10°C or greater for time necessary to obtain 70% of specified concrete strength using:
.1 Non-staining absorptive mat or fabric kept continuously wet.
.2 Curing mats shall be thoroughly wet when applied and kept continuously wet in full contact with concrete surface for duration of required curing period. Mats shall cover entire concrete surface with lapped joints. Place mats on concrete immediately after disappearance of surface water sheen after final finishing pass.
.3 Lap joints minimum 75 mm and seal with waterproof tape or adhesive. Immediately repair holes or tears during curing period using cover material and waterproof tape.

3.1 PREPARATION (Cont'd)

.15 (Cont'd)

.6 (Cont'd)

.4 Remove curing cover and allow concrete to air dry for at least twelve (12) hours prior to applying liquid densifier/ sealer.

.7 Apply floor sealer as per manufacturer's recommendations to areas specified in finish schedule.

.8 Prior to application of non-breathable floor finishes/coatings test for moisture content in compliance with ASTM D 4263.

.9 Keep foot traffic off concrete for minimum 1 day.

.10 Keep vehicle traffic off concrete for minimum 7 days.

.16 Joint fillers:

.1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Departmental Representative.

.2 When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.

.3 Locate and form isolation, construction and expansion joints as indicated.

.4 Install joint filler.

.5 Use 12 mm thick joint filler to separate slab-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.

.6 Fill interior saw-cut control and construction joints in slab-on-grade with joint filler as specified in 2.3 - MATERIALS. Minimum concrete age prior to installation: greater of 120 days or Manufacturers' recommendation for best performance. Clean dust and debris from saw cuts and adjacent area. Place joint filler to full depth of joint and over-fill. Shave over-fill flush with slab surface once joint filler has cured sufficiently. Tape joint sides to prevent slab discolouration and to ease overfill removal.

.17 Dampproof membrane:

3.1 PREPARATION (Cont'd)

.17 (Cont'd)
.1 Install dampproof membrane under concrete slab-on-grade inside building.
.2 Lap dampproof membrane minimum 150 mm at joints and seal.
.3 Extend membrane up edges to top of slab at junctions with vertical construction elements, foundation walls and pits.
.4 Seal punctures in dampproof membrane before placing concrete. Use patching material at least 150 mm larger than puncture and seal.
.5 Seal membrane to pipe and conduit penetration.

3.2 SURFACE TOLERANCE

.1 Concrete tolerance to CSA A23.1/A23.2.

3.3 FIELD QUALITY CONTROL

.1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated and paid by Departmental Representative in accordance with CSA-A23.1/A23.2.

.2 For compressive strength testing of concrete a minimum of 3 cylinders and 2 field cured cylinders are required for:
.1 Each day's pour.
.2 Each type of grade of concrete.
.3 Each change of supplier.
.4 Each 50 cubic meter or fraction thereof for footings and foundation walls.
.5 Additional test specimen shall be taken whenever requested by the Departmental Representative to verify the concrete quality.
.6 Additional test specimen shall be taken during cold weather concreting.

.3 Cure cylinders on job site under same conditions as concrete which they represent.

.4 Non-destructive Methods for Testing Concrete shall be in accordance with CSA-A23.1/A23.2.

3.3 FIELD QUALITY CONTROL (Cont'd)

.5 Inspection and testing by testing laboratory will not augment or replace contractor quality control nor relieve contractor of contractor responsibility.

3.4 CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.

.2 Waste management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.1 Divert unused concrete materials from landfill to local facility after receipt of written approval from Departmental Representative.

.2 Provide appropriate area on joint site where concrete trucks can be safely washed.

.3 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved by Departmental Representative.

.4 Do not dispose of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

.5 Prevent admixtures and additive materials from entering drinking water supplies or streams.

.6 Using appropriate safety precautions, collect liquid or solidify liquid with inert, noncombustible material and remove for disposal.

.7 Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

3.5 DEFECTIVE WORK

.1 Repairs and classification of defective concrete to CSA A23.1/A23.2.

.2 Remove defective concrete and embedded debris and repair as directed by Departmental Representative.

3.5 DEFECTIVE WORK (Cont'd)

.3 Excessive honeycomb or embedded debris in concrete shall deem it defective. Remove and replace defective concrete.

.4 Remove to bare concrete curing compounds detrimental to application of specified finishes.

.5 Supply concrete at minimum strength requirement at 28 days. Tests indicating strengths lower than specified will necessitate further testing as required by Departmental Representative. Cost for additional testing to be at Contractor's expense. Should further tests confirm low values, Departmental Representative has right to require strengthening of affected area or removal and replacing of weak concrete at Contractor's expense.

.6 Repair shrinkage cracks in completed concrete work employing a suitable epoxy injection technique acceptable to Departmental Representative to completely seal cracks.

.7 All exposed metal form ties, nails and wires shall be removed, fins broken off and all loose concrete removed.

.8 Form tie pockets shall be thoroughly wetted and patched with patching concrete followed by proper curing.

.9 Except at unfinished areas: remove blemishes and joint marks by rubbing with carborundum block and water. Complete rubbing within twenty-four (24) hours of stripping concrete.

.10 Concrete areas to receive paint finish shall have all protrusions, ridges and other irregularities removed and all voids filled. Sample area mock-up to be provided for general acceptance by Departmental Representative.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTION

.1 Section 01 74 11 - Cleaning.

.2 Section 01 74 21 - Construction/Demolition Waste Management and Construction.

.3 Section 23 11 23 - Facility Natural Gas Piping

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-1.181.99, Ready-Mixed Organic Zinc-Rich Coating.

.2 Canadian Standards Association (CSA International)
.1 CAN/CSA B149.1-15, Natural Gas and propane Installation Code.

.3 Green Seal Environmental Standards (GSES)
.1 Standard GS-11-2008, 2nd Edition, Environmental Standard for Paints and Coatings.

.4 National Fire Code of Canada 2010.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.

PART 2 - PRODUCTS

2.1 MATERIAL

.1 Paint: zinc-rich to CAN/CGSB-1.181.
.1 In accordance with manufacturer's recommendations for surface conditions.
.2 Primer: maximum VOC limit 250 g/L to Standard GS-11
.3 Paints: maximum VOC limit 150 g/L to Standard GS-11

.2 Sealants:
.1 Sealants: maximum VOC limit to GSES GS-36.

.3 Adhesives: maximum VOC limit to GSES GS-36.

PART 3 - EXECUTION

3.1 APPLICATION

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

3.2 CONNECTIONS TO EQUIPMENT

.1 In accordance with manufacturer's instructions unless otherwise indicated.

.2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.

.3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

3.3 CLEARANCES

.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer, as well as applicable local codes and standards.

3.3 CLEARANCES (Cont'd)

.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer or as indicated (whichever is greater) without interrupting operation of other system, equipment, components.

3.4 DRAINS

.1 Install piping with grade in direction of flow except as indicated.

.2 Install drain valve at low points in piping systems, at equipment and at section isolating valves.

.3 Pipe each drain valve discharge separately to above floor drain. Discharge to be visible.

.4 Drain valves: NPS 3/4 ball valves unless indicated otherwise, with hose and male thread, cap and chain.

3.5 DIELECTRIC COUPLINGS

.1 General: Compatible with system, to suit pressure rating of system.

.2 Locations: Where dissimilar metals are joined.

.3 NPS 2 and under: isolating unions or bronze valves.

.4 Over NPS 2: Isolating flanges.

3.6 PIPEWORK INSTALLATION

.1 Screwed fittings jointed with Teflon tape.

.2 Protect openings against entry of foreign material.

.3 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.

.4 Assemble piping using fittings manufactured to ANSI standards.

.5 Saddle type branch fittings may not be used

3.6 PIPEWORK INSTALLATION (Cont'd)

.6 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.

.7 Install concealed pipework to minimize furring space, maximize headroom, conserve space.

.8 Slope piping, except where indicated, in direction of flow for positive drainage and venting.

.9 Install, except where indicated, to permit separate thermal insulation of each pipe.

.10 Group piping wherever possible and as indicated.

.11 Ream pipes, remove scale and other foreign material before assembly.

.12 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.

.13 Provide for thermal expansion as indicated.

.14 Valves:
.1 Install in accessible locations.
.2 Remove interior parts before soldering.
.3 Install with stems above horizontal position unless otherwise indicated.
.4 Valves accessible for maintenance without removing adjacent piping.
.5 Install globe valves in bypass around control valves.
.6 Use butterfly or ball valves at branch take-offs for isolating purposes except where otherwise specified.
.7 Install butterfly valves between weld neck flanges to ensure full compression of liner.
.8 Use chain operators on gate and globe valves NPS 2-1/2 and larger where installed more than 2400 mm above floor in Mechanical Rooms.

.15 Check Valves:
.1 Install swing check valves in horizontal lines on discharge of pumps and elsewhere as indicated.

3.7 SLEEVES

.1 General: Install where pipes pass through masonry, concrete structures, fire rated assemblies (except drywall assemblies), and elsewhere as indicated.

.2 Material: Schedule 40 black steel pipe.

.3 Construction: Foundation walls and where sleeves extend above finished floors to have annular fins continuously welded on at mid-point.

.4 Sizes: 6 mm minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation.

.5 Installation:
.1 Concrete, masonry walls, concrete floors on grade: Terminate flush with finished surface.
.2 Other floors: Terminate 25 mm above finished floor.
.3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint.

.6 Sealing:
.1 Foundation walls and below grade floors: Fire retardant, waterproof non-hardening mastic.
.2 Elsewhere: Provide space for firestopping. Maintain fire rating integrity.
.3 Sleeves installed for future use: Fill with lime plaster or other easily removable filler.
.4 Ensure no contact between copper pipe or tube and sleeve.

3.8 ESCUTCHEONS

.1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.

.2 Construction: One piece type with set screws. Chrome or nickel plated brass or type 302 stainless steel.

3.8 ESCUTCHEONS (Cont'd)

.3 Sizes: Outside diameter to cover opening or sleeve. Inside diameter to fit around pipe or outside of insulation if so provided.

3.9 PREPARATION FOR FIRESTOPPING

.1 Material and installation within annular space between pipes, ducts, insulation and adjacent fire separation.

.2 Uninsulated unheated pipes not subject to movement: No special preparation.

.3 Uninsulated heated pipes subject to movement: Wrap with non-combustible smooth material to permit pipe movement without damaging firestopping material or installation.

.4 Insulated pipes and ducts: Ensure integrity of insulation and vapour barriers.

3.10 FLUSHING OUT OF PIPING SYSTEMS

.1 In accordance with National Plumbing Code of Canada, CSA B149.1-15 and local authority having jurisdiction (AHJ) regulations and guidelines.

.2 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.

3.11 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

.1 Advise Departmental Representative 48 hours minimum prior to performance of pressure tests.

.2 Pipework: Test as specified in relevant sections of Division 23. Where specific pressure testing criteria does not exist, pressure test piping to the greater of 860 kPa or 1-1/2 times the maximum system operating pressure.

.3 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant sections of Division 23.

3.11 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK (Cont'd)

.4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.

.5 Conduct tests in presence of Departmental Representative.

.6 Pay costs for repairs or replacement, retesting, and making good. Departmental Representative to determine whether repair or replacement is appropriate.

.7 Insulate or conceal work only after approval and certification of tests by Departmental Representative.

3.12 EXISTING SYSTEMS

.1 Connect into existing piping systems at times approved by Departmental Representative.

.2 Request written approval 10 days minimum, prior to commencement of work.

.3 Be responsible for damage to existing systems by this work.

.4 Ensure daily clean-up of existing areas.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

1.2 REFERENCES

.1 American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME)
- .1 ANSI/ASME B31.1-2014, Power Piping.

.2 American Society for Testing and Materials International (ASTM)
- .1 ASTM A 125-96(2013)e1, Specification for Steel Springs, Helical, Heat-Treated.
- .2 ASTM A307-14, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .3 ASTM A 563-07a(2014), Specification for Carbon and Alloy Steel Nuts.

.3 Factory Mutual (FM)

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

.5 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
- .1 MSS SP 58-2009, Pipe Hangers and Supports - Materials, Design and Manufacture.
- .2 ANSI/MSS SP69-2009, Pipe Hangers and Supports - Selection and Application.
- .3 MSS SP 89-2009, Pipe Hangers and Supports - Fabrication and Installation Practices.

.6 Underwriter's Laboratories of Canada (ULC)

1.3 SYSTEM DESCRIPTION

.1 Design Requirements:
- .1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
- .2 Base maximum load ratings on allowable stresses prescribed by MSS SP 58. ASME B31.1 or

1.3 SYSTEM DESCRIPTION (Cont'd)

.1 (Cont'd)

.3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.

.4 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.

.5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP 58.

1.4 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit shop drawings, stamped and signed by a professional engineer registered or licensed in Ontario, Canada and product data for following items:

.1 Bases, hangers and supports.

.2 Connections to equipment and structure.

.3 Structural assemblies.

.3 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.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.

.4 Closeout Submittals:

.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeuout Submittals.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

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

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

1.5 DELIVERY, STORAGE, AND HANDLING (Cont'd)

.2 (Cont'd)
.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 GENERAL

.1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1 and MSS SP 58.

.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

2.2 PIPE HANGERS

.1 Finishes:
.1 Pipe hangers and supports: galvanized after manufacture.
.2 Use electro-plating galvanizing process or hot dipped galvanizing process.
.3 Ensure steel hangers in contact with copper piping are copper plated.

.2 Upper attachment structural: suspension from lower flange of I-Beam:
.1 Cold piping NPS 2 maximum: malleable iron C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip.
.2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, UL listed FM approved to MSS-SP 58 and MSS-SP 69.

.3 Upper attachment structural: suspension from upper flange of I-Beam:
.1 Cold piping NPS 2 maximum: ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, UL listed, FM approved to MSS SP 69.

2.2 PIPE HANGERS (Cont'd)

.3 (Cont'd)
.2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nut UL listed, FM approved.

.4 Upper attachment to concrete:
.1 Ceiling: carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye 6 mm minimum greater than rod diameter.
.2 Concrete inserts: wedge shaped body with knockout protector plate UL listed, FM approved to MSS SP 69.

.5 Shop and field-fabricated assemblies:
.1 Trapeze hangers.
.2 Steel brackets.

.6 Hanger rods: threaded rod material to MSS SP 58:
.1 Ensure that hanger rods are subject to tensile loading only.
.2 Provide linkages where lateral or axial movement of pipework is anticipated.
.3 Do not use 22 mm or 28 mm rod.

.7 Pipe attachments: material to MSS SP 58:
.1 Attachments for steel piping: carbon steel, black.
.2 Attachments for copper piping: copper plated black steel.
.3 Use insulation shields for hot pipework.
.4 Oversize pipe hangers and supports.

.8 Adjustable clevis: material to MSS SP 69 UL listed FM approved, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.
.1 Ensure "U" has hole in bottom for rivetting to insulation shields.

.9 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP 69.

.10 U-bolts: carbon steel to MSS SP 69 with 2 nuts at each end to ASTM A 563.
.1 Finishes for steel pipework: black, except galvanized in wash bays.

2.2 PIPE HANGERS (Cont'd)

.10 (Cont'd)
.2 Finishes for copper, glass, brass or aluminum pipework: black, with formed portion plastic coated.

.11 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP 69.

2.3 RISER CLAMPS

.1 Steel or cast iron pipe: black, carbon steel to MSS SP 58, type 42, UL listed, FM approved.

.2 Copper pipe: carbon steel copper plated to MSS SP 58, type 42.

.3 Bolts: to ASTM A 307.

.4 Nuts: to ASTM A 563.

2.4 EQUIPMENT SUPPORTS

.1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel. Submit calculations with shop drawings.

2.5 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

.1 Provide templates to ensure accurate location of anchor bolts.

2.6 HOUSE-KEEPING PADS

.1 Provide 100 mm high concrete housekeeping pads for base-mounted equipment; size pads 100 mm larger than equipment; chamfer pad edges.

2.7 OTHER PIPING AND EQUIPMENT SUPPORTS

.1 Fabricate other piping and equipment supports from structural grade steel.

.2 Submit structural calculations with shop drawings.

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 Install in accordance with:
.1 Manufacturer's instructions and recommendations.

.2 Vibration Control Devices:
.1 Install on piping systems at generator and as indicated.

.3 Clamps on riser piping:
.1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.
.2 Bolt-tightening torques to industry standards.
.3 Steel pipes: install below coupling or shear lugs welded to pipe.
.4 Cast iron pipes: install below joint.

.4 Clevis plates:
.1 Attach to concrete with 4 minimum concrete inserts, one at each corner.

.5 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.

3.3 HANGER SPACING

.1 Gas piping: up to NPS 1/2: every 1.8 m and to CSA B149.1-15.

.2 Copper piping: up to NPS 1/2: every 1.5 m.

.3 Flexible joint roll groove pipe: in accordance with table below, but not less than one hanger at joints.

.4 Within 300 mm of each elbow.

Maximum Pipe Size: NPS	Maximum Spacing Steel	Maximum Spacing Copper
Up to 1-1/4	2.1 m	1.8 m
1-1/2	2.7 m	2.4 m
2	3.0 m	2.7 m
2-1/2	3.6 m	3.0 m

3.4 HANGER INSTALLATION

.1 Install hanger so that rod is vertical under operating conditions.

.2 Adjust hangers to equalize load.

.3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

3.5 HORIZONTAL MOVEMENT

.1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.

.2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.6 FINAL ADJUSTMENT

.1 Adjust hangers and supports:
.1 Ensure that rod is vertical under operating conditions.
.2 Equalize loads.

.2 Adjustable clevis:
.1 Tighten hanger load nut securely to ensure proper hanger performance.
.2 Tighten upper nut after adjustment.

.3 C-clamps:
.1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.

.4 Beam clamps:
.1 Hammer jaw firmly against underside of beam.

3.7 FIELD QUALITY CONTROL

.1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - SUBMITTALS.

.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.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTION

.1 Section 01 33 00 - Submittal Procedures.

1.2 REFERENCES

.1 Canadian Gas Association (CGA)
.1 CSA/CGA B149.1-15, Natural Gas and Propane Installation Code.

.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-24.3-92, Identification of Piping Systems.

1.3 SUBMITTALS

.1 Product Data
.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
.2 Product data to include paint colour chips, other products specified in this section.
.3 Samples:
.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
.2 Samples to include nameplates, labels, tags, lists of proposed legends.

1.4 QUALITY ASSURANCE

.1 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:
.1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
.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 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

.1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.

.2 Lettering and numbers raised or recessed.

.3 Information to include, as appropriate:
.1 Equipment: manufacturer's name, model, size, serial number, capacity.
.2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.2 SYSTEM NAMEPLATES

.1 Colours:
.1 Hazardous: red letters, white background.
.2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).

.2 Construction:
.1 3 mm thick laminated plastic or white anodized aluminum, matte finish, with square corners, letters accurately aligned and machine engraved into core.

.3 Sizes:
.1 Conform to following table:

Size # mm	Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

.2 Use maximum of 25 letters/numbers per line.

.4 Locations:

2.2 SYSTEM NAMEPLATES (Cont'd)

.4 (Cont'd)
.1 Terminal cabinets, control panels: use size # 5.
.2 Equipment in Mechanical Rooms: use size # 9.

2.3 EXISTING IDENTIFICATION SYSTEM

.1 Apply existing identification system to new work.

.2 Where existing identification system does not cover for new work, use identification system specified this section.

.3 Before starting work, obtain written approval of identification system from Departmental Representative.

2.4 PIPING SYSTEMS GOVERNED BY CODES

.1 Identification:
.1 Natural Gas: CSA B149.1-15.

2.5 IDENTIFICATION OF PIPING SYSTEMS

.1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.

.2 Pictograms:
.1 Where required: Workplace Hazardous Materials Information System (WHMIS) regulations.

.3 Legend:
.1 Block capitals to sizes and colours listed in CAN/CGSB 24.3.

.4 Arrows showing direction of flow:
.1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.
.2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.
.3 Use double-headed arrows where flow is reversible.

.5 Extent of background colour marking:
.1 To full circumference of pipe or insulation.
.2 Length to accommodate pictogram, full length of legend and arrows.

2.5 IDENTIFICATION OF PIPING SYSTEMS (Cont'd)

.6 Materials for background colour marking, legend, arrows:

.1 Pipes and tubing 20 mm and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.

.2 Other pipes: pressure sensitive vinyl with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150 degrees C and intermittent temperature of 200 degrees C.

.7 Colours and Legends:

.1 Where not listed, obtain direction from Departmental Representative.

.2 Colours for legends, arrows: to following table:

Background colour:	Legend, arrows:
Yellow	BLACK
Green	WHITE
Red	WHITE

.3 Background colour marking and legends for piping systems:

Contents	Background colour	Legend Marking
Natural Gas	to Codes	
Regulator Vents	to Codes	

2.6 IDENTIFICATION DUCTWORK SYSTEMS

.1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.

.2 Colours: back, or co-ordinated with base colour to ensure strong contrast.

2.7 VALVES, CONTROLLERS

.1 Brass tags with 12 mm stamped identification data filled with black paint.

.2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

2.8 CONTROLS COMPONENTS IDENTIFICATION

.1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.

.2 Inscriptions to include function and (where appropriate) fail-safe position.

2.9 LANGUAGE

.1 Identification in English.

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 TIMING

.1 Provide identification only after painting.

3.3 INSTALLATION

.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Provide ULC and or CSA registration plates as required by respective agency.

3.4 NAMEPLATES

.1 Locations:
.1 In conspicuous location to facilitate easy reading and identification from operating floor.

.2 Standoffs:
.1 Provide for nameplates on hot and/or insulated surfaces.

.3 Protection:
.1 Do not paint, insulate or cover.

3.5 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

.1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.

.2 Adjacent to each change in direction.

.3 At least once in each small room through which piping or ductwork passes.

.4 On both sides of visual obstruction or where run is difficult to follow.

.5 On both sides of separations such as walls, floors, partitions.

.6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.

.7 At beginning and end points of each run and at each piece of equipment in run.

.8 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.

.9 Identification easily and accurately readable from usual operating areas and from access points.

.1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

3.6 VALVES, CONTROLLERS

.1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.

.2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by Departmental Representative. Provide one copy (reduced in size if required) in each operating and maintenance manual.

.3 Number valves in each system consecutively.

3.7 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Related Sections:
- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 45 00 - Quality Control.
- .3 Section 01 74 21 - Construction/ Demolition Waste Management and Disposal.
- .4 Section 01 78 00 - Closeout Submittals.
- .5 Section 23 05 05 - Installation of Pipework.

1.2 REFERENCES

.1 American Society of Mechanical Engineers (ASME)
- .1 ASME B16.5-2013, Pipe Flanges and Flanged Fittings.
- .2 ASME B16.18-2012, Cast Copper Alloy Solder Joint Pressure Fittings.
- .3 ASME B16.22-2013, Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.
- .4 ASME B18.2.1-2012, Square and Hex Bolts and Screws Inch Series.

.2 American Society for Testing and Materials International (ASTM)
- .1 ASTM A47/A 47M-99(2014), Standard Specification for Ferritic Malleable Iron Castings.
- .2 ASTM A53/A53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
- .3 ASTM B75M-11, Standard Specification for Seamless Copper Tube Metric.
- .4 ASTM B837-10, Standard Specification for Seamless Copper Tube for Natural Gas and Liquified Petroleum (LP) Gas Fuel Distribution Systems.

.3 Canadian Standards Association (CSA International)
- .1 CSA W47.1-09(R2014), Certification of Companies for Fusion Welding of Steel.

.4 Canadian Standards Association (CSA)/Canadian Gas Association (CGA)
- .1 CAN/CSA B149.1-10(R2015), Natural Gas and Propane Installation Code.

1.2 REFERENCES (Cont'd)

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

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

.2 Product Data:
.1 Submit manufacturer's printed product literature, specifications and datasheet for piping, fittings and equipment.
.2 Indicate on manufacturers catalogue literature following: valves, regulators, meters, pressure reducing valves.

.3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

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

.5 Instructions: submit manufacturer's installation instructions.

.6 Closeout Submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 DELIVERY, STORAGE AND HANDLING

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

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

1.4 DELIVERY, STORAGE AND HANDLING (Cont'd)

.3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 PIPE

.1 Steel pipe: to ASTM A 53/A 53M-07, Schedule 40, seamless as follows:
.1 NPS 1/2 to 2, screwed.
.2 NPS 2-1/2 and over, plain end.

.2 Copper tube: to ASTM B 837-10.

.3 Underground pipe: Type 'L' copper tubing with extruded polyethylene coating or polyethylene piping certified for underground use.

2.2 JOINTING MATERIAL

.1 Screwed fittings: pulverized lead paste.

.2 Welded fittings: to CSA W47.1-03.

.3 Flange gaskets: nonmetallic flat.

.4 Brazing: to ASTM B 837-10.

2.3 FITTINGS

.1 Steel pipe fittings, screwed, flanged or welded:
.1 Malleable iron: screwed, banded, Class 150.
.2 Steel pipe flanges and flanged fittings: to ASME B16.5-1996.
.3 Welding: butt-welding fittings.
.4 Unions: malleable iron, brass to iron, ground seat, to ASTM A 47M-90.
.5 Bolts and nuts: to ASME B18.2.1-1996.
.6 Nipples: schedule 40, to ASTM A 53/A 53M-06a.

.2 Copper pipe fittings, screwed, flanged or soldered:
.1 Cast copper fittings: to ANSI B16.18-2012.

2.3 FITTINGS (Cont'd)

.2 (Cont'd)
.2 Wrought copper fittings: to ASME B16.22-2013.

2.4 VALVES

.1 Provincial Code approved, lubricated ball type.

.2 NPS 2 and under, screwed.

.3 NPS 2 1/2 and over, flanged.

.4 Suitable for the temperature to which exposed.

.5 Certified by Canadian Gas Association (CGA).

.6 NPS 2 1/2 and over, flanged.

.7 Suitable for the temperature to which exposed.

.8 Provincial code approved, certified by Canadian Gas Association and CSA B149.1-15.

.9 ASTM D2513/F1973 certified.

2.5 PRESSURE REGULATOR

.1 Service Regulator: commercial type, direct-operated, spring-loaded with internal relief overpressure protection.

.2 Line Regulator: approved for use by gas equipment manufacturer.

.3 NPS 2 and under, screwed.

.4 NPS 2 1/2 and over, flanged.

.5 Suitable for the temperature to which exposed.

.6 Provincial Code approved, certified by Canadian Gas Association and CSA B149.1-15.

.7 Acceptable Material:
.1 Fisher
.2 Elster
.3 Emerson

2.5 PRESSURE REGULATOR (Cont'd)

.7 (Cont'd)
.4 Material approved by gas equipment manufacturer.

2.6 FLEXIBLE CONNECTOR

.1 Working pressure: 2400 kPa (min.).

.2 Certified by Canadian Gas Association (CGA) to CSA CAN/CGA-8.1 or CSA CAN1-8.3.

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 PIPING

.1 Install in accordance with Section 23 05 05 - Installation of Pipework, CAN/CSA B149.1, CAN/CSA B149.2, applicable Provincial Codes, and supplemented as specified.

.2 Install drip points:
.1 At low points in piping system.
.2 At connections to equipment.

.3 Ream Pipe ends. Clear scale and dirt, inside and outside before and after assembly.

.4 Slope piping down in direction of flow to low point.

.5 Use eccentric reducers at pipe size change installed to provide positive drainage.

.6 Use dielectric type fittings where buried service enters and connect to building piping.

.7 Joints:
.1 Gas service inside building - screw or weld NPS 2 and under. Weld NPS 2-1/2 and over.
.2 Gas service in ceiling plenums or concealed areas - weld all sizes.

3.2 PIPING (Cont'd)

.7 (Cont'd)
.3 Gas service outside building - Type "L" copper with extruded polyethylene coating or polyethylene piping certified for underground use.

3.3 VALVES

.1 Install valves with stems upright or horizontal.

.2 Install valves at branch take-offs to isolate pieces of equipment, and as indicated.

.3 Install valve on the main gas service entering the building. Value to have locking lugs.

3.4 FIELD QUALITY CONTROL

.1 Site Tests/Inspection:
.1 Test system in accordance with CAN/CSA B149.1-05 and requirements of authorities having jurisdiction.

.2 Obtain reports within 3 days of review and submit immediately to Departmental Representative.

.3 Submit final gas inspection certification to Departmental Representative.

3.5 ADJUSTING

.1 Purging: purge after pressure test in accordance with CAN/CSA B149.1-15.

.2 Pre-Start-Up Inspections:
.1 Check vents from regulators, control valves, terminate outside building in approved location, protected against blockage, damage.
.2 Check gas trains, entire installation is approved by authority having jurisdiction.

3.6 CLEANING

.1 Cleaning: in accordance with CAN/CSA B149.1-15, supplemented as specified.

.2 Perform cleaning operations in accordance with manufacturer's recommendations.

3.6 CLEANING
(Cont'd)

.3 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
- .1 ASTM E 90-09, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

.3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).

.4 Society of Automotive Engineers (SAE).

1.2 SYSTEM DESCRIPTION

.1 Performance Requirements:
- .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
  - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate following:
  - .1 Pressure drop.
  - .2 Face area.
  - .3 Free area.

.2 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

1.3 ACTION AND INFORMATIONAL SUBMITTALS (Cont'd)

.2 (Cont'd)
.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 Test Reports:
.1 Submit certified data from independent laboratory substantiating acoustic and aerodynamic performance to ASTM E 90.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:
.1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
.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 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 FIXED LOUVRES - ALUMINUM

.1 Construction: welded with exposed joints ground flush and smooth.

.2 Material: extruded aluminum alloy 6063-T5.

.3 Blade: drainable blade stormproof pattern, reinforcing bosses and maximum blade length of 1500 mm.

.4 Frame, head, sill and jamb: 150 mm deep one piece extruded aluminum, minimum 3 mm thick with approved caulking slot, integral to unit.

.5 Mullions: at 1500 mm maximum centres.

2.1 FIXED LOUVRES - ALUMINUM (Cont'd)

.6 Fastenings: stainless steel SAE-194-8F with SAE-194-SFB nuts and resilient neoprene washers between aluminum and head of bolt, or between nut, ss washer and aluminum body.

.7 Screen: 12 mm exhaust 19 mm intake mesh, 2 mm diameter wire aluminum birdscreen on inside face of louvres in formed U-frame.

.8 Finish: prime coated with anodized colour finish. Colour: to Departmental Representative's approval.

.9 Acceptable Material: Airolite, Ruskin, Ventex.

.10 Provide AMCA certified ratings for pressure drop, free area and water penetration.

.11 Free area velocity and pressure drop beginning point of water penetration per AMCA Standard 511: 375 m/min and 57 Pa.

.12 Suitable for existing louver replacement.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 In accordance with manufacturer's and SMACNA recommendations.

.2 Reinforce and brace.

.3 Anchor securely into opening. Seal with caulking to ensure weather tightness.

3.3 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

3.3 CLEANING (Cont'd)

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

1.2 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 Ontario Electrical Safety Code, 26th Edition, 2015.
.2 CSA Group
.1 CSA C22.2 No. 7-2015, Underground Systems.
.3 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.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for all electrical material and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Submit for review single line electrical diagrams under plexiglass and locate in Electrical Room and adjacent to transfer switch.
.1 Electrical distribution system in main electrical room.
.2 Electrical power generation and distribution systems adjacent to transfer switch.

.4 Shop drawings:

1.3 ACTION AND INFORMATIONAL SUBMITTALS (Cont'd)

.4 (Cont'd)

.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 drawings to Ontario Electrical Safety Authority.

.6 If changes are required, notify Departmental Representative of these changes before they are made.

.7 Pay all associated fees for Electrical Permit.

.5 Certificates:

.1 Provide CSA certified equipment and material.

.2 Where CSA certified equipment and material is not available, submit such equipment and material to authority having jurisdiction for special approval before delivery to site.

.3 Submit test results of installed electrical systems and instrumentation.

.4 Permits and fees: in accordance with General Conditions of contract.

.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.

1.3 ACTION AND INFORMATIONAL SUBMITTALS (Cont'd)

.6 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.

1.4 CLOSEOUT SUBMITTALS

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

.2 Operation and Maintenance Data: submit operation and maintenance data for all electrical equipment 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.

1.5 DELIVERY, STORAGE AND HANDLING

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

1.5 DELIVERY, STORAGE AND HANDLING (Cont'd)

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

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

.4 Develop Waste Reduction Workplan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse pallets, crates, padding, and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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 and French.

.4 Use one nameplate or label for each language.

2.2 MATERIALS AND EQUIPMENT

.1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.

.2 Material and equipment to be CSA certified. Where CSA certified material and equipment is are not available, obtain special approval from authority having jurisdiction 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. CSA certification required for the entire assembly.

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 - Control Devices.

2.4 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of Ontario Electrical Safety Authority and Departmental Representative.

.2 Aluminum composite decal signs, minimum size 175 x 250 mm.

.3 Provide Arc Flash and Shock Hazard warning sign on electrical equipment in accordance with Ontario Electrical Safety Code.

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: plastic laminate lamicoid 3 mm thick plastic engraving sheet melamine, red finish face, white core for equipment fed from generator, lettering accurately aligned and engraved into core mechanically attached with self tapping screws.

2.6 EQUIPMENT IDENTIFICATION (Cont'd)

.1 (Cont'd)

.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 to be approved by Departmental Representative prior to manufacture.

.4 Allow for minimum of twenty-five (25) letters per nameplate.

.5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.6 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.7 Terminal cabinets and pull boxes: indicate system and voltage.

.8 Panels, transfer switch, controllers: indicate type of equipment, voltage, phase, pole, current, point of supply and load controlled.

.9 Receptacles: indicate panel and branch circuit number. Locate on wall immediately above receptacle.

2.7 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

2.7 WIRING IDENTIFICATION (Cont'd)

.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. Identification to be visable after painting.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
Other Communication Systems	Green	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 indoor distribution enclosures light gray to EEMAC 2Y-1-1958.

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.

3.1 EXAMINATION (Cont'd)

.1 (Cont'd)

.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 Ontario Electrical Safety Code except where specified otherwise.

.2 Do underground systems in accordance with CAN/CSA-C22.3 No.7 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 Install conduit and sleeves prior to pouring of concrete.

.1 Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.

.2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

.3 Install cables, conduits and fittings 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 - Outlet Boxes, Conduit Boxes and Fittings.

.2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.

3.5 LOCATION OF OUTLETS (Cont'd)

.3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.

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 Wall receptacles:
.1 General: 300 mm.
.2 In mechanical rooms: 1400 mm.
.2 Panelboards: as required by Code or as indicated.

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.

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 Provide upon completion of work, load balance report as directed in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS, phase and neutral currents on panelboards, 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 - Quality Control.
.1 Power generation and distribution system including phasing, voltage, grounding and load balancing.
.2 Circuits originating from branch distribution panels.

3.8 FIELD QUALITY CONTROL (Cont'd)

.2 (Cont'd)

.3 Motors, snow melting system and associated control equipment including sequenced operation of systems where applicable.

.4 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.

3.9 SYSTEM STARTUP (Cont'd)

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

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

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 21 - Wires and Cables (0-1000 V).

1.2 REFERENCES

.1 CSA International
.1 CAN/CSA-C22.2 No. 18.4-15, Hardware For The Support Of Conduit, Tubing and Cable.
.2 CAN/CSA-C22.2 No.65-13, Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
.1 EEMAC 1Y-2-1961, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

.3 National Electrical Manufacturers Association (NEMA)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for wire and box connectors and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 CLOSEOUT SUBMITTALS

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

.2 Operation and Maintenance Data: submit operation and maintenance data for wire and box connectors for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

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

1.5 DELIVERY, STORAGE AND HANDLING (Cont'd)

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

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

.4 Packaging Waste Management: remove for reuse and return packaging materials in accordance with Section 01 74 21 - Construction /Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Pressure type wire connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.

.2 Bushing stud connectors: to EEMAC 1Y-2 to consist of:
.1 Connector body and stud clamp for stranded copper conductors.
.2 Clamp for copper bar.
.3 Stud clamp bolts.
.4 Bolts for copper bar.
.5 Sized for conductors and bars as indicated.

.3 Clamps or connectors for armoured cable, TECK cable, flexible conduit, as required to: CAN/CSA-C22.2 No.18.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and cables and:

3.1 INSTALLATION (Cont'd)

.1 (Cont'd)

.1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 No.65.

.2 Install bushing stud connectors in accordance with EEMAC 1Y-2.

3.2 CLEANING

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

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

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

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 11 - Cleaning..

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

END OF SECTION

PROJECT NO. 45366267/45369810

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 20 - Wire and Box Connectors (0-1000 V).

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CSA C22.2 No. 0.3-09(R2014), Test Methods For Electrical Wires and Cables.

1.3 PRODUCT DATA

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

1.4 DELIVERY, STORAGE AND HANDLING

.1 Packaging Waste Management: remove for reuse packaging materials in accordance with Section 01 74 11 - Cleaning.

PART 2 - PRODUCTS

1.1 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 for indoor and RWU90 XLPE for outdoor (in underground conduits) installations.

PART 3 - EXECUTION

2.1 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

2.1 FIELD QUALITY CONTROL (Cont'd)

.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.

2.2 GENERAL CABLE INSTALLATION

.1 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).

.2 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical.

.3 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

.4 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.

2.3 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:
.1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
.2 Provide dedicated neutral for each branch circuit.
.3 In underground ducts in accordance with Section 26 05 43.01 - Installation of Cables in Trenches and in Ducts.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results For Electrical.

1.2 REFERENCES

.1 American National Standards Institute /Institute of Electrical and Electronics Engineers (ANSI/IEEE)
.1 ANSI/IEEE 837-2014, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for grounding equipment and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 CLOSEOUT SUBMITTALS

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

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

1.5 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:
.1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

1.5 DELIVERY, STORAGE AND HANDLING (Cont'd)

.3 (Cont'd)
.2 Store and protect grounding equipment from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

.4 Develop Waste Reduction Workplan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse pallets, crates, padding, and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 EQUIPMENT

.1 Grounding conductors: bare stranded copper, tinned, medium-hard drawn (MHD) size as indicated.

.2 Insulated grounding conductors: green, copper conductors, size as indicated.

.3 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
.1 Grounding and bonding bushings.
.2 Protective type clamps.
.3 Bolted type conductor connectors.
.4 Thermit welded type conductor connectors.
.5 Bonding jumpers, straps.
.6 Pressure wire connectors.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for grounding equipment installation in accordance with manufacturer's written instructions.

3.1 EXAMINATION (Cont'd)

.1 (Cont'd)

.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 GENERAL

.1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Run ground wire in each conduit.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Make buried connections, and connections to electrodes, using copper welding by thermit process.

.5 Use mechanical connectors for grounding connections to equipment provided with lugs.

.6 Soldered joints not permitted.

.7 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.

3.3 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting, cable trays.

3.4 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

.4 Disconnect ground fault indicator during tests.

3.5 CLEANING

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

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

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results For Electrical.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 DELIVERY, STORAGE AND HANDLING

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

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

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

.4 Develop Waste Reduction Workplan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse pallets, crates, padding, and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted or suspended

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for hangers and supports 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 Secure equipment to solid masonry, tile and plaster surfaces with lead anchors or nylon shields.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.4 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.5 Fasten exposed conduit or cables to building construction or support system using straps.
.1 One-hole malleable iron steel straps to secure surface conduits and cables 50 mm and smaller.
.2 Two-hole steel straps for conduits and cables larger than 50 mm.

3.2 INSTALLATION (Cont'd)

.5 (Cont'd)
.3 Beam clamps to secure conduit to exposed steel work.

.6 Suspended support systems.
.1 Support individual cable or conduit runs with 6 mm diameter threaded rods and spring clips.
.2 Support 2 or more cables or conduits on channels supported by 6 mm diameter threaded rod hangers where direct fastening to building construction is impractical.

.7 For surface mounting of two or more conduits use channels at centre spacing in accordance with Ontario Electrical Safety Code.

.8 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.9 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.10 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.11 Do not use supports or equipment installed for other trades for conduit or cable support.

.12 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

3.3 CLEANING

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

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

3.3 CLEANING (Cont'd)

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

1.2 REFERENCES

.1 Ontario Electrical Safety Code, 26th Edition, 2015.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.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 - Submittal Procedures.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:
.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/ Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 SPLITTERS

.1 Construction: sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.

.2 Terminations: main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.

.3 Spare Terminals: minimum one spare terminals or lugs on each connection.

2.2 JUNCTION AND PULL BOXES

.1 Construction: welded steel enclosure.

2.2 JUNCTION AND PULL BOXES (Cont'd)

.2 Covers Flush Mounted: 25 mm minimum extension all around.

.3 Covers Surface Mounted: screw-on turned edge covers.

2.3 CABINETS

.1 Construction: welded sheet steel hinged door, handle, lock 2 keys, catch and sheet steel backboard.

PART 3 - EXECUTION

3.1 SPLITTER INSTALLATION

.1 Mount plumb, true and square to building lines.

.2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Mount cabinets with top not higher than 2 m above finished floor except where indicated otherwise.

.3 Only main junction and pull boxes are indicated. Install additional pull boxes as required by Ontario Electrical Safety Code.

3.3 IDENTIFICATION

.1 Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical.

.2 Identification Labels: size 2 indicating system name voltage and phase or as indicated.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

1.2 REFERENCES

.1 Ontario Electrical Safety Code, 26th Edition, 2015.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Waste Management and Disposal:
.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with Ontario Electrical Safety Code.

.2 102 mm square or larger outlet boxes as required.

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.

2.2 GALVANIZED STEEL OUTLET BOXES (Cont'd)

.4 Extension and plaster rings for flush mounting devices in finished plaster tile walls.

2.3 CONDUIT BOXES

.1 Cast FS or FD aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of devices.

2.4 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 35mm 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.

3.1 INSTALLATION (Cont'd)

.7 FS or FD outlet boxes for devises installed outdoors.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CAN/CSA C22.2 No. 18.1-13, Metallic Outlet Boxes.
- .2 CSA C22.2 No. 45.1-07(R2012), Electrical Rigid Metal Conduit.
- .3 CS C22.2 No. 56-13, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .4 CSA C22.2 No. 83-M1985(R2013), Electrical Metallic Tubing.
- .5 CSA C22.2 No. 211.2-06(R2011), Rigid Types PVC (unplasticized) Conduit.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.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.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Place materials defined as hazardous or toxic waste in designated containers.

1.4 WASTE MANAGEMENT AND DISPOSAL (Cont'd)

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

PART 2 - PRODUCTS

2.1 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel threaded.

.2 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

.3 Rigid pvc conduit: to CSA C22.2 No. 211.2.

.4 Flexible metal conduit: to CSA C22.2 No. 56, steel aluminum or liquid-tight flexible metal.

2.2 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits NPS 2 50 mm and smaller.
.1 Two hole steel straps for conduits larger than NPS 2 50 mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits at spacing in accordance with Ontario Electrical Safety Code.

.4 Threaded rods, 6 mm diameter, to support suspended channels.

2.3 CONDUIT FITTINGS

.1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.

.2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.

.3 Watertight with insulated throat connectors and couplings for EMT.
.1 Set-screws are not acceptable.

2.4 FISH CORD

.1 Polypropylene.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Conceal conduits except in unfinished areas.

.3 Surface mount conduits except in finished areas and after approval from Departmental Representative.

.4 Use rigid galvanized steel threaded conduit where specified.

.5 Use electrical metallic tubing (EMT) except in cast concrete and where not exposed to injury.

.6 Use rigid pvc conduit underground.

.7 Use flexible metal conduit for connection to motors in dry areas.

.8 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.

.9 Minimum conduit size for lighting and power circuits: 21 mm.

.10 Bend conduit cold:
.1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.11 Mechanically bend steel conduit over 21 mm diameter.

3.2 INSTALLATION (Cont'd)

.12 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.13 Install fish cord in empty conduits.

.14 Remove and replace blocked conduit sections.
.1 Do not use liquids to clean out conduits.

.15 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 channels.

.5 Do not pass conduits through structural members except as indicated.

.6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

.3 Do not install conduits in terrazzo or concrete toppings.

3.5 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

.2 Waterproof joints (pvc excepted) with heavy coat of bituminous paint.

3.6 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

3.6 CLEANING
(Cont'd)

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 21 - Wires and Cables (0-1000 V).

.2 Section 33 65 76 - Direct Buried Underground Cable Ducts.

1.2 REFERENCES

.1 Ontario Electrical Safety Code, 26th Edition, 2015.

.2 Insulated Cable Engineers Association, Inc. (ICEA)

1.3 ACTION AND INFORMATIONAL SUBMITTAL

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

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

1.4 DELIVERY, STORAGE AND HANDLING

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

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

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

.4 Develop Waste Reduction Workplan related to Work of this Section.

1.4 DELIVERY, STORAGE AND HANDLING (Cont'd)

.5 Packaging Waste Management: remove for reuse pallets, crates, padding, and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 CABLE PROTECTION

.1 38 x 140 mm planks pressure treated with clear or copper naphthenate or 5% pentachlorophenol solution, water repellent preservative.

2.2 MARKERS

.1 Polyethylene warning type over full length of raceway route. Tape width 75 mm with 4 mil thickness. Colour and text as indicated on drawings.

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 cable 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 CABLE INSTALLATION IN DUCTS

.1 Install cables as indicated in ducts.

.2 Do not pull spliced cables inside ducts.

.3 Install multiple cables in duct simultaneously.

3.2 CABLE INSTALLATION IN DUCTS (Cont'd)

.4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.

.5 To facilitate matching of colour coded multiconductor control cables reel off in same direction during installation.

.6 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.

.7 After installation of cables, seal duct ends with duct sealing compound.

3.3 MARKERS

.1 Install warning tape as indicated on drawings.

.2 Install protective planks as indicated on drawings.

3.4 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Perform tests using qualified personnel.
.1 Include necessary instruments and equipment.

.3 Check phase rotation and identify each phase conductor of each feeder.

.4 Check each feeder for continuity, short circuits and grounds.
.1 Ensure resistance to ground of circuits is not less than 50 megohms.

.5 Provide Departmental Representative with list of test results showing location at which each test was made, circuit tested and result of each test.

.6 Remove and replace entire length of cable if cable fails to meet any of test criteria.

3.5 CLEANING

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

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

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

.1 Repair damage to adjacent materials caused by cables installation.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 26 05 00 - Common Work Results For Electrical.

.3 Section 26 28 16.02 - Moulded Case Circuit Breakers.

1.2 REFERENCES

.1 CSA International
.1 CSA C22.2 No.29-2015, Panelboards and Enclosed Panelboards.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

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

.3 Shop Drawings:
.1 Include on drawings:
.1 Electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

1.4 CLOSEOUT SUBMITTALS

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

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

1.5 DELIVERY, STORAGE AND HANDLING

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

1.5 DELIVERY, STORAGE AND HANDLING (Cont'd)

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

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

.4 Develop Waste Reduction Workplan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse pallets, crates, padding, and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 PANELBOARDS

.1 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.
.1 Install circuit breakers in panelboards before shipment.
.2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

.2 250 V panelboards: bus and breakers rated for (symmetrical) interrupting capacity or as indicated.

.3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

2.1 PANELBOARDS (Cont'd)

.4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.

.5 Minimum of 2 flush locks for each panel board.

.6 Two keys for each panelboard and key panelboards alike.

.7 Copper bus with neutral of same ampere rating of mains.

.8 Mains: suitable for bolt-on breakers.

.9 Trim with concealed front bolts and hinges.

.10 Trim and door finish: baked enamel as per colour schedule.

.11 Include grounding busbar with 3 of terminals for bonding conductor equal to breaker capacity of the panel board.

2.2 BREAKERS

.1 Breakers: to Section 26 28 16.02 - Moulded Case Circuit Breakers.

.2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

.3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.

.4 Lock-on devices for 10% of 15 to 30 A breakers installed as indicated. Turn over unused lock-on devices to Departmental Representative.

.5 Lock-on devices for fire alarm, security panel, stairway, exit and night light circuits.

2.3 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.

2.3 EQUIPMENT IDENTIFICATION (Cont'd)

.2 Nameplate for each panelboard size 4 engraved as indicated.

.3 Nameplate for fire alarm circuit in panelboards size 2 engraved as indicated.

.4 Complete circuit directory with typewritten legend showing location and load of each circuit, mounted in plastic envelope at inside of panel door.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Mount panelboards to height specified in Section 26 05 00 - Common Work Results for Electrical or as indicated.

.3 Connect loads to circuits.

.4 Connect neutral conductors to common neutral bus with respective neutral identified.

3.3 CLEANING

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

3.3 CLEANING (Cont'd)

.1 (Cont'd)
.1 Leave Work area clean at end of each day.

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

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

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

.2 Repair damage to adjacent materials caused by panelboards installation.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 26 05 00 - Common Work Results For Electrical.

.3 Section 26 28 20 - Ground Fault Circuit Interrupters - Class "A".

1.2 REFERENCES

.1 CSA International
.1 CSA C22.2 No.42-10(R2015), General Use Receptacles, Attachment Plugs and Similar Devices.
.2 CAN/CSA C22.2 No.42.1-13, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 Submittal Procedures.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for wiring devices and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
.1 Submit drawings stamped in accordance with 01 33 00 - Submittal Procedure.

1.4 CLOSEOUT SUBMITTALS

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

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

1.5 DELIVERY, STORAGE AND HANDLING

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

1.5 DELIVERY, STORAGE AND HANDLING (Cont'd)

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

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

.4 Develop Waste Reduction Workplan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse pallets, crates, padding, and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 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.

2.1 RECEPTACLES (Cont'd)

.3 Other receptacles with ampacity and voltage as indicated.

.4 Receptacles of one manufacturer throughout project.

2.2 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 Cast cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

.5 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for GFCI receptacles.

2.3 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 Receptacles:
.1 Mount receptacles at height in accordance with Section 26 05 00 - Common Work Results for Electrical and as indicated.
.2 Install GFCI type receptacles as indicated.

.2 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 - Cleaning.
.1 Leave Work area clean at end of each day.

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

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

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

.2 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.

.3 Repair damage to adjacent materials caused by wiring device installation.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 26 05 00 - Common work Results For Electrical.

.3 Section 26 24 16.01 - Panelboards Breaker Type.

1.2 REFERENCES

.1 CSA International
.1 CSA C22.2 No. 5-2013, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2010).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 Submittal Procedures.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for circuit breakers and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Certificates:
.1 Prior to installation of circuit breakers in either new or existing installation, Contractor must submit 3 copies of a production certificate of origin from the manufacturer. Production certificate of origin must be duly signed by factory and local manufacturer's representative certifying that circuit breakers come from this manufacturer and are new and meet standards and regulations.
.1 Production certificate of origin must be submitted to Departmental Representative for approval.
.2 Delay in submitting production of certificate of origin will not justify any extension of contract and additional compensation.

1.3 ACTION AND INFORMATIONAL SUBMITTALS (Cont'd)

.3 (Cont'd)

.3 Any work of manufacturing, assembly or installation to begin only after acceptance of production certificate of origin by Departmental Representative. Unless complying with this requirement, Departmental Representative reserves the right to mandate manufacturer listed on circuit breakers to authenticate new circuit breakers under the contract, and to Contractor's expense.

.4 Production certificate of origin must contain:

.1 Manufacturer's name and address and person responsible for authentication. Person responsible must sign and date certificate.

.2 Licensed dealer's name and address and person of distributor responsible for Contractor's account.

.3 Contractor's name and address and person responsible for project.

.4 Local manufacturer's representative name and address. Local manufacturer's representative must sign and date certificate.

.5 Name and address of building where circuit breakers will be installed:

.1 Project title:

.2 End user's reference number:

.3 List of circuit breakers:

1.4 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

.1 Store circuit breakers indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect circuit breakers from nicks, scratches, and blemishes.

1.4 DELIVERY, STORAGE AND HANDLING (Cont'd)

.3 (Cont'd)
.3 Replace defective or damaged materials with new.

.4 Develop Waste Reduction Workplan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse pallets, crates, padding, and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 BREAKERS GENERAL

.1 Moulded-case circuit breakers and ground-fault circuit-interrupters: to CSA C22.2 No. 5

.2 Bolt-on moulded case circuit breaker: quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.

.3 Plug-in moulded case circuit breakers: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient. Allowed only for panel 'GH1'.

.4 Common-trip breakers: with single handle for multi-pole applications.

.5 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.
.1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.

.6 Circuit breakers with interchangeable trips as indicated.

.7 Circuit breakers to have minimum symmetrical rms interrupting capacity rating same as associated panel.

2.2 THERMAL MAGNETIC BREAKERS DESIGN A

.1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

2.3 MAGNETIC BREAKERS DESIGN B

.1 Moulded case circuit breaker to operate automatically by means of magnetic tripping devices to provide instantaneous tripping for short circuit protection.

2.4 BREAKER TYPE GROUND FAULT INTERRUPTER

.1 Single or two pole ground fault circuit interrupter as indicated for single phase circuits c/w test and reset facilities. Equipment protection type with 30 mA ground trip.

2.5 OPTIONAL FEATURES

.1 Include:
.1 On-off locking device.

2.6 ENCLOSURE

.1 Enclosure type as indicated on drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

.1 Install circuit breakers as indicated.

3.3 CLEANING

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

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

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 26 05 00 - Common Work Results For Electrical.

.3 Section 26 27 26 - Wiring Devices.

1.2 PAYMENT

.1 Payment for field testing of ground fault equipment performed by equipment manufacturer in accordance with Section 01 29 83 - Payment Procedures: Testing Laboratory Services.

1.3 REFERENCES

.1 CSA International
.1 CAN/CSA C22.2 No.144-M91(R2015), Ground Fault Circuit Interrupters.

.2 National Electrical Manufacturers Association (NEMA)
.1 NEMA PG 2.2-2014, Application Guide for Ground Fault Protection Devices for Equipment.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 Submittal Procedures.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for ground fault circuit interrupters and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
.1 Submit drawings as outlined in 1.4.2.

.4 Test and Evaluation Reports: submit test report for field testing of ground fault equipment to Departmental Representative and certificate that system as installed meets criteria specified.

1.5 CLOSEOUT SUBMITTALS

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

.2 Operation and Maintenance Data: submit operation and maintenance data for ground fault circuit interrupters for incorporation into manual.

1.6 DELIVERY, STORAGE AND HANDLING

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

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

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

.4 Develop Waste Reduction Workplan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse pallets, crates, padding, and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Equipment and components for ground fault circuit interrupters (GFCI): to CAN/CSA C22.2 No.144.

2.1 MATERIALS (Cont'd)

.2 Components comprising ground fault protective system to be of same manufacturer.

2.2 GROUND FAULT PROTECTOR UNIT

.1 Self-contained with 15 A, 120 V circuit interrupter and duplex receptacle complete with:
.1 Solid state ground sensing device.
.2 Facility for testing and reset.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

.1 Connect supply and load wiring to equipment in accordance with manufacturer's recommendations.

3.3 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and co-ordinate with Section 01 45 00 - Quality Control.

.2 Arrange for field testing of ground fault equipment by ground fault equipment manufacturer Contractor before commissioning service.

.3 Demonstrate simulated ground fault tests.

3.4 CLEANING

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

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

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.3 Section 26 05 00 - Common Work Results - For Electrical.

1.2 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Collect and separate for plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

.3 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

.1 Non-fusible, and horsepower rated disconnect switches with CSA Type 1 enclosures, sizes as indicated.

.2 Provision for padlocking in OFF switch position by three locks.

.3 Mechanically interlocked door to prevent opening when handle is in ON position.

.4 Quick-make, quick-break action.

.5 ON-OFF switch position indication on switch enclosure cover.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results For Electrical.

.2 Indicate name of load controlled on size 2 nameplate.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install disconnect switches.

.2 Test disconnect switch operation in accordance with manufacturer's recommendations. Monitor load status concurrent with testing.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 26 05 00 - Common Work Results For Electrical.

.3 Section 26 29 03 - Control Devices.

1.2 REFERENCES

.1 CSA International
.1 CSA C22.2 No.14-13, Industrial Control Equipment.

.2 National Electrical Manufacturers Association (NEMA)
.1 NEMA ICS 2-2000 (R2005), Controllers, Contactors and Overload Relays Rated 600 V.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 Submittal Procedures.

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

1.4 CLOSEOUT SUBMITTALS

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

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

.3 Include operating information required for start-up, synchronizing and shut-down of generating units.

1.5 DELIVERY, STORAGE AND HANDLING

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

1.5 DELIVERY, STORAGE AND HANDLING (Cont'd)

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

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

.4 Develop Waste Reduction Workplan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse pallets, crates, padding, and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 CONTACTORS

.1 Contactors: to CSA C22.2 No.14.

.2 Electrically held controlled by pilot devices as indicated and rated for type of load controlled. Half size contactors not accepted.

.3 Complete with 2 normally open and 2 normally closed auxiliary contacts unless indicated otherwise.

.4 Mount in CSA Enclosure Type 1 unless otherwise indicated.

.5 Include following options in cover:
.1 Red indicating lamp
.2 Hand-Off-Auto selector switch.

2.2 EQUIPMENT IDENTIFICATION

.1 Identify equipment in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Size 4 nameplate indicating name of load controlled.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install contactors and connect power wires and auxiliary control devices.

.2 Identify contactors with nameplates or labels indicating panel and circuit number.

.3 Test contactors in accordance with 26 05 00 - Common Work Results for Electrical.

3.2 CLEANING

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

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

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.3 PROTECTION

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

.2 Repair damage to adjacent materials caused by contactor installation.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 26 05 00 - Common Work Results For Electrical.

.3 Section 26 29 01 - Contactors.

1.2 REFERENCES

.1 CSA International
.1 CSA C22.2 No.14-2013, Industrial Control Equipment.

.2 National Electrical Manufacturers Association (NEMA)
.1 NEMA ICS 1-2000(R2015), Industrial Control and Systems: General Requirements.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 Submittal Procedures.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for control devices and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
.1 Submit drawings for all components.
.2 Include schematic, wiring, interconnection diagrams.

1.4 QUALITY ASSURANCE

.1 Conduct tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

1.5 CLOSEOUT SUBMITTALS

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

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

1.6 DELIVERY, STORAGE AND HANDLING

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

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

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

.4 Develop Waste Reduction Workplan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse pallets, crates, padding, and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 AC CONTROL RELAYS

.1 Control Relays: to CSA C22.2 No.14 and NEMA ICS 1.

.2 Convertible contact type: contacts field convertible from NO to NC, electrically held. Coil rating: 120 V, 5 VA. Contact rating: 120 V, 5 A.

2.2 RELAY ACCESSORIES

.1 Standard contact cartridges: normally-open - convertible to normally-closed in field.

2.3 SELECTOR SWITCHES

.1 Maintained 3 position labelled as indicated heavy duty oil tight , operators standard, contact arrangement as indicated, rated 120 V, 5 A, AC.

2.4 INDICATING LIGHTS

.1 Heavy duty Oil tight, full voltage, LED type, push-to-test, lens colour: red, supply voltage: 120 V AC, lamp voltage: 120 V AC, labels as indicated.

2.5 CONTROL AND RELAY PANELS

.1 CSA Type 1 sheet steel enclosure with hinged padlockable access door, accommodating relays, labels, as indicated, factory installed and wired to identified terminals.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

.1 Install control and relay panels, control devices and interconnect as indicated.

3.3 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Depending upon magnitude and complexity, divide control system into convenient sections, energize one section at time and check out operation of section.

3.3 FIELD QUALITY CONTROL (Cont'd)

.3 Upon completion of sectional test, undertake group testing.

.4 Check out complete system for operational sequencing.

3.4 CLEANING

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

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

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal procedures.

.2 Section 26 05 00 - Common Work Results For Electrical.

.3 Section 26 36 23 - Automatic Transfer Switches.

1.2 REFERENCES

.1 National Electrical Manufacturers Association (NEMA)
.1 NEMA MG1-2014, Motors and Generators.

.2 International Organization for Standardization (ISO)
.1 ISO 3046-1-2002, Reciprocating Internal Combustion Engines - Performance - Part 1: Declarations of Power, Fuel and Lubricating Oil Consumptions, and Test Methods - Additional requirements for engines for general use.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:
.1 Provide manufacturer's printed product literature, specifications and data sheets for power generators and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
.1 Submit drawings and include:
.1 Dimensioned drawing of set including engine, alternator, control cubicle, exhaust system, fuel system and accessories.
.2 Line diagram showing alternator, control cubicle, automatic transfer switch, voltage regulator, battery, battery charger, governor specifications.
.3 Diagram for automatic engine ventilation.
.4 Flow diagrams for:

1.3 ACTION AND INFORMATIONAL SUBMITTALS (Cont'd)

.3 (Cont'd)
.1 (Cont'd)
.1 Fuel.
.2 Lubricating oil.
.3 Cooling air.
.5 Continuous full load output at 0.8 power factor lagging.
.6 Type and make of governor.
.7 Cooling air requirements in m^3 /s.
.8 British standard or DIN rating of engine.
.9 Set operation:
.1 Automatic starting, transfer to load, back to normal power and shut down.
.2 Manual starting.
.3 Automatic shut down on over cranking, overspeed, high engine temperature, low lube oil pressure, short circuit and alternator over voltage.

1.4 CLOSEOUT SUBMITTALS

.1 Submit data for incorporation into maintenance manual specified in Sections 01 78 00 - Closeout Submittals.
.1 Ensure that information is for unit supplied and not general description of units manufactured.

.2 Operation and maintenance instructions for engine, alternator, control panel, automatic transfer switch, manual bypass switch, battery charger, fuel system and accessories to permit effective operation, maintenance and repair.

.3 Technical data:
.1 Illustrated parts lists with parts numbers.
.2 Schematic diagram of electrical controls
.3 Flow diagrams for fuel, lube oil and cooling air.

1.5 MAINTENANCE MATERIAL SUBMITTALS

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

.2 Include:

1.5 MAINTENANCE MATERIAL SUBMITTALS (Cont'd)

.2 (Cont'd)
- .1 4 oil.
- .2 4 lube oil filter replacement elements.
- .3 4 air cleaner filter elements.
- .4 10 spark plugs.
- .5 Special tools for unit servicing.

1.6 DELIVERY, STORAGE AND HANDLING

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

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

.3 Packaging Waste Management: remove for reuse pallets crates padding and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

.1 Generator set consists of:
- .1 Engine.
- .2 Alternator.
- .3 Control panel.
- .4 Automatic transfer switch.
- .5 Battery charger and battery.
- .6 Fuel supply system.
- .7 Engine exhaust system.
- .8 Mounting base.
- .9 Weatherproof enclosure.
- .10 Battery heater.
- .11 Emergency stop.
- .12 Flexible fuel line.
- .13 Carburetor heater.
- .14 Fuel regulator heater.
- .15 Line circuit breaker.

.2 Set designed for standby service to operate unattended.

2.2 GENERATING SET

.1 Capacity:

2.2 GENERATING SET (Cont'd)

.1 (Cont'd)

.1 Total output of engine in hp (brake) = British standard rating as defined to ISO 3046-1 expressed in hp (brake), minus the sum of the following:

.1 Power to drive cooling fan.

.2 Power loss for site conditions.

.2 Site conditions; derate for:

.1 70 m above sea level.

.2 Ambient temp: 40 degrees C.

.3 Relative humidity: 60 %.

.3 Generator rating in kW x 1.34 divided by generator efficiency.

.2 Engine: to ISO 3046-1, natural gas 4 cycle, operating speed 3600 rpm, air or liquid cooled:

.1 Air cooled: pressure cooled with engine driven direct drive blower.

.2 Carburetor and battery heaters:: thermostatically controlled heater connected to line side of automatic transfer switch to allow engine to start below 0 degree C room ambient. 120 V.

.3 Starting system:

.1 12 V lead-acid storage battery of sufficient capacity to crank engine for 3 min at 0 degrees C without using more than 25% battery capacity.

.2 Battery charger: constant voltage, solid state, two stage from trickle charge at standby to boost charge after use, regulation +/-1% output for +/-10% input variation, and auto boost for 6 hours every 30 days.

.1 Capable of returning battery to full charge within 4 hours after 10 cranking operations.

.2 Equipped with dc voltmeter, dc ammeter and on-off switch.

.4 Governor:

.1 Electronic type, electric actuator, speed droop externally adjustable from isochronous to 5%, temperature compensated with steady state speed maintenance capability of +/-0.25%.

.5 Shock mounted engine instrument panel with:

.1 Lube oil pressure gauge.

2.2 GENERATING SET (Cont'd)

.2 (Cont'd)
.5 (Cont'd)
.2 Lube oil temperature gauge.
.6 Fuel rack solenoid energized when engine running.

.3 Alternator: to NEMA MG1, single bearing, rotating field, coupled to engine by means of semi-flexible coupling and SAE housing, drip proof, synchronous type, class H insulation with:
.1 Static exciter.
.2 Voltage regulator: solid state.
.3 Output:
.1 16 kVA at 0.8 pf, 1 phase, 120/240 V, 3 wire, 60 Hz.
.2 150% full load for 1 min.
.3 110% full load for 1 hour.
.4 100% full load continuously at 40 degrees C ambient.
.4 Floating neutral.

.4 Rodent-resistant construction.

2.3 CONTROL PANEL

.1 Totally enclosed, mounted on stand straddling generator.

.2 Panel door with formed edges and lockable handle with 2 keys.

.3 Flexible conductors between door and fixed panel.

.4 Digital controller.

.5 Controls:
.1 Engine start and emergency stop buttons, test button, alternator output moulded case circuit breaker, program selector switch, power transfer switch, voltage control rheostat, "normal power" and "emergency power" pilot lights.
.2 Voltage control rheostat to be screwdriver adjust type with locking nut and mounted on the inside of the control panel.

.6 Automatic shut-down and alarms:

2.3 CONTROL PANEL (Cont'd)

.6 (Cont'd)
.1 Engine overcrank, overspeed, high temp, short circuit, low battery voltage to alarm only, and alternator overvoltage.

2.4 GENERATING SET OPERATION

.1 Program selector switch set at "Automatic".
.1 On normal power failure, after adjustable time delay to ignore transients, engine starts. Load is transferred when frequency and voltage reach rated values.
.2 On restoration of normal power, load transfers back to normal source after adjustable time delay and engine shuts down.

.2 Program Selector Switch set at "Manual"
.1 Start button controls engine but automatic transfer of load prevented.
.2 Manual transfer possible.
.3 Electrical transfer possible by use of power transfer switch.

.3 Program selector switch set at "OFF".
.1 Engine will not start.
.2 Switch lockable in this position.

.4 Test full load - unit starts up and assumes building non-essential load through test transfer switch without interrupting building essential load.

2.5 AUTOMATIC TRANSFER SWITCH

.1 Refer to Section 26 36 23 - Automatic Transfer Switches.

2.6 EXHAUST SYSTEM

.1 Heavy duty, residential type, horizontally mounted exhaust silencer with condensate drain, plug and flanged couplings.

.2 Heavy duty flexible exhaust hose with flanged couplings as indicated.

.3 Expansion joints, stainless steel, corrugated, of suitable length to absorb both vertical and horizontal expansion.

2.7 FUEL SYSTEM

.1 Flexible fuel line.

2.8 COOLING AIR SYSTEM

.1 Engine ventilating system:
.1 Air intake and discharge gooseneck weatherhoods.
.2 Modulating thermostat, and replaceable intake air filters.

2.9 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Controls: size 4 nameplates.

2.10 SOURCE QUALITY CONTROL

.1 Complete generator set factory tested.

.2 Tests:
.1 6 hours test at 100% rated load.
.2 Automatic shut down devices on trouble alarms.
.3 Automatic start-up, transfer to loads back to normal power and shutdown.
.4 Battery charger's ability to revert to high rate charge after cranking.

.3 Submit certified copy of test results to Departmental Representative before shipment to site.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Position generating set and install as indicated.

.2 Install fuel supply as indicated.

.3 Complete wiring and interconnections as indicated.

.4 Start generating set and test to ensure proper performance.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

3.2 FIELD QUALITY CONTROL (Cont'd)

.2 Notify Departmental Representative 10 working days in advance of test date.

.3 Demonstrate:
.1 Automatic start, transfer to load, retransfer to normal power and unit shut down.
.2 Manual start, transfer, retransfer and shut down.
.3 Operation of automatic shut-down devices and alarms.

.4 Run unit on load for 6 hours to show load carrying ability, stability of voltage and frequency and satisfactory performance of engine ventilation system to provide adequate engine cooling.

3.3 TRAINING

.1 Provide training for operation personnel by manufacturer certified technician. Minimum training duration is 1 day (including transfer switch).

3.4 CLEANING

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

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

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
.1 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Departmental Representative.
.2 Divert unused batteries from landfill to battery recycling facility approved by Departmental Representative.
.3 Divert unused lubricating oil materials from landfill to oil recycling facility approved by Departmental Representative.

3.4 CLEANING (Cont'd)

.3 (Cont'd)

.4 Divert unused antifreeze from landfill to antifreeze recycling facility approved by Departmental Representative.

3.5 MAINTENANCE - CLEARANCES

.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer and National Fire Code of Canada.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 26 05 00 - Common Work Results For Electrical.

.3 Section 26 32 13.02 - Power Generation to 30kW.

1.2 REFERENCES

.1 CSA International
.1 CSA C22.2 No.178.1-2014, Automatic Transfer Switches.
.2 CAN/CSA C60044-1-07(R2011), Instrument Transformers.

.2 National Electrical Manufacturers Association (NEMA)
.1 NEMA ICS 2-1996(R2009), Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC, Part 8: Disconnect Devices for Use in Industrial Control Equipment.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 Submittal Procedures.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for transfer switches and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
.1 Submit drawings.
.1 Indicate on drawings:
.1 Make, model and type.
.2 Load classification:
.1 Tungsten lamp load: kW.
.2 Ballast lamp load: kW.
.3 Motor load: kW.
.4 Restricted use: resistance and general loads, 0.8 pf or higher kW.
.3 Single line diagram showing controls and relays.

1.3 ACTION AND INFORMATIONAL SUBMITTALS (Cont'd)

.3 (Cont'd)
.1 (Cont'd)
.4 Description of equipment operation including:
.1 Automatic starting and transfer to standby unit and back to normal power.
.2 Test control.
.3 Manual control.
.4 Automatic shutdown.

1.4 CLOSEOUT SUBMITTALS

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

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

.3 Detailed instructions to permit effective operation, maintenance and repair.

.4 Technical data:
.1 Schematic diagram of components, controls and relays.
.2 Illustrated parts lists with parts catalogue numbers.
.3 Certified copy of factory test results.

1.5 DELIVERY, STORAGE AND HANDLING

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

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

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

1.5 DELIVERY, STORAGE AND HANDLING (Cont'd)

.4 Develop Waste Reduction Workplan related to Work of this Section and in accordance with Section.

.5 Packaging Waste Management: remove for reuse pallets, crates, padding, and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

.1 Automatic load transfer equipment to:
.1 Monitor voltage on phases of normal power supply.
.2 Initiate cranking of standby generator unit on normal power failure or abnormal voltage on any one phase below preset adjustable limits for adjustable period of time.
.3 Transfer load from normal supply to standby unit when standby unit reaches rated frequency and voltage pre-set adjustable limits.
.4 Transfer load from standby unit to normal power supply when normal power restored, confirmed by sensing of voltage on phases above adjustable pre-set limit for adjustable time period.
.5 Shut down standby unit after running unloaded to cool down using adjustable time delay relay.

2.2 MATERIALS

.1 Instrument transformers: to CAN/CSA C60044-1.

.2 Contactors: to NEMA ICS2.

2.3 CONTACTOR TYPE TRANSFER EQUIPMENT

.1 Contact Type Transfer Equipment: to CSA C22.2 No.178.1.

.2 Two - 2 pole contactors mounted on common frame, in double throw arrangement, mechanically and electrically interlocked, motor solenoid operated, with CSA enclosure.

2.3 CONTACTOR TYPE TRANSFER EQUIPMENT (Cont'd)

.3 Solid neutral bus.

.4 Rated: 240 V, 60Hz, 100 A. 3 wire.

.5 Main contacts: silver surfaced, protected by arc disruption means.

.6 Switch and relay contacts, coils, spring and control elements accessible for inspection and maintenance from front of panel without removal of switch panel or disconnection of drive linkages and power conductors.

.7 Auxiliary contact: silver plated, to initiate emergency generator start-up on failure of normal power.

.8 Fault withstand rating: 10 kA symmetrical.

.9 Lever to operate switch manually when switch is isolated.

.10 Neutral bar, rated: 100 A.

2.4 CONTROLS

.1 Selector switch - 4 position, "Test", "Auto", "Manual", "Engine start".
.1 Test position - normal power failure simulated. Engine starts and transfer takes place. Return switch to "Auto" to stop engine.
.2 Auto position - normal operation of transfer switch on failure of normal power; retransfers on return of normal voltage and shuts down engine.
.3 Manual position - transfer switch may be operated by manual handle but transfer switch will not operate automatically and engine will not start.
.4 Engine start position - engine starts but unit will not transfer unless normal power supply fails. Switch must be returned to "Auto" to stop engine.

.2 Relays: continuous duty, industrial control type, with wiping action contacts rated 10 A minimum:

2.4 CONTROLS (Cont'd)

.2 (Cont'd)

.1 Voltage sensing: 2 phase for normal power and on one phase only for emergency, solid state type, adjustable drop out and pick up, close differential, 2 V minimum undervoltage and over voltage protection.

.2 Time delay: normal power to standby, adjustable solid state, 5 to 180 s.

.3 Time delay on engine starting to override momentary power outages or dips, adjustable solid state, 0 to 60 s delay.

.4 Time delay on retransfer from standby to normal power, adjustable 0 to 60 s 5 to 180 s 20 s to 10 minutes.

.5 Time delay for engine cool-off to permit standby set to run unloaded after retransfer to normal power, adjustable solid state, 20 s intervals to 10 minutes.

.6 Time delay during transfer to stop transfer action in neutral position to prevent fast transfer, adjustable, 5 s intervals to 180 s.

.7 Frequency sensing, to prevent transfer from normal power supply until frequency of standby unit reaches preset adjustable values.

.8 Neutral position delay: allow time for motors to delay between live sources, adjustable, 0 to 5 s.

.3 Solid state electronic in-phase monitor.

2.5 ACCESSORIES

.1 Ensure pilot lights indicate power availability normal and standby, switch position, green for normal, red for standby, mounted in panel.

.2 Plant exerciser: 168 hours timer to start standby unit once each week for selected interval but does not transfer load from normal supply. Timer adjustable 0-168 hours in 15 minute intervals.

.3 Auxiliary relay to provide 2 N.O. and 2 N.C. contacts for remote alarms.

.4 Instruments:

.1 Digital true RMS, indicating type 2 % accuracy, flush panel mounting:

2.5 ACCESSORIES (Cont'd)

.4 (Cont'd)
.1 (Cont'd)
.1 Voltmeter: ac, scale 0 to 250 V.
.2 Ammeter: ac, scale 0 to 150 A.
.3 Frequency meter: scale 55 to 65 Hz.

.5 Voltmeter selector switch: rotary, maintained contacts, panel mounting type, round notched handle, four position, labelled "OFF-Phase A-Phase B-Phase C".

.6 Ammeter selector switch: rotary, maintained contacts, panel mounting type, designed to prevent opening of current circuits, round notched handle, four position labelled "OFF - Phase A - Phase B - Phase C".

2.6 EQUIPMENT IDENTIFICATION

.1 Identify equipment in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Control panel:
.1 For selector switch and manual switch: size 4 nameplates.
.2 For meters, indicating lights, minor controls: use size 2 nameplates.

2.7 SOURCE QUALITY CONTROL

.1 Complete equipment, including transfer mechanism, controls, relays and accessories factory assembled and tested in presence of Departmental Representative.

.2 Notify Departmental Representative 5 days minimum in advance of date of factory test.

.3 Tests:
.1 Operate equipment both mechanically and electrically to ensure proper performance.
.2 Check selector switch, in modes of operation Test, Auto, Manual, Engine Start and record results.
.3 Check voltage sensing and time delay relay settings.
.4 Check:
.1 Automatic starting and transfer of load on failure of normal power.

2.7 SOURCE QUALITY CONTROL (Cont'd)

.3 (Cont'd)

.4 (Cont'd)

.2 Retransfer of load when normal power supply resumed.

.3 Automatic shutdown.

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 transfer switches installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Locate, install and connect transfer equipment as indicated.

.2 Check relays and solid state monitors and adjust as required to ensure correct operation.

3.3 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Energize transfer equipment from normal power supply.

.3 Set selector switch in "Test" position to ensure proper standby start, running, transfer, retransfer. Return selector switch to "Auto" position to ensure standby shuts down.

.4 Set selector switch in "Manual" position and check to ensure proper performance.

3.3 FIELD QUALITY CONTROL (Cont'd)

.5 Set selector switch in "Engine start" position and check to ensure proper performance. Return switch to "Auto" to stop engine.

.6 Set selector switch in "Auto" position and open normal power supply disconnect. Standby should start, come up to rated voltage and frequency, and then load should transfer to standby. Allow to operate for 10 minutes, then close main power supply disconnect. Load should transfer back to normal power supply and standby should shutdown.

.7 Repeat, at 1 hour intervals, 3 times, complete test with selector switch in each position, for each test.

3.4 TRAINING

.1 Provide training for operation personnel by manufacturer certified technician. Minimum training duration is 1 day (including generator).

3.5 CLEANING

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

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

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 26 05 00 - Common work Results For Electrical.

1.2 REFERENCES

.1 CSA Group
.1 CAN/CSA-C22.2 No.130-2016, Requirements for Electrical Resistance Heating Cables and Heating Device Sets.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 Submittal Procedures.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for electric radiant heating and include product characteristics, performance criteria, physical size, finish and limitations.

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

1.4 CLOSEOUT SUBMITTALS

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

.2 Operation and Maintenance Data: submit operation and maintenance data for electric radiant heating for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

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

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

1.5 DELIVERY, STORAGE AND HANDLING (Cont'd)

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

.4 Develop Waste Reduction Workplan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse pallets, crates, padding, and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 GENERAL

.1 Heating cables: existing to remain.

2.2 ACCESSORIES

.1 Roof clips to hold cables in place when installed on roof.

2.3 SNOW SENSING CONTROLS

.1 Snow sensing controls consisting of control unit and sensor module.

.2 System features as follows:
.1 Lowering of outside air temperature to selected dial setting to close contacts of variable thermal control in control unit and activate solid state module.
.2 Thermal control in sensor module, responsive to outer surface temperature, to control heater to maintain temperature above freezing point.
.3 Snow falling on heated sensor module to melt, allowing sufficient current to close magnetic relay and complete circuit to control unit output lines, energizing cable installation.

2.3 SNOW SENSING CONTROLS (Cont'd)

.2 (Cont'd)
.4 Control unit complete with manual off-auto control switch, pilot light, and manual temperature setting switching device.
.5 Control module rating: 120 V A.C., 5 A.

.3 De-Icing Sensor:
.1 Sensor able to detect: precipitation, blowing snow at ambient temperature at below 3.3°C. Used for roof drain de-icing system.
.2 Operating temperature -40°C to 71°C.
.3 Compatible with provided controller.
.4 24 VAC, class 2 circuit.
.5 provide sensor with cable length as required to allow sensor to be mounted in roof drain pipe.

.4 Snow Melting and De-Icing Controller:
.1 Automatic controller to be used for snow melting system and de-icing system. Controller will automatically control heating cable contactor and shall be compatible with all sensors provided for: de-icing and snow melting systems.
.2 Adjustable hold-on timer (0-10 hours) and integral high-limit temperature sensor.
.3 Wall mounted and rated Nema 3R minimum.
.4 Supply voltage 120 V, 1-ph.
.5 Adjustment range 4°C to 32°C.
.6 Operating temperature -40°C to 71°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 radiant heating electrical cables 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 controller and senor.

.2 Reinstate existing heating cables.

.3 Install cable straps fastened to roof.

.4 Do not alter heating cable length.

.5 Ensure cables do not bunch or cross.

.6 Make power and control connections.

3.3 FIELD QUALITY CONTROL

.1 Tests:
.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
.2 Use 500 V Megger to test cables for continuity and insulation value and record readings as follows:
.1 After installation.
.3 Where resistance of 50 megohms or less is measured, stop work and advise Departmental Representative.

3.4 TRAINING

.1 Provide training for operation personnel by manufacturer certified technician. Minimum training duration is 3 hours.

3.5 CLEANING

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

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

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Archaeological Overview Assessment - Laurier House Site Accessibility /Generator Replacement/Exterior Repairs, FII Project RPA No. 1170.

.2 Ontario Provincial Standard Specification (OPSS).
.1 OPSS.MUNI 1010, Material Specification for Aggregates - Base, Sub-base, Select Subgrade and Backfill Material (November, 2013).

.3 American Society for Testing and Materials International (ASTM)
.1 ASTM C 117-13, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
.2 ASTM C 136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
.3 ASTM D 422-63(2007)e1, Standard Test Method for Particle-Size Analysis of Soils.
.4 ASTM D 698-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ^{3}) (600 kN-m/m ^{3}).
.5 ASTM D 4318-10e1, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.4 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

.5 Reference Documents
.1 Ontario Provincial Standards (OPS) for Roads and Public Works, Ministry of Transportation (MTO), latest edition.

1.2 DEFINITIONS

.1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.

1.2 DEFINITIONS (Cont'd)

.1 (Cont'd)

.1 Rock: solid material in excess of 1.00 m^3 and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95m^3 bucket. Frozen material not classified as rock.

.2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation including dense tills, hardpan and frozen materials.

.2 Topsoil:

.1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

.2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.

.3 Waste material: excavated material unsuitable for use in Work or surplus to requirements.

.4 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.

.5 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.

.6 Unsuitable materials:

.1 Weak, chemically unstable, and compressible materials.

.2 Frost susceptible materials:

.1 Fine grained soils with plasticity index less than 10 when tested to ASTM D 4318-10, and gradation within limits specified when tested to ASTM D 422-63(2007) and ASTM C 136-06: Sieve sizes to CAN/CGSB-8.2-M88.

1.2 DEFINITIONS (Cont'd)

.6 (Cont'd)

.2 (Cont'd)

.2 Table:

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 - 100
0.02 mm	10 - 80
0.005 mm	0 - 45

.3 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.

.7 Unshrinkable fill: very weak mixture of Portland cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

1.3 SUBMITTALS

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

.2 Quality Control: in accordance with Section 01 45 00 - Quality Control.

.1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this section.

.2 Submit to Departmental Representative written notice when bottom of excavation is reached.

.3 Submit to Departmental Representative testing inspection results and report as described in PART 3 of this section.

.3 Preconstruction Submittals:

.1 Submit construction equipment list for major equipment to be used in this section prior to start of work.

.2 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field clearance record from utility authority location plan of relocated and abandoned services, as required.

.3 Product Data: Submit manufacturer's instructions, printed product literature and data sheets for aggregate materials and included product characteristics, performance criteria, physical size, finish and limitations.

1.4 QUALITY ASSURANCE

.1 Qualification Statement: submit proof of insurance coverage for professional liability.

.2 For design of any temporary structures submit design and supporting data at least 2 weeks prior to beginning Work.

.3 Engage services of qualified professional Engineer who is registered or licensed in Province of Ontario, Canada in which work is to be carried out to design and inspect shoring, coffer dams, temporary access, bracing and underpinning required for Work.

.4 Contractor's Engineer shall make, check and sign all calculations; check, seal and sign all drawings; inspect temporary structures and systems; and verify their adequacy and safety.

.5 Keep design and supporting data on site.

1.5 EXISTING CONDITIONS

.1 Existing buried utilities and structures:
.1 Before commencing work obtain all required digging permits from local utilities, and verify and establish location of buried services on and adjacent to site.
.2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
.3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
.4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
.5 Prior to beginning excavation Work, notify applicable owner or authorities to clearly mark such locations to prevent disturbance during Work.
.6 Confirm locations of buried utilities by hand digging or careful test excavations in presence of Departmental Representative. Hand dig all cables one metre either side of cable prior to machine excavation.

1.5 EXISTING CONDITIONS (Cont'd)

.1 (Cont'd)

.7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.

.8 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing or otherwise disturbing utilities or structures.

.9 Record location of maintained, re-routed and abandoned underground lines.

.2 Existing buildings and surface features:

.1 Conduct, with Departmental Representative, condition survey of existing buildings, fencing, service poles, wires, lighting fixtures, pavement, survey benchmarks and monuments, and all other surface features which may be affected by Work.

.2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.

.3 Protect existing asphalt and concrete pavements which may be affected by Work from damage while work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.

.4 Observe and obey areas on site identified as No-Go zones as delineated by Parks Canada Representatives. No construction activities are permitted in these areas without proper ground surface protection and Departmental approval.

.5 Restrict vehicular access and staging areas to present-day roadways, parking lots and pathways, unless approved otherwise by Parks Canada.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Engineered Fill: Granular A (Base) and Granular B - Type II (Subbase) OPSS.MUNI 1010.

2.1 MATERIALS (Cont'd)

.2 Select backfill material: from excavations or other sources, approved by the Departmental Representative for use intended, unfrozen and free from rocks larger than 80 mm, cinders, ashes, sods, organics, peat, refuse or other deleterious materials.

PART 3 - EXECUTION

3.1 SITE PREPARATION

.1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

3.2 STOCKPILING

.1 Stockpile fill materials in areas designated by Departmental Representative.
.1 Stockpile granular materials in manner to prevent segregation.

.2 Protect fill materials from contamination.

3.3 COFFERDAMS, SHORING, BRACING AND UNDERPINNING

.1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 29.06 - Health and Safety Requirements.

3.4 DEWATERING AND HEAVE PREVENTION

.1 Keep excavations free of water while Work is in progress.

.2 Protect open excavations against flooding and damage due to surface run-off.

.3 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures to approved runoff areas and in manner not detrimental to public and private property, existing facilities, or portion of Work completed or under construction.
.1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

3.5 EXCAVATION

.1 Excavate to lines, grades, elevations and dimensions as indicated.

3.5 EXCAVATION
(Cont'd)

.2 Excavation must not interfere with normal 45 degree spray of bearing capacity of adjacent foundations.

.3 Do not disturb soil within branch spread of trees or shrubs that are to remain.
.1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.

.4 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than what can be completed in two (2) working days.

.5 Hoard excavations as required to present exposure to precipitation and/or freezing conditions. Frozen soil shall be replaced prior to backfilling at no cost to owner.

.6 Keep excavated and stockpiled materials safe distance away from edge of trench.

.7 Restrict vehicle operations directly adjacent to open trenches.

.8 Dispose of surplus and unsuitable excavated material at approved location off site. Comply with applicable provincial and municipal regulations.

.9 Do not obstruct flow of surface drainage or natural watercourses, expect where permitted.

.10 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

.11 Notify Departmental Representative when bottom of excavation is reached and/or appears unsuitable and proceed as directed by Departmental Representative.

.12 Obtain Departmental Representative's approval of completed excavation.

3.5 EXCAVATION (Cont'd)

.13 If encountered, remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
.1 Replace excavated material with compacted Engineered Fill compacted to no less than 98% Standard Proctor maximum dry density.

.14 Correct unauthorized over-excavation as follows:
.1 Fill under areas with Engineered Fill compacted to not less than 98% of Standard Proctor Maximum Dry Density.

.15 Hand trim, make firm and remove loose material and debris from excavations.
.1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
.2 Clean out rock seams and fill with concrete mortar or grout to approval of Departmental Representative.

.16 Cease work and notify Departmental Representative immediately upon the discovery of any significant features (ie. structural remains, and/or high artifact concentrations) during excavation activities.

3.6 FILL TYPES AND COMPACTION

.1 Use types of fill as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D 698.
.1 Adjacent Foundation Wall and Below Slab-On-Grade: Engineered Fill, placed in uniform layers not exceeding 200m compacted thickness up to grades indicated to allow for surface treatment. Compact to no less than 98% maximum dry density.

3.7 BACKFILLING

.1 Do not proceed with backfilling operations until completion of following:
.1 Departmental Representative has inspected and approved installations.

3.7 BACKFILLING (Cont'd)

.1 (Cont'd)
.2 Inspection, testing, approval, and recording location of underground utilities.
.3 Removal of shoring and bracing; backfilling of voids with satisfactory material.

.2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

.3 Do not use backfill material which is frozen or contains ice, snow or debris.

.4 Place backfill material in uniform layers. Compact each layer before placing succeeding layer.

3.8 RESTORATION

.1 Upon completion of Work, remove waste materials and debris, trim slopes, and correct defects as directed by Departmental Representative.

.2 Replace topsoil, seed or sod and fertilize as indicated.

.3 Clean and reinstate areas affected by Work as directed by Departmental Representative.

.4 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results For Electrical.

.2 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

.3 Section 26 05 43.01 - Installations of Cables in Trenches and in Ducts.

1.2 REFERENCES

.1 CSA C22.2 No. 211.2-06(R2016), Rigid PVC (Unplasticized) Conduit.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:
.1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 QUALITY ASSURANCE

.1 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.
.1 Certificates: signed by manufacturer certifying materials comply with specified performance characteristics and physical properties.
.2 Manufacturer's Instructions: for installation and special handling criteria, installation sequence, cleaning procedures.

1.5 DELIVERY, STORAGE AND HANDLING

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

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

1.5 DELIVERY, STORAGE AND HANDLING (Cont'd)

.3 Packaging Waste Management: remove for reuse pallets crates padding and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 PVC DUCTS AND FITTINGS

.1 Rigid PVC conduit, for direct burial expanded flange ends, Trade size as indicated.
.1 Nominal length: 3 m plus or minus 12 mm.

.2 Rigid PVC split ducts.

.3 Rigid PVC bends, couplings, reducers, bell end fittings, plugs, caps, adaptors same product material as duct, to make a complete installation.

.4 Rigid PVC 90 degrees, 45 degrees bends and 5 degrees angle couplings as required.

2.2 SOLVENT WELD COMPOUND

.1 Solvent cement for PVC duct joints.

2.3 CABLE PULLING EQUIPMENT

.1 6 mm stranded nylon pull rope tensile strength 5 kN.

2.4 MARKERS

.1 Concrete type cable markers: as indicated, with words: "Cable", "Joint" or "Conduit" impressed in top surface, with arrows to indicate change in direction of duct runs.

2.5 WARNING TAPE

.1 Standard 4-mil polyethylene 76 mm wide tape,red and yellow with black letters, imprinted with respectively "CAUTION BURIED ELECTRIC CABLE BELOW " and 'CAUTION BURIED GAS LINE BELOW".

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 duct in accordance with manufacturer's instructions and at elevations as indicated.

.2 Clean inside of ducts before laying.

.3 Install plastic duct spacers and ensure full, even support every 1.5 m and smooth transition throughout duct length.

.4 Slope ducts with 1 to 400 minimum slope.

.5 Install plugs and cap both ends of ducts to prevent entrance of foreign materials during and after construction.

.6 Pull through each duct wooden mandrel not less than 300 mm long and of diameter 6 mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign material.
.1 Pull stiff bristle brush through each duct immediately before pulling-in cables.

.7 Install a pull rope continuous throughout each duct run with 3 m spare rope at each end.

.8 Place continuous strip of warning tape above duct before backfilling trenches.

.9 Install markers at point where conduits leave building.

.10 Notify the Departmental Representative for field review upon completion of direct buried ducts and obtain acceptance prior to backfill.

3.3 CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.

.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 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

Appendix A

Attestation and Proof of Compliance
with Occupational Health and Safety (OHS)

Attestation and Proof of Compliance with Occupational Health and Safety (OHS)

Submission of this completed form, satisfactory to Parks Canada, is a condition of gaining access to the work place.

Instructions:

Prime contractor must sign this form for all projects undertaken at Parks Canada work places.

This form is to be administered by the Project Manager and completed by the Prime Contractor AFTER contract award.

Parks Canada recognizes that federal OHS legislation places certain specific responsibilities upon Parks Canada as owner of the work place. In order to meet those responsibilities, Parks Canada is implementing a contractor safety regime that will ensure that roles and responsibilities assigned under Part II of the *Canada Labour Code* and the *Canada Occupational Health and Safety Regulations* are implemented and observed when involving contractor(s) to undertake works in Parks Canada work places.

Parks Canada Responsible Authority/Project Lead	Address	Contact Information
Project Manager/Contracting Authority (delete as required)		
Prime Contractor		
Subcontractor(s) (add additional fields as required)		

Location of Work

General Description of Work to be Completed

Mark “Yes” where applicable.

	A meeting has been held to discuss hazards and access to the work place and all known and foreseeable hazards have been identified to the contractor and/or subcontractor(s)
	The contractor and/or its subcontractor(s) will comply with all federal and provincial/territorial legislation and Parks Canada's policies and procedures, regarding occupational health and safety.
	The contractor and/or its subcontractor(s) will provide all prescribed safety materials, equipment, devices and clothing.
	The contractor and/or its subcontractor(s) will ensure that its employees are familiar with and use all prescribed safety materials, equipment, devices and clothing at all times.
	The contractor and/or its subcontractor(s) will ensure that its activities do not endanger the health and safety of Parks Canada employees.
	The contractor and/or its subcontractor(s) has inspected the site and has carried out a hazard assessment and has put in place a health and safety plan and informed its employees accordingly, prior to the commencement of the work.
	Where a contractor and/or its subcontractor(s) will be storing, handling or using hazardous substances in the work place, it will place warning signs at access points warning persons of the presence of the substances and any precautions to be taken to prevent or reduce any hazard of injury or death.
	The contractor and/or its subcontractor(s) will ensure that its employees are instructed in respect of any emergency procedures applicable to the site.

I, _____ (contractor), certify that I have read, understood and attest that my firm, employees and all sub-contractors will comply with the requirements set out in this document and the terms and conditions of the contract.

Name _____ Signature _____

Date _____

Appendix B

Designated Substances Report
(PWGSC – 2014-06-30)

Public Works and Government Services Canada
Travaux publics et Services gouvernementaux Canada

Canada

Respect • Integrity • Excellence • Leadership

Serving GOVERNMENT, Serving CANADIANS.

Designated Substances Report, Repair of Interior and Exterior Finishes, Laurier House, Corner of Laurier and Chapel Streets, Ottawa, ON Summary Report

2014-06-30

Public Works and Government Services Canada
Real Property Branch
Professional and Technical Service Management
Environmental Services Directorate

Prepared for: Rob Sheldrick
Senior Maintenance Management Specialist, PWGSC

Prepared by: Cyprien Amani
Environmental Services Directorate
Professional and Technical Service Management
Real Property Branch

On June 04, 2014, the Canada Labour Code – Building Environment Unit (CLC-BE) of Public Works and Government Services Canada (PWGSC) was retained by Rob Sheldrick, Senior Maintenance Management Specialist at PWGSC's Real Property Branch (RPB), to conduct a Designated Substances Report (DSR) for the repairing of some interior and exterior finishes of Laurier House, located at the corner of Laurier and Chapel Streets, in Ottawa, Ontario.

This Designated Substances Report (DSR) was prepared in order to meet the requirements of the *Canada Labour Code* under Part II, Section 124 which stipulates that "*every employer shall ensure that the health and safety at work of every person employed by the employer is protected*". Furthermore, Section 125(1) (z.14) of the *Canada Labour Code* stipulates that the employer, to the extent that he controls the activity, "*will take all reasonable care to ensure that all persons granted access to the work place, other than the employer's employees, are informed of every known or foreseeable health and safety hazard to which they are likely to be exposed in the work place*". In addition, this DSR was performed to meet the requirements of Section 30 of the Ontario *Occupational Health and Safety Act*, Revised Statutes of Ontario, 1990, Chapter 0.1.

By having a DSR completed, the Departmental Representative will be able to inform his or her employees, contractors, and tenants of any designated substances that may be present and possibly disturbed throughout the duration of the project. Polychlorinated Biphenyls (PCBs) and halocarbons, although not designated substances, were considered in order to identify the need to comply with applicable environmental legislation.

The scope of work for the project consists of repairing some finishes of the interior and exterior of Laurier House.

The project areas are:

- the West visitors door ,
- the pipe close to the visitor's entry door,
- the ground floor kitchen's cupboard,
- the base of the kitchen's cupboard,
- the front façade of Laurier House,
- the wood structure of the front façade of Laurier House, and
- the inside corridor door.

On June 18, 2014, a visual inspection of building materials within the project area was completed and materials that were suspected of containing designated substances were sampled. All samples collected were submitted for analysis to the EXOVA Laboratory (accredited by the Canadian Association for Laboratory Accreditation (CALA) and National Voluntary Laboratory Accreditation Program (NAVLAP)) located at 146 Colonnade Road, Unit 8, Ottawa, Ontario.

The following summary outlines the findings resulting from the visual inspection and the analysis of samples collected.

ASBESTOS

In Ontario, a material is defined as an Asbestos-Containing Material (ACM) if the material has minimum asbestos content of 0.5 per cent by dry weight. If materials are suspected to contain asbestos based on visual identification, they must be treated as asbestos-containing, unless laboratory analysis of the prescribed number of samples proves otherwise, as per *Ontario Regulation 278/05 – Asbestos on Construction Projects and in Buildings and Repair Operations* (*O.Reg. 278/05*), as amended.

Twelve (12) bulk samples of suspected ACMs were collected in order to satisfy the requirements of *O. Reg. 278/05* (as amended) and analyzed using Polarized Light Microscopy (PLM). This analytical method complies with the United States Environmental Protection Agency (U.S. EPA) Method 600/R-93/116.

The results from the sampling indicate that no asbestos was identified in samples of plaster, ceiling tile, mortar or caulking collected within the project area defined above.

Table 1 summarizes the analytical results of building material samples collected from the project area that were analyzed for asbestos content.

Table 1: Results of asbestos samples analyzed by Polarized Light Microscopy (PLM)

Sample ID	Material	Location	Asbestos Type	Asbestos content (%)
LAURIERH-AS-1A	Caulking	Base of the kitchen's cupboard	n/d	n/a
LAURIERH -AS-1B			n/d	n/a
LAURIERH -AS-1C			n/d	n/a
LAURIERH -AS-2A	Plaster	Inside walkway's wall close to the door	n/d	n/a
LAURIERH -AS-2B			n/d	n/a
LAURIERH -AS-2C			n/d	n/a
LAURIERH -AS-3A	Caulking	Wall close to the entry door of Laurier House	n/d	n/a
LAURIERH -AS-3B			n/d	n/a
LAURIERH -AS-3C			n/d	n/a
LAURIERH -AS-4A	Caulking	Window over the west entry door	n/d	n/a
LAURIERH -AS-4B			n/d	n/a
LAURIERH -AS-4C			n/d	n/a

n/d = none detected, n/a = not applicable

LEAD

Laboratory analysis results indicate that the green (LAURIERH-Pb-1), the beige (LAURIERH-Pb-2), (LAURIERH-Pb-3), (LAURIERH-Pb-4), (LAURIERH-Pb-5) and the grey (LAURIERH-Pb-6) paints samples collected from the West entry door, the pipe close to the West entry door, the kitchen's cupboard, the visitor entry door's wall, the front façade of Laurier House, the wood structure of the front façade of Laurier House in the project area all have a lead content above the 90 ppm threshold outlined in the *Canada Consumer Product Safety Act's Surface Coating Materials Regulations SOR/2005-109* (as amended).

Six (6) bulk samples of paint suspected of containing lead were collected and analyzed using Inductively Coupled Plasma – Mass Spectrometry (ICP-MS) in accordance with U.S. EPA Method 6010-C.

Table 2 summarizes the analytical results of the paint samples collected from the project area that were analyzed for lead content.

Table 2: Results of lead paint samples analyzed by Inductively Coupled Plasma-Mass Spectrometry (ICP-MS)

Sample ID	Description	Location	Lead Content (ppm)
LAURIERH-Pb-1	**Green Paint**	**West entry door**	**180**
LAURIERH-Pb-2	**Beige Paint**	**Pipe close to the west entry door**	**50700**
LAURIERH-Pb-3	**Beige Paint**	**Kitchen's cupboard**	**2010**
LAURIERH-Pb-4	**Beige Paint**	**Visitor entry door's wall**	**42300**
LAURIERH-Pb-5	**Green Paint**	**Front façade of the Laurier House**	**55700**
LAURIERH-Pb-6	**Grey paint**	**Wood structure of the front façade of Laurier House**	**180**

Bold items exceed the 90 parts per million (ppm) limit for lead, as per *Canada Consumer Product Act's Surface Coating Materials Regulations (SOR/2005-109) (as amended) Should all be bold????*

Recommendations:

The Occupational Health and Safety (OHS) Branch of the Ontario Ministry of Labour (MoL) has published the document entitled "*Guideline: Lead on Construction Projects*". This document classifies the disturbance of materials containing lead as Type 1, Type 2a/2b or Type 3a/3b work, and assigns different levels of respiratory protection and work procedures for each classification. These procedures shall be followed when performing work involving the disturbance of lead-containing materials. It is recommended conducting a risk assessment to assess the potential for high levels of lead exposure and to determine the appropriate precautionary measures that would need to be followed.

"Designated Substances" O. Reg 490/09 as amended

Waste containing lead must be disposed of according to The *Ontario General – Waste Management Regulation, O.Reg 347/90*.

The *Federal Transportation of Dangerous Goods Act* controls the transport of the waste to a disposal site.

SILICA

Free crystalline silica is found in concrete and plaster within the project area. Appropriate work practices including adequate ventilation and respiratory protection must be utilized during the demolition and modification of these structures as per "Designated Substances" *O.Reg 490/09* as amended.

Recommendations:

The Occupational Health and Safety (OHS) Branch of the Ontario Ministry of Labour (MoL) has published the document entitled "*Guideline: Silica on Construction Projects"*. This document classifies the disturbance of materials containing silica as Type 1, Type 2 or Type 3 work, and assigns different levels of respiratory protection and work procedures for each classification. These procedures should be followed when performing work involving the disturbance of silica-containing materials.

The following substances are not suspected to be present in forms or quantities that would impact the project**:**

- Acrylonitrile**,**
- Arsenic,
- Benzene,
- Coke Oven Emissions,
- Ethylene Oxide,
- Isocyanates,

- Mercury,
- Vinyl Chloride,
- PCBs,
- Halocarbons.

SURVEY LIMITATIONS

The visual inspection was limited to readily accessible areas. Destructive testing was not included in the investigation; therefore, it is possible that designated substances are present in non-accessible areas and/or concealed. Should such spaces be demolished or disturbed during project activities, it is recommended that additional inspection and/or sampling be performed. Likewise, should any designated substance be encountered in the course of demolition or renovation work, work shall be stopped, precautionary measures taken, and the PWGSC Departmental Representative notified immediately. Do not proceed until written instructions have been received.

The Designated Substance Specification Report is provided in a separate document for your tender package