LIST OF DRAWINGS

LANDSCAPING

L-1 EXISTING CONTEXT AND LIMITS OF WORK

ARCHITECTURAL

A100 LOCATION PLAN
A101 STAIR TOWER PLANS
A102 STAIR TOWER PLANS
A103 STAIR TOWER ELEVATIONS
A104 STAIR TOWER SECTIONS
A105 STAIR TOWER SECTIONS
A106 STAIR TOWER SECTIONS AND DETAILS
A107 STAIR TOWER DETAILS

STRUCTURAL

S100 STAIR TOWER FOUNDATION PLAN, SECTIONS AND DETAILS
S101 STAIR TOWER FRAMING PLANS
S102 STAIR TOWER FRAMING PLANS AND SECTIONS
S103 STAIR TOWER FRAMING ELEVATIONS, SECTIONS AND DETAILS
S104 STAIR TOWER SHADE SAIL ANCHOR LAYOUT AND DETAIL

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

.1 Work under this Contract includes the supply of all materials, labour, energy and equipment for upgrades to the infrastructure at the Tip area located within Pt Pelee National Park near Leamington, Ontario.

.2 This section compliments applicable sections of General Information to Tenderers, as well as the remainder of the Contract Documents.

1.2 DOCUMENTS REQUIRED

.1 Maintain at the job site, one copy each of following:
- .1 Full size contract Drawings.
- .2 Specifications.
- .3 Addenda.
- .4 Reviewed Shop Drawings.
- .5 Change Orders.
- .6 Other modifications to Contract.
- .7 Field Test Reports.
- .8 Copy of approved work schedule.
- .9 Manufacturers' installation and application instructions.

1.3 SITE CONDITIONS

.1 A site visit is scheduled as provided in the Tender Notice.

1.4 COST BREAKDOWN

.1 Cost breakdown provided in the Form of Tender will be used as basis for Progress Payment.

1.5 CONTRACTOR'S USE OF SITE

.1 Use of site: exclusive for execution of work within the limits identified on the drawings. The Tip Area will be in operation for part of the contract period. However based on construction schedule and contractor needs, selective closures of the area may be granted during construction only if confirmed in writing in advance.

.2 The site contains plant species and animal species that are considered endangered and/or protected. Construction storage, staging and/or excavations are to be done with care and with as little disturbance as possible, and only in pre-authorized areas,

.3 Do not unreasonably encumber site with materials or equipment.

1.6 CODES AND STANDARDS

.1 Construction of this project shall meet the requirements of the following statutes and most recent editions of codes:
- .1 Occupational Health and Safety Act and latest Ontario Regulations for construction projects.
- .2 The Building Code Act and Ontario Regulation 925.
- .3 National Building Code of Canada.
- .4 National Fire Code.
- .5 Ontario Electrical Safety Code.

.2 For the purpose of the Occupational Health and Safety Act, the Contractor for this project will be designated "Constructor" and shall assume the responsibility of the Constructor as set out in the Act and its regulations.

.3 The Department Representative or designate will monitor the quality and quantity of work, undertake inspections for compliance with specifications and plans, check grades and perform such similar work. Parks Canada, the Department Representative or designate will NOT be a "Constructor" by reason thereof.

.4 Complete and file all registration and notification forms at the Ministry of Labour with the information required under Section 4 of the Ontario Regulation 213/91 or latest prior to commencing work.

1.7 PERMITS

.1 Apply for, obtain and pay for all permits that are required for the project, including but not limited to plumbing and hydro permits. Parks Canada will arrange for the building permit review.

.2 The Department Representative or designate will provide a clean set of Departmental Drawings and/or Specifications for each such application as required.

.3 Arrange and pay for inspections required under permits, including but not limited to the building permit, plumbing, and electrical certificates.

.4 Arrange for regular inspections and a final inspection with the local Hydro Authority/ESA Inspector.

1.8 SETTING OUT OF WORK

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

1.9 LOCATION OF EQUIPMENT AND FIXTURES

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

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

.3 Inform the Department Representative or designate of impending installation and obtain his approval for actual location.

.4 Submit field Drawings to indicate relative position of various services and equipment when required by the Department Representative or designate.

1.10 CONCEALMENT

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

1.11 CUTTING, FITTING AND PATCHING

.1 Execute cutting (including excavation), fitting and patching required to make work fit properly.

.2 Where new work connects with existing and where existing work is altered, cut, patch and make good to match existing work.

.3 Obtain Department Representative or designate's approval before cutting, boring or sleeving load-bearing members and before attaching new installations and/or supports to load-bearing members.

.4 Make cuts with clean, true, smooth edges. Make patches inconspicuous in final assembly.

.5 Fit work airtight to pipes, sleeves, ducts and conduits.

1.12 CO-ORDINATION OF TRADES

.1 Co-ordinate all architectural, mechanical, electrical and structural works for equipment being installed, provide openings in walls and structures for pipes and conduits and excavate and backfill, all in a timely manner so that all the work proceeds expeditiously.

1.13 PRECEDENCE OF DOCUMENTS

.1 In the event of any conflicts or inconsistencies in the provisions of Departmental Documents, such provisions shall take precedence and govern in the order shown in Article 2 of the General Special Provisions.

.2 Figured dimensions shown on a drawing shall govern even though they may differ from dimensions scaled on the same drawing. Drawings of larger scale shall govern over those of smaller scale on the same date. Detailed Drawings take precedence over General Drawings.

.3 Division 1 shall govern over all other Divisions of the Departmental Technical Specifications.

PART 1 PRODUCTS – NOT APPLICABLE

PART 2 EXECUTION – NOT APPLICABLE

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

.1 This Section outlines generally the work to be executed under the Contract.

.2 Supervise, organize, co-ordinate and direct all construction operations of sub-trades and suppliers.

.3 Provide, install and put in continuous successful operation all equipment and appurtenances. Provide operating assistance to the Department Representative or designate as described herein.

.4 In addition to constructing the works shown on the Drawings, design, construct, maintain and, unless otherwise specified or shown on the Drawings, remove when construction is completed all temporary works and facilities required for the construction of the works.

1.2 GENERAL

.1 The work consists but not limited to:

- .1 Erect temporary barriers and protection to ensure safety of the public and workers at all times and to prevent damage to the site, buildings and contents from environmental effects such as temperature, rain, wind, snow and ice.
- .2 Selective demolition to remove items not required for the completed work or to temporarily access areas of the structures for the installation of new materials and equipment.
- .3 Landscape work includes upgrades to the shuttle drop off near the washrooms and new construction at the base of the new observation tower plus connecting walk ways.
- .4 Work at TIP Experience area (southernmost point of land in Canada).
- .5 New observation tower, including foundations, fabrication and erection.
- .6 Clean up of site, removal of temporary works, and disposal of surplus and waste materials.

.2 Site clearing will be by Parks Canada staff in cooperation with General Contractor. Site disturbance is to be kept to the minimum.

.3 All new planting will be by Parks Canada staff at completion of the project in cooperation with General Contractor.

1.3 WORK TO CONFORM

.1 All work shall be built in a thoroughly substantial and workmanlike manner, in accordance with the Specifications, subject to such modifications and additions as may be deemed necessary during its execution. In no case shall any work in excess of the requirements of the Specifications be paid for unless approved in writing.

1.4 BASIS OF PAYMENT

.1 Payment for the various work components is to be included in the Lump Sum Price items in the Form of Tender, which will serve as the Schedule for payment in normal circumstances.

.2 The Lump Sum Price and Extended Pricing shall cover supply of all labour, materials, tools, tests, calibration, equipment, and documentation including manufacturers' representatives, as specified, and/or required for all the components.

.3 Cost of remedying faults and correcting deficiencies, attributable to the Contractor shall be at Contractor's expense.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

.1 This section specifies the requirements for scheduled preconstruction and progress meetings.

1.2 ADMINISTRATIVE

.1 The Department Representative or designate will schedule project meetings throughout the progress of the Work.

.2 The Department Representative or designate will prepare agenda for meetings.

.3 The Department Representative or designate will provide physical space for meetings at a facility close to the site.

.4 The Department Representative or designate shall preside at meetings.

.5 The Contractor shall record and distribute the minutes. These minutes shall include significant proceedings and decisions and identify "action by" parties.

.6 The Contractor will reproduce and distribute copies of minutes within five days after each meeting and transmit to meeting participants, affected parties not in attendance and the Department Representative or designate.

.7 Representatives of Contractor, Subcontractor and suppliers when requested to attend meetings shall be qualified and authorized to act on behalf of the party each represents.

1.3 PRECONSTRUCTION MEETING

.1 After award of the Contract, the Department Representative or designate will request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.

.2 Senior representatives of the Department Representative or designate, Contractor, major Subcontractors, field inspectors and supervisors shall be in attendance.

.3 The Department Representative or designate will establish the time and location of meeting and notify parties concerned.

.4 Preconstruction meeting agenda may include the following:
- .1 Appointment of official representative of participants in the Work.
- .2 Schedule of Work, progress scheduling in Gantt chart format.
- .3 Schedule of submission of Shop Drawings and samples.

.4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences, sediment control.
.5 Delivery schedule of specified equipment.
.6 Site security.
.7 Contemplated Change Notices, Change Orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
.8 Departmental Representative or designate-provided equipment.
.9 Record Drawings.
.10 Maintenance manuals.
.11 Take-over procedures, acceptance, warranties.
.12 Monthly Progress Claims, administrative procedures, photographs, holdbacks.
.13 Appointment of inspection and testing agencies or firms.
.14 Insurances, transcript of policies.
.15 Health and Safety.
.16 Environmental procedures.

1.4 PROGRESS MEETINGS

.1 During course of Work, the Department Representative or designate will schedule regular progress review meetings, generally at two week intervals.

.2 Contractor, major Subcontractors involved in Work and Department Representative or designate are to be in attendance.

.3 The Contractor will record minutes of meetings and circulate to attending parties and affected parties not in attendance.

.4 Project progress review meeting agenda to include the following:
.1 Review, approval of minutes of previous meeting.
.2 Review of Work progress since previous meeting.
.3 Field observations, problems, conflicts.
.4 Problems which impede construction schedule.
.5 Review of off-site fabrication delivery schedules.
.6 Corrective measures and procedures to regain projected schedule.
.7 Revisions to construction schedule.
.8 Progress, schedule, during succeeding work period.
.9 Review submittal schedules: expedite as required.
.10 Maintenance of quality standards.
.11 Pending changes and substitutions.
.12 Review proposed changes for effect on construction schedule and on completion date.
.13 Review Occupational Health and Safety issues.
.14 Review Environmental Plan, procedures and issues.

1.5 BASIS OF PAYMENT

.1 Payment for Project Meetings is to be included in Lump Sum Price bid in Form of Tender for construction.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

.1 This Section specifies general requirements and procedures for Contractors' submissions of Shop Drawings, product data and samples to the Department Representative or designate for review. Additional specific requirements for submissions are specified in individual Sections of the specifications.

.2 Do not proceed with work until relevant submissions are reviewed by Department Representative or designate.

.3 Present Shop Drawings, product data and samples in SI Metric units.

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

.5 Contractor's responsibility for errors and omissions in submission is not relieved by Department Representative or designate's review of submissions.

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

.7 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Department Representative or designate's review of submission, unless Department Representative or designate gives written acceptance of specific deviations.

.8 Make any changes in submissions which Department Representative or designate may require consistent with Contract Documents and resubmit as directed by Department Representative or designate.

.9 Notify Department Representative or designate, in writing, when resubmitting, of any revisions other than those requested by Department Representative or designate.

1.2 SUBMISSION REQUIREMENTS

.1 The General Contractor shall submit shop drawings via email (email addresses to be provided at the time of the pre-construction meeting) using the electronic "Shop Drawings Submission Form". Returned shop drawings shall also be returned via email.

.2 The General Contractor is responsible for coordination among all trades of all submissions and is to verify the dimensions and conditions for the work prior to submitting the shop drawings for approval.

.3 Submittals shall be made with reasonable promptness and in accordance with the approved Work and submission schedules. Failure to submit in ample time shall not be considered cause for any extension of Contract Time.

.4 Coordinate each submission with requirements of work and Contract Documents. Individual submissions will not be reviewed until all related information is available. Review all documents before submission to the Department Representative or designate. Submissions must be complete for each system. Partial systems will not be reviewed.

.5 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.

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

.13 Completed Equipment Data Sheets as noted in the Contract Specifications.

.7 After Department Representative or designate's review, distribute electronic copies via email.

.8 Submit copies of shop drawings for each requirement requested in specification Sections and as Department Representative or designate may reasonably request.

.9 Submit copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Department Representative or designate where shop drawings will not be prepared due to standardized manufacture of product.

.10 Submit copies of manufacturer’s instructions for requirements requested in specification Sections and as requested by Department Representative or designate.

.1 Pre-printed material describing recommended installation requirements for the product, system or material, including offloading and storage requirements, manufacturer recommended spare parts, special notices and Material Safety Data Sheets concerning impedances, and hazards and safety precautions.

.11 Submit copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Department Representative or designate.

.12 Delete information not applicable to project.

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

.14 If upon review by Department Representative or designate, 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.

.15 Do not proceed with work affected by submittals until review is complete.

1.3 SHOP DRAWINGS

.1 Shop Drawings: original Drawings, or modified standard Drawings provided by Contractor, to illustrate details of portions of Work, which are specific to project requirements.

.2 All shop drawings shall be provided via email in electronic form.

.3 Submit one (1) Adobe Acrobat format file (*.pdf) or AutoCAD 2012 or later version (*.dwg) file of drawings, data sheets, etc. for review by the Department Representative or designate.

.4 Identify each shop drawing giving reference such as:
- .1 Project name and location.
- .2 Section of specifications where specified.
- .3 Location where equipment or material is to be installed.
- .4 Name of Sub-Contractor or supplier.
- .5 Other relevant information.

.5 Check and initial all drawings before submission to the Department Representative or designate. Shop drawings will not be reviewed by the Department Representative or designate unless they have been previously checked and initialed by the Contractor.

.6 Shop drawings to detail completely equipment to be installed and components thereof, including the location and type of process connections and mounting hardware.

.7 Shop Drawings shall be complete in all respects and show clear compliance with the Specifications. Where applicable, performance figures of equipment, finishes and reference to other relevant Drawings must be noted on the Shop Drawings. Details of ancillary items being supplied with the particular equipment must be submitted. Piecemeal submissions will not be considered.

.8 Equipment with electrical or electric components:
- .1 Shop drawings of equipment furnished with electrical controls or devices are to include electrical wiring diagrams with the Bill or Materials showing manufacturer's catalogue numbers and other rating data required for all relays, timers, starters and other electrical components.
- .2 Electric circuit diagrams to show complete electrical ratings for all electronic components adjacent to components in diagram as well as universal generic and manufacturer's parts numbers.

.9 All dimensions must be shown in metric units unless otherwise indicated.

.10 Revision of Shop Drawings:
- .1 Make corrections or changes required by Department Representative or designate and re-submit one (1) electronic copy of revised drawings as per above. When resubmitting, notify the Department Representative or designate in writing or revisions other than those requested.
- .2 Do not make any changes to shop drawings after final review without written permission of Department Representative or designate.

.11 Review of shop drawings by Department Representative or designate to be construed as gratuitous service to the Contractor. Acceptance of contract implies unequivocal responsibility for all equipment specified and furnished under contract.

.12 Adjustments made on shop drawings by the Department Representative or designate are not intended to change the Contract Price. If adjustments affect the value of work, state such in writing to the Department Representative or designate prior to proceeding with the work.

1.4 PRODUCT DATA

.1 Product data: manufacturers' catalogue sheets, brochures, literature, performance charts and diagrams, used to illustrate standard manufactured products.

.2 Submit required number of copies of product data.

1.5 SAMPLES

.1 Submit review samples to Department Representative or designate as requested in respective specification Sections. Label samples with origin and intended use.

.2 Notify Department Representative or designate in writing, at time of submission of deviations in samples from requirements of Contract Documents.

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

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

.5 Make changes in samples which Department Representative or designate may require, consistent with Contract Documents.

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

1.6 MOCK-UPS

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

1.7 PROGRESS PHOTOGRAPHS

.1 Submit progress photographs of all construction phases.

.2 Record construction details and locations of services prior to concealment.

PART 2 PRODUCTS

2.1 THIS SECTION IS NOT APPLICABLE

PART 3 EXECUTION

3.1 THIS SECTION IS NOT APPLICABLE

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

.1 This Section provides general details about the Contract Drawings and Specifications.

1.2 GENERAL

.1 Upon request, the Contractor will be provided up to five CDs and full size printed sets of Contract Drawings and Technical Specifications at no charge.

.2 Additional sets may be issued upon payment of $25.00 plus GST to cover the cost of reproducing.

1.3 CONTRACT DRAWINGS

.1 Additional Drawings showing details in accordance with which work is to be constructed will be furnished from time to time by the Department Representative or designate and will become part of Contract Documents. Such Drawings are for the information of and assistance to the Contractor and will not become a basis for extra payment. The Department Representative or designate may furnish Drawings covering additional work. These will be identified as such.

.2 Location of utilities shown on Contract Drawings is in accordance with best information available and is not guaranteed.

.3 Obtain required dimensions not shown on Contract Drawings from the Department Representative or designate before proceeding with construction work.

.4 Contract Drawings which bear the general and detailed titles accompany and form part of these Specifications. The Drawings are prepared in SI metric units.

.5 The Drawings shall be read as a whole as details applicable to one Section may appear on the Drawings of another Section or Sections.

.6 Contract Drawings give general location of piping routes and equipment. Except where specific dimensions are indicated, locate all equipment and piping to limit interference with pedestrian access, crane routes and headroom.

1.4 CONTRACT SPECIFICATIONS

.1 For easy reference, the Contract Specifications are divided into Divisions. The Specifications shall be read as a whole as details applicable to one Division may appear in another Division or Divisions. The Contractor shall co-ordinate the work done by sub-trades.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

.1 This Section specifies requirements for preservation and protection of existing services and structures.

1.2 GENERAL

.1 Comply with all requirements and regulations of Road Authorities and Utility Companies especially those pertaining to protective work, inspection and safety.

.2 Allow for specific site protection measures to the environment in the execution of the contract, as defined in Parks Canada environmental policies. Do not allow concrete trucks to empty waste products or discharge water on site other than in contained areas which are to be pumped out and removed off site.

1.3 PROTECTION OF EXISTING STRUCTURES AND PROPERTY

.1 Prevent concrete rinse water runoff by providing temporary containment measures and remove waste from site.

.2 Protect natural areas and foliage adjacent to site from damage during construction.

.3 The Contractor shall be held fully responsible by the Department Representative or designate for any damage to utilities, properties, buildings, or structures adjacent to or in the general area of the work, through settlement of ground, vibration or shock resulting from any cause relating to the work carried out under this Contract. Make good and repair all such damage at own expense.

.4 The Contractor is responsible to field locate, stake and clearly mark in the field all services which are located on or near the line of the proposed work.

.5 The area of work does not contain typical utilities as the area is not serviced by municipal services. The Contractor shall be provided with as built drawings outlining the services that are anticipated to be underground or overhead in the area of construction. The Contractor shall be responsible for daylighting any utility that may be in the area of construction for confirmation of location. The Department Representative or designate should be on-site during daylighting. The Contractor shall then be responsible for marking the location of each utility and maintaining the locations during construction. Services anticipated include hydro from the solar panel array, water from underground water tanks, and sanitary to underground storage tanks.

.6 Sustain in their places and protect from direct or indirect injury, all water and gas mains, public and private sewers and drains, conduits, cables, service pipes, poles, sidewalks, curbs, embankments, structures, equipment and other property in the vicinity of the work.

.7 Sustain and support structures that are uncovered, weakened, endangered or threatened.

.8 Prevent dust and dirt from entering existing buildings or areas where equipment is stored or is operating.

.9 Prevent dust, water or other deleterious substances from entering areas with existing electrical, heating, ventilating, pumping and other equipment. The Contractor will be held responsible for any damage caused by work carried out under this Contract.

.10 Where existing wall sections are removed or where pipes are installed through existing walls or where any dust-generating operation is necessary, provide a suitable temporary wall or enclosure suitably reinforced and sealed to prevent dust entering the existing area. When work is completed, remove temporary dust control device and thoroughly clean all areas affected by the work.

1.4 PROTECTION AGAINST FREEZING

.1 Furnish all necessary equipment and fuel for heating buildings and structures during construction. Maintain a minimum temperature of 13^{o}C in interior areas for mechanical, electrical, painting and other work susceptible to frost damage.

.2 Direct fired, open flame heaters within areas of combustible construction are prohibited.

1.5 PROTECTION, SOUNDNESS AND REPAIR OF NEW CONSTRUCTION

.1 Protect all newly constructed work from damage. Prevent heavy loading of newly constructed work and repair all damage. Construct all works watertight and correct all imperfect work.

.2 If, in the final inspection, any deficiencies are found, repair or replace the defective work. Be responsible for satisfactory maintenance and repair of all work undertaken for the specified guaranteed maintenance period. Protect and store all equipment supplied under this Contract.

1.6 PRECONSTRUCTION SURVEY

.1 Undertake a preconstruction survey of the existing buildings and structures in the vicinity of the proposed construction. Undertake a survey of existing surface finish conditions. Document findings with photographs and in writing to the Department Representative or designate, prior to construction. Unless identified as a pre-existing condition, be responsible for repairing damage due to construction.

1.7 BASIS OF PAYMENT

.1 Cost of all repair to be at Contractor's expense.

.2 Cost of all locates to be at the Contractor’s expense.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION

PART 1 GENERAL

1.1 CONSTRUCTION SAFETY MEASURES

.1 Safety is the Contractor's responsibility. The Contractor will be the "Constructor" as defined in the Occupational Health and Safety Act.

.2 Observe and enforce construction safety measures of National Building Code, latest edition, Part 8, Provincial Government, Workplace Safety & Insurance Board, municipal statutes, WHMIS and local authorities.

.3 Before any work at the site is started, the Contractor shall have prepared a Project-Specific Health and Safety Plan including health and safety precautions and programs, safety of property on site, and for protection of persons adjacent to site and environment to the extent that they may be affected by conduct of Work. The plan shall be complete with respect to procedures and actions that the Contractor needs to follow in order for the Contractor and all others to comply with all applicable laws and regulations.

.4 Contractor to 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.

.5 The Contractor shall designate a qualified and experienced safety representative at the site.

.6 The Contractor shall note that there may be other Contractors working at Point Pelee National Park during the time of this contract. The Contractor shall coordinate through the Department Representative or designate any overlaps in Construction areas and address Health and Safety requirements appropriately.

1.2 SUBMITTALS

.1 Make submittals in accordance with Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.

.2 Submit site-specific Health and Safety Plan within seven days after date of Notice to Proceed and prior to commencement of Work. The 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 copies of Contractor's authorized representative's work site health and safety inspection reports to Department Representative or designate, and authority having jurisdiction, weekly.

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

.5 Submit copies of incident and accident reports.

.6 Contractor to maintain up-to-date WHMIS MSDS - Material Safety Data Sheets on site in an area accessible to working staff, the Department Representative or designate.

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

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

.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 Department Representative or designate.

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

1.3 FILING OF NOTICE

.1 File Notice of Project with Provincial authorities prior to initiating Work in the Contract.

1.4 SAFETY ASSESSMENT AND MEETINGS

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

.2 Schedule and administer Health and Safety meeting with staff and Department Representative or designate prior to commencement of Work.

.3 Do Work in accordance with health and safety regulations.

1.5 UNFORSEEN HAZARDS

.1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right

to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Department Representative or designate verbally and in writing.

1.6 CORRECTION OF NON-COMPLIANCE

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

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

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

1.7 FIRE SAFETY REQUIREMENTS

.1 Comply with requirements of FCC No. 301 Standard for Construction Operations, latest edition, issued by Fire Commissioner of Canada (FC).

.2 This standard may be viewed at Regional Engineer's office and copies may be obtained from:

Fire Commissioner of Canada,
Sir Charles Tupper Building,
Riverside Drive,
Ottawa, Canada, K1A 0M2

1.8 OVERLOADING

.1 Ensure no part of Work is subjected to a load which will endanger its safety or will cause permanent deformation.

1.9 FALSEWORK

.1 Design and construct falsework in accordance with CSA S269.1 1975, latest edition and Division 3 of these Specifications.

.2 All falsework design shall be certified by a Professional Engineer licensed to practice in the Province of Ontario.

1.10 SCAFFOLDING

.1 Design and construct scaffolding in accordance with CSA S269.2 M87 (R2003), latest edition.

.2 The Shop Drawings shall be submitted to the Department Representative or designate and shall include Detail Drawings and Design Calculations for scaffolding. The Department Representative or designate will not be responsible for review of scaffolding.

.3 The Detail Drawings and Design Calculations for scaffolding shall bear the signature and stamp of a Professional Engineer registered in Ontario, and experienced in scaffolding design.

.4 The Professional Engineer, whose signature and seal appear on the Detail Design Drawings and Design Calculations, shall inspect and check the falsework and completed scaffolding and certify in writing that the scaffolding is in accordance with Calculations and Drawings submitted to the Department Representative or designate.

.5 The falsework and scaffolding shall be re-inspected after any change in detail or placement to ensure that it is properly placed, rigid, and secure before commencing work. Each re-inspection will be certified by the Professional Engineer whose signature and seal appear on the Calculations and Drawings.

.6 Submit such certifications to the Department Representative or designate before commencing work.

1.11 MATERIALS ON SITE

.1 Comply with WHMIS requirements regarding all materials stored on site. Submit safety data sheets to Contractor prior to shipping materials.

1.12 CONFINED SPACE ENTRY

.1 Comply with latest legislative requirements of the Occupational Health and Safety Act (Ontario).

.2 Submit detailed procedures as part of the Project-Specific Health and Safety Plan.

.3 Contractor's written procedures shall include a "Coordination Document" for confined space entry involving multiple employees.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

.1 This section describes the necessary steps and precautions for preserving the natural environment, including mitigating measures to reduce environmental impacts of the work.

.2 All construction related activities should be confined to the site to avoid additional impacts on archaeological resources and natural heritage features.

1.2 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.

.2 Prior to commencing construction activities or delivery of materials to site, submit an Environmental Protection Plan for review and approval by the Department Representative or designate. The Environmental Protection Plan is to present comprehensive overview of known or potential environmental issues which must be addressed during construction.

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

.4 Environmental protection plan shall include:

- .1 Name(s) of person(s) responsible for ensuring adherence to Environmental Protection Plan.
- .2 Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from site.
- .3 Name(s) and qualifications of person(s) responsible for training site personnel.
- .4 Descriptions of environmental protection personnel training program.
- .5 Drawings showing locations of proposed temporary excavations or embankments, material storage areas, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.
- .6 Traffic control plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Plans include measures to minimize amount of mud transported onto paved public roads by vehicles or runoff.
- .7 Spill Control Plan: including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
- .8 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.

.9 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, do not become air borne and travel off project site.

.10 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.

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

.12 Means of containing and removing concrete waste water and rinsing fluids.

1.3 FIRES

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

1.4 DISPOSAL OF WASTES

.1 Do not bury rubbish and waste materials on site.

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

.3 Dispose all waste and remove material and equipment off-site.

.4 Dispose hazardous waste according to regulations in accordance with 01 74 21.

1.5 SITE CLEARING AND PLANT PROTECTION

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

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

.3 Minimize stripping of topsoil and vegetation.

.4 Restrict tree removal to areas indicated or designated by the Contract.

1.6 WORK ADJACENT TO WATERWAYS

.1 Do not operate construction equipment in waterways.

.2 Do not dump excavated fill, waste material or debris in waterways.

1.7 EQUIPMENT FUELING

.1 Designate an area within the working limits to be used exclusively for fueling construction equipment. Submit for review a plan for the interception and rapid clean-up of fuel spills should they occur. Maintain the apparatus for cleaning up fuel spills on site.

1.8 CLEANING EQUIPMENT

.1 Manage construction equipment so that no debris is deposited on any public roadway. Contain construction debris in a designated area within the working limits. Dispose of debris off-site as specified.

.2 Concrete truck are to be cleaned off property, any run off of concrete during construction shall be controlled.

1.9 NOISE CONTROL

.1 The Contractor is to adhere to current municipal noise by-law requirements.

.2 Use only vehicles and equipment equipped with effective muffling devices. Provide noise barriers on stationary engines and compressors. Provide sufficient muffling and noise barriers to ensure that the noise level at the site boundaries do not exceed local municipal designated levels.

1.10 DUST CONTROL

.1 Control dust on the site at all times by application of calcium chloride or water.

1.11 ASBESTOS

.1 If found, Contractor is responsible for removal and disposal of asbestos.

.2 Contractor shall provide costing to Department Representative or designate for review and approval prior to commencing works.

.3 Cost of asbestos removal and disposal will be paid by the Department Representative or designate.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION

PART 1 GENERAL

1.1 INSPECTION

.1 Department Representative or designate will engage, as required, independent inspection/testing agencies for the purpose of quality assurance only. That is to verify Contractor's quality control process for construction materials, workmanship, environmental protection, waste disposal, etc.

.2 Contractor is responsible for quality control. Employment of inspection/testing agencies does not relax responsibility of the Contractor to perform the work in accordance with the contract documents.

.3 Allow Department Representative or designate 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.

.4 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Department Representative or designate's instructions, or law of Place of Work.

.5 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.

.6 Department Representative or designate will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Department Representative or designate shall pay cost of examination and replacement.

1.2 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies and surveyors will be engaged by the Contractor for purpose of inspecting and/or testing portions of Work where indicated in the Contract Documents and for routine quality control. Cost of such services will be borne by Contractor.

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

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

.4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Department Representative or designate. Pay costs for retesting and reinspection.

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 Department Representative or designate in advance of requirement for tests, in order that attendance arrangements can be made.

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

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

1.5 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 Department Representative or designate 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.

1.6 REPORTS

.1 Submit four copies of inspection and test reports to Department Representative or designate.

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

1.7 TESTS AND MIX DESIGNS

.1 Furnish test results as requested.

.2 Cost of tests beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Department Representative or designate and may be authorized as recoverable.

1.8 EQUIPMENT AND SYSTEMS

.1 Submit adjustment and balancing reports for mechanical and electrical systems where specified.

.2 Refer to relevant Sections for definitive requirements.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

.1 This section specifies the requirement for cleaning during and after the works has been completed.

1.2 GENERAL

.1 Conduct cleaning and disposal operations to comply with local ordinances and antipollution laws, including requirements of WHMIS.

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

.3 Prevent accumulation of waste which creates hazardous conditions.

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

1.3 MATERIALS

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

1.4 CLEANING DURING CONSTRUCTION

.1 Maintain the work, including roof and building systems, at least on a daily basis free from accumulations of waste material and debris.

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

.3 Remove waste materials and debris from site.

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

.5 Vacuum clean all building interiors prior to paint application. Continue to vacuum clean finished areas until final completion.

1.5 FINAL CLEANING

.1 In preparation for acceptance of the project on an Interim or Final Certificate of Completion, perform final cleaning.

.2 Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials, from interior and exterior finished surfaces including glass and other polished surfaces.

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

.4 Broom clean paved surfaces; rake clean other surfaces of grounds.

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

.6 Remove snow and ice from access to buildings.

.7 The tower structure shall be thoroughly cleaned at the time of completion, all dirt and debris resulting from construction is to be removed.

.8 Trails shall be blown clean of debris after construction.

1.6 BASIS OF PAYMENT

.1 Payment for works under this section is to be included in Lump Sum Prices in Form of Tender for construction.

.2 The Lump Sum Price shall cover supply of all labor, materials, tools and equipment, as specified, and/or required.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Text, schedules and procedures for systematic Waste Management Program for construction, deconstruction, demolition, and renovation projects, which may include:
- .1 Diversion of Materials.
- .2 Waste Audit (WA).
- .3 Waste Reduction Workplan (WRW).
- .4 Demolition Waste Audit (DWA).
- .5 Materials Source Separation Program (MSSP).

1.2 DEFINITIONS

.1 Demolition Waste Audit (DWA): Relates to actual waste generated from project.

.2 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.

.3 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.

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

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

.6 Reuse: Repeated use of product in same form but not necessarily for same purpose. Reuse includes:
- .1 Salvaging reusable materials from 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.

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

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

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

.10 Waste Audit (WA): Detailed inventory of materials in building. Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project. Indicates quantities of reuse, recycling and landfill.

.11 Waste Management Coordinator (WMC): Contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.

.12 Waste Reduction Workplan (WRW): Written report which addresses opportunities for reduction, reuse, or recycling of materials. WRW is based on information acquired from WA.

1.3 DOCUMENTS

.1 Maintain at job site, one copy of following documents:
- .1 Waste Audit.
- .2 Waste Reduction Workplan.
- .3 Material Source Separation Plan.

1.4 SUBMITTALS

.1 Submittals in accordance with Section 01 33 23 – Submittal Procedures.

.2 Prepare and submit the following material prior to project start-up, if required by the Department Representative or designate:
- .1 Waste Audit (WA).
- .2 Waste Reduction Workplan (WRW).
- .3 Demolition Waste Audit (DWA).
- .4 Cost/Revenue Analysis Workplan (CRAW).
- .5 Materials Source Separation Program (MSSP) description.

1.5 WASTE AUDIT (WA)

.1 Conduct WA prior to project start-up.

.2 Prepare WA.

.3 Record, on WA, extent to which materials or products used consist of recycled or reused materials or products.

1.6 WASTE REDUCTION WORKPLAN (WRW)

.1 Prepare WRW prior to project start-up.

.2 WRW should include but not limited to:
- .1 Destination of materials listed.
- .2 Deconstruction/disassembly techniques and sequencing.
- .3 Schedule for deconstruction/disassembly.
- .4 Location.
- .5 Security.
- .6 Protection.
- .7 Clear labelling of storage areas.
- .8 Details on materials handling and removal procedures.
- .9 Quantities for materials to be salvaged for reuse or recycled and materials sent to landfill.

.3 Structure WRW to prioritize actions and follow 3R's hierarchy, with Reduction as first priority, followed by Reuse, then Recycle.

.4 Describe management of waste.

.5 Identify opportunities for reduction, reuse, and recycling of materials. Based on information acquired from WA.

.6 Post WRW or summary where workers at site are able to review content.

.7 Set realistic goals for waste reduction, recognize existing barriers and develop strategies to overcome these barriers.

.8 Monitor and report on waste reduction by documenting total volume and cost of actual waste removed from project.

1.7 DEMOLITION WASTE AUDIT (DWA)

.1 Prepare DWA prior to project start-up.

.2 Complete DWA.

.3 Provide inventory of quantities of materials to be salvaged for reuse, recycling, or disposal.

1.8 COST/REVENUE ANALYSIS WORKPLAN (CRAW)

.1 Prepare CRAW.

1.9 MATERIALS SOURCE SEPARATION PROGRAM (MSSP)

.1 Prepare MSSP and have ready for use prior to project start-up.

.2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by Department Representative or designate. Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.

.3 Provide containers to deposit reusable and recyclable materials.

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

.5 Locate separated material(s) in area(s) which minimize material damage.

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

.7 Collect, handle, store on-site, and transport off-site, salvaged materials in combined condition.
.1 Ship material(s) to site operating under Certificate of Approval or as directed by Department Representative or designate.
.2 Materials must be immediately separated into required categories for reuse or recycling.

1.10 WASTE PROCESSING SITES

.1 Identify appropriate waste processing sites, based on municipal requirements, as required.

1.11 STORAGE, HANDLING AND PROTECTION

.1 Store, materials to be reused, recycled and salvaged in locations as directed by Department Representative or designate.

.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 building is endangered, cease operations and immediately notify Department Representative or designate.

.7 Protect surface drainage, mechanical 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.

1.12 DISPOSAL OF WASTES

.1 Do not bury rubbish or waste materials.

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

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

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

.5 Dispose of waste in accordance with Municipal and Provincial regulations.

1.13 USE OF SITE AND FACILITIES

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

.2 Maintain security measures established by existing facility and provide temporary security measures approved by Department Representative or designate as required.

1.14 SCHEDULING

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

PART 2 PRODUCTS

2.1 THIS SECTION IS NOT APPLICABLE

PART 3 EXECUTION

3.1 UNIT/COMPONENT/SUBSECTION

3.2 APPLICATION

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

3.3 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 DESCRIPTION

.1 This Section specifies requirements of submission of operating and maintenance data for each system necessitating operation and/or maintenance.

1.2 OPERATING AND MAINTENANCE MANUALS

.1 Prepare three (3) copies of documentation including As-Constructed Shop Drawings to instruct the Department Representative or designate's operation and maintenance staff in the operation and associated maintenance of each piece of equipment and system as supplied and installed. Three (3) CDs containing all of the documentation should also be provided.

.2 Provide 65 mm spine, 215 mm x 280 mm capacity extension-type catalogue binders.

.3 Each copy shall be permanently numbered 1 to 3.

.4 Each binder shall be made up as follows:
- .1 Tab: Table of Contents for the Volume – details the titles of various divisions of the included divider tabs.
- .2 Tab: Introduction to manual – provide written explanation of the layout of the manual and intended use.

.5 Each Division shall be provided with the following:
- .1 Tab: Division Number xx:
  - .1 Index – information in that Division in order of appearance.
  - .2 List of Contractors and Suppliers – names, addresses and telephone numbers.
  - .3 Specification Sections cross reference.
  - .4 Drawing List.
- .2 The various applicable Sections in each Division shall be organized under separate divider tabs labeled Division/Section Number as required by the project.

.6 The following information shall be provided for each system and major piece of equipment. Each piece of equipment shall be referred by its tag number. Where manufacturer's literature covers several models or options, the applicable information shall be highlighted or redundant information crossed out:
- .1 Index of information in that Section in order of appearance.

.2 Description of systems, components and technical data. Include interfaces, sequences, operational characteristic changes for seasonal operation.
.3 Maintenance and operating instructions.
.4 Recommended Spare Parts List.
.5 Schematics, Single Line and Wiring Diagrams.
.6 Service representatives - names, addresses and telephone numbers.
.7 Suppliers for replacement parts - names, addresses and telephone numbers.
.8 Test results; witness testing commissioning, test results.
.9 Certification, guarantee, warranty.
.10 Troubleshooting data.
.11 Preventive maintenance program complete with suggested check list sheets.
.12 Inspection Approval Certificates for all types of systems: plumbing and piping, hot air and ventilating, electrical supervisory.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION

PART 1 GENERAL

1.1 RECORD DRAWINGS

.1 Department Representative or designate will provide two sets of whiteprints for Record Drawing purposes.

.2 Maintain project "As-Built" Record Drawings and record accurately deviations from Contract Documents caused by site conditions and changes ordered by the Department Representative or designate.

.3 Mark "As-Built" changes in red coloured ink on one set of whiteprints.

.4 Record following significant deviations:

- .1 Depths of various elements of foundation in relation to floor level.
- .2 Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvement.
- .3 Location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure.
- .4 Field changes of dimension and detail.
- .5 Changes made by Change Order or Field Order.
- .6 Other significant deviations which are concealed in construction and cannot be identified by visual inspection.
- .7 Electrical Contractor to indicate on "As-Built" Record Drawings all conduit runs as installed, including conduit sizes, number of wires, and percentage of fill.

.5 At completion of project and prior to final inspection, neatly transfer "As-Built" notations to second set of whiteprints using fine red marker. Neatly print lettering and number in size to match original. Lines may be drawn free-hand, but shall be neat and accurate. Add at each Drawing Title Block Note: "AS-BUILT DRAWING". Also circle on List of Drawings each title and number of Drawing marked with "As-Built" changes.

.6 Submit this set of "As-Built" Record Drawings to the Department Representative or designate.

1.2 PHOTOGRAPHS

.1 Take sets of photographs during the Contract. The first set of photographs shall be taken prior to commencement of construction and the final set following completion of the project. Intermediate sets shall be taken at least once every week and at major milestones in construction. A minimum of three intermediate photo sets shall be taken.

.2 Provide photographs to the Department Representative or designate. Digital photographs will be accepted provided they are taken at a resolution of 4 megapixel or greater. Digital photographs or prints shall be identified with the date of taking and the name of the job and the name of the Contractor.

.3 Submit progress photographs to the Department Representative or designate with monthly application for payment.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.

.2 Section 03 30 00 – Cast-in-Place Concrete.

1.2 MEASUREMENT PROCEDURES

.1 No measurement will be made under this Section. Include costs in items of work for which concrete formwork and falsework is required.

1.3 REFERENCES

.1 Canadian Standards Association (CSA):
- .1 CAN/CSA-A23.1-14, Concrete Materials and Methods of Concrete Construction.
- .2 CAN/CSA-O86-14, Engineering Design in Wood.
- .3 CSA O121-08, Douglas Fir Plywood.
- .4 CSA O151-09, Canadian Softwood Plywood.
- .5 CSA O153-13, Poplar Plywood.
- .6 CSA S269.1-1975, Falsework for Construction Purposes.
- .7 CAN/CSA-S269.3-M92, Concrete Formwork.

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

.3 Health and Safety:
- .1 Occupational Health and Safety Act, 1990 and Ontario Regulation 213/91 and all amendments.

1.4 DEFINITION

.1 Architectural Concrete: all formed surfaces exposed to view in the completed structure.

1.5 SHOP DRAWINGS

.1 Submit shop drawings for formwork and falsework in accordance with Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.

.2 The shop drawings shall include detail drawings, design calculations of falsework and formwork for columns, beams, slabs and concrete walls.

.3 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 and with CAN/CSA-S269.3 for formwork drawings.

.4 Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms.

.5 Indicate sequence of erection and removal of formwork/falsework as directed by Department Representative or designate.

.6 Each shop drawing submission shall bear stamp and signature of qualified professional engineer registered or licensed in Province of Ontario, Canada.

.7 The professional engineer, whose signature and seal appear on the shop drawings, or competent person approved by the design engineer, shall inspect the work and certify, in writing, that the formwork and falsework are in accordance with the drawings reviewed by the Department Representative or designate. Submit such certification to the Department Representative or designate before placing concrete.

1.6 DELIVERY, STORAGE AND PROTECTION

.1 Deliver, handle and store formwork material and accessories to prevent weathering, warping or damage detrimental to the strength of the materials or to the surfaces to be formed.

.2 Ensure that formwork surfaces which will be in contact with concrete are not contaminated by foreign matter.

.3 Handle and erect the fabricated formwork to prevent damage.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

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

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

.4 Use sealers, form release and stripping agents that are non-toxic, biodegradable and have zero or low VOC's.

PART 2 PRODUCTS

2.1 MATERIALS

.1 General: material shall conform to the requirements of CAN/CSA-A23.1, except as amended or extended herein.

.2 Formwork materials:
- .1 Formwork Lumber: use wood and wood product formwork materials to CSA-O121 and CAN/CSA-O86.
- .2 For concrete with special architectural features, use formwork materials to CAN/CSA-A23.1.

.3 Chamfers shall be formed of suitably shaped wood or pre-moulded elements secured in the forms.

.4 Form ties:
- .1 Construct ties so that when end of fasteners of ties are removed, no metal shall be within 50 mm of formed faces of concrete.
- .2 Ties shall have a minimum working strength of 15 kN.
- .3 Use Acrow-Richmond Space Tys or Contract Representative or Designate approved equal.

.5 Form release agent: chemically active release agents containing compounds that react with free lime present in concrete to provide water insoluable soaps, preventing concrete from sticking to forms. Use “Sealtight Duogard Form Release Agent” manufactured by W.R. Meadows, or Department Representative or designate approved equal.

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

PART 3 EXECUTION

3.1 FABRICATION AND ERECTION

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

.2 Do not allow form release agent to come in contact with hardened concrete against which fresh concrete is to be placed, or where waterproofing, floor finishes, paint, etc. are applied directly to finished concrete surfaces. Remove with approved solvents any form coating which contacts reinforcing steel.

.3 Obtain Department Representative or designate 's approval for use of earth forms not indicated on drawings.

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

.5 Fabricate and erect falsework in accordance with CSA S269.1 and COFI Exterior Plywood for Concrete Formwork.

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

.7 Obtain Department Representative or designate's permission before framing openings not indicated on the structural drawings.

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

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

.10 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 CAN/CSA-A23.1.

.11 Align form joints and make watertight. Keep form joints to minimum.

.12 Use 20 mm chamfer strips on external corners, joints, unless specified otherwise.

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

.14 Construct forms for architectural concrete, and place ties as indicated and/or as directed. Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.

.15 Build in anchors, sleeves and other inserts required to accommodate work specified in other sections. Assure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

.16 Inspect and check the completed formwork and falsework to ensure that the work is in accordance with the shop drawings and design calculations, and that they are properly placed, rigid and secure, before placing concrete. The Engineer responsible for the design of the formwork and falsework or competent person approved by the design Engineer shall assist in this inspection.

.17 Inspect forms immediately prior to placing concrete. Remove any loose metal ties, chairs, wood or other foreign material. Ensure that reinforcement, ties, inserts, anchors, etc. are clear of the forms.

.18 Clean formwork in accordance with CAN/CSA-A23.1 and CAN/CSA-S269.3 before placing concrete.

3.2 REMOVAL AND RESHORING

.1 Removal of forms and falsework shall be based on the test results and condition of the concrete. If, in the opinion of the Department Representative or designate, removal of forms is likely to endanger whole or part of the structure, forms and falsework shall remain in place until stability is ensured. Leave formwork in place for following minimum periods of time after placing concrete:

- .1 Seven days for walls and sides of beams.
- .2 Seven days for columns.
- .3 Fourteen days for beam soffits, slabs, decks and other structural members, unless replaced immediately with adequate shoring to standard specified for falsework to the satisfaction of the Department Representative or designate.
- .4 Seven days for footings and abutments.

.2 Loosen wall forms sufficiently 12 to 24 hours after concrete is placed to permit curing.

.3 Exercise care in removing forms for concrete so that edges, corners, etc. are not damaged.

.4 Design, supply and install all necessary reshoring of members where early removal of forms is approved or where members may be subjected to additional loads during construction as required.

.5 Maximum spacing of reshoring members not to exceed 3000 mm apart.

.6 Re-use formwork and falsework subject to requirements of CAN/CSA-A23.1. Do not re-use formwork if there is evidence of surface wear which would impair concrete surface quality.

.7 Patch tie holes and defects with grout to match adjacent concrete in texture and colour, remove fins, thoroughly clean and coat forms, to approval of Department Representative or designate, before re-using.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.

.2 Section 03 30 00 – Cast-in-Place Concrete.

1.2 MEASUREMENT PROCEDURES

.1 No measurement will be made under this section. Include costs in items of concrete work for which reinforcement is required.

1.3 REFERENCES

.1 American Society for Testing and Materials (ASTM):
- .1 ASTM A 775/A 775M- 91c, Specification for Epoxy-Coated Reinforcing Steel Bars.
- .2 ASTM A185-02, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
- .3 ASTM A82-07, Standard Specification for Steel Wire, Plain for Concrete Reinforcement.

.2 Canadian Standards Association (CSA):
- .1 CAN/CSA-A23.1-14, Concrete Materials and Methods of Concrete Construction.
- .2 CAN/CSA-A23.3-14, Design of Concrete Structures for Buildings.
- .3 CAN/CSA-G30.18-09, Billet-Steel Bars for Concrete Reinforcement.
- .4 CAN/CSA-G40.21-13, Structural Quality Steels.
- .5 CSA W186-M1990 (R2002), Welding of Reinforcing Bars in Reinforced Concrete Construction.

1.4 SHOP DRAWINGS

.1 Submit shop drawings including placing of reinforcement in accordance with Section 01 33 23 – Submittal Procedures Shop Drawings, Product Data and Samples.

.2 Shop Drawings shall include the following:
- .1 Reinforcing placing drawings to a minimum scale of 1:50, showing size, location spacing and identification of all bars, and outline of all concrete surrounding steel, drawn to scale. Drawings shall show openings required for mechanical, electrical and other services, dimensioned and related to a suitable grid line or elevation data. Shop drawings shall include plans of all slabs.

.2 Bar lists showing all detailed dimensions, number of bars, size and location, prepared in accordance with recommendations of "Reinforcing Steel Manual of Standard Practice" by Reinforcing Steel Institute of Canada.

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

.4 Reproduction of Department Representative or designate's drawings, to produce shop drawings, will not be permitted.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Substitute different size bars only if permitted in writing by Department Representative or designate.

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

.3 Reinforcing steel: weldable low alloy steel deformed bars to CAN/CSA-30.18.

.4 Cold-drawn annealed steel wire ties: to ASTM A82, minimum diameter 1.2 mm (18 ga).

.5 Welded steel wire fabric: to ASTM A185. Provide in flat sheets only.

.6 Chairs, bolsters, bar supports, spacers: to CAN/CSA-A23.1. Chairs used to support bars in slabs or ceilings, underside of which will be visible, shall be made from non-ferrous metal or other non-staining material.

.7 Mechanical splices: taperped threaded couplers, use "Lenton Rebar Splicing System" by Erco Products Inc., or Department Representative or designate approved equal.

.8 Plain round bars: to CAN/CSA-G40.21.

.9 Dowling Adhesive: Hilti HIT HY 150 Rebar adhesive as manufactured by Hilti Canada Limited.

2.2 FABRICATION

.1 Fabricate reinforcing steel in accordance with CAN/CSA-A23.1 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada, unless indicated otherwise.

.2 Provide lapped splice lengths shown in the reinforcing lap length table on the drawings.

.3 Welded wire fabric used as reinforcement in concrete slabs-on-grade shall have fabric sheets lap-spliced a minimum of 300 mm.

.4 Obtain Department Representative or designate's approval for locations of reinforcement splices other than those shown on placing drawings.

.5 Upon approval of Department Representative or designate, weld reinforcement in accordance with CSA W186.

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

2.3 SOURCE QUALITY CONTROL

.1 Upon request, provide Department Representative or designate with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 5 weeks prior to commencing reinforcing work.

.2 Upon request inform Department Representative or designate of proposed source of material to be supplied.

2.4 INSPECTION AND TESTING

.1 Tests on reinforcing steel shall be by an independent inspection company.

.2 A series of specimens for each grade and size of reinforcing steel contained in any 100 tonnes of steel shipped may be tested.

.3 A series of tests will include two bars for each test required of each size and grade of steel used. Reinforcing steel tests will be made in accordance with CAN/CSA-G30.18.

PART 3 EXECUTION

3.1 FIELD BENDING

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

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

.3 Replace bars which develop cracks or splits.

3.2 PLACING REINFORCEMENT

.1 Deliver, handle and store reinforcing steel and accessories in accordance with CAN/CSA-A23.1.

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

.3 Tack welding of crossing bars and welding of pipe supports to reinforcing bars will not be permitted, unless approved by the Department Representative or designate.

.4 Concrete support blocks may be used to support bottom reinforcing steel in slabs and footings resting on working slab or ground. Blocks shall be suitably tapered to ensure a permanent key with finished structure.

.5 Top steel in base slab foundations shall be supported on high chairs. All beam and slab steel in suspended concrete structures shall be supported and tied to chairs.

.6 Use plain round bars as slip dowels in concrete. Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint. When paint is dry, apply a thick even film of mineral lubricating grease.

.7 Prior to placing concrete, notify the Department Representative or designate a minimum of 48 hours prior to placement for the purpose of reviewing reinforcing steel in place. In the case of a wall, notify the Department Representative or designate prior to closing in wall forms.

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

.9 Protect epoxy coated portions of bars with covering during transportation and handling.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.

.2 Section 03 10 00 – Concrete Forming and Accessories.

.3 Section 03 20 00 – Concrete Reinforcing.

.4 Section 03 30 50 – Concrete Curing

1.2 MEASUREMENT PROCEDURES

.1 No measurement will be made under this section. Include costs in items of work for which concrete is required at the Lump Sum Price bid in Bid Form.

.2 Payment at Lump Sum Price bid shall include compensation for protection required for hot and cold weather. No additional payment will be made for measures required to comply with the requirements of Clauses 3.1 and 3.2.

1.3 REFERENCES

.1 American Society for Testing and Materials (ASTM):
- .1 ASTM C109/C109M-08, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or 50 mm Cube Specimens).
- .2 ASTM C260-06, Specification for Air-Entraining Admixtures for Concrete.
- .3 ASTM C494-08, Specification for Chemical Admixtures for Concrete.

.2 Canadian General Standards Board (CGSB):
- .1 CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.
- .2 CAN/CGSB-51.34-M86 (amended 1998), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

.3 Canadian Standards Association (CSA):
- .1 CAN/CSA-A23.1-14, Concrete Materials and Methods of Concrete Construction.
- .2 CAN/CSA-A23.2-14, Methods of Test for Concrete.
- .3 CAN/CSA-A3001-13, Cementitious Materials Compendium.

.4 Ontario Provincial Standard Specifications (OPSS):
- .1 OPSS.PROV. 904, November 2014, Construction Specifications for Concrete Structures.

1.4 WORK INSTALLED BUT FURNISHED BY OTHERS

.1 The locating and setting of all items cast integral with concrete shall be carried out under this section of the Specifications. Following is a partial list of such items:
  .1 Anchor bolts and grouting of base plates for structural steel members.
  .2 Shelf angles, connection angles, anchor plates and miscellaneous anchor bolts.
  .3 Inserts, flashing, reglets, sleeves, conduits, hooks, pipes and metal frames.

.2 Coordinate requirements and be responsible for correct setting of the above items.

1.5 DEFINITIONS

.1 Architectural Concrete: all formed surfaces exposed to view in the completed structure including exposed portions of caissons.

1.6 DEFECTIVE CONCRETE

.1 Concrete will be considered defective if concrete cylinder tests on any section of work fail to meet the acceptance standard specified in Clause 4.4.6.6 of CAN/CSA-A23.1. In such cases, concrete in place shall be checked by the Department Representative or designate by obtaining core specimens, drilled and tested in accordance with CSA Test Method A23.2-14c.

.2 Concrete shall also be considered defective if it is structurally unsound, not watertight, excessively honeycombed or improperly finished as determined by the Department Representative or designate.

.3 The Department Representative or designate shall have the right to require, at his discretion, replacement, strengthening or correction of defective portions of structure.

.4 Pay all costs, including coring, testing, strengthening, demolishing and replacing.

1.7 SOURCE QUALITY CONTROL

.1 Sampling and testing of concrete materials shall be performed by an independent inspection and testing company specializing in this work and selected by the Department Representative or designate.

.2 Provide, at no cost, all material requested by the Department Representative or designate for sampling and testing.

.3 Sampling and testing of concrete materials shall be in accordance with the requirements of CAN/CSA-A23.2.

.4 The Department Representative or designate shall have access to the material source and batching plants at all times for inspection of materials and production methods, and the Contractor shall extend full cooperation.

1.8 MIX DESIGN AND TEST REPORTS

.1 Submit the final mix design and results of tests for each class of concrete to the Department Representative or designate for review prior to placing any concrete. Mix designs shall be adjusted to prevent alkali aggregate reactivity problems.

.2 Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CAN/CSA-A23.1.

.3 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CAN/CSA-A23.1.

.4 Where noted on drawings, submit P.Eng. stamped mix design for concrete in direct contact with galvanized steel adjusted to prevent any adverse reactions from occurring.

1.9 LOADING OF STRUCTURE

.1 Do not concrete elements until a min. 14 days after placing concrete.

.2 Do not apply the full load (self weight plus design live load) to caissons, beams, columns, walls or slabs prior to 28 days after placing concrete. The Department Representative or designate may permit prior application if job-cured test cylinders indicate a strength of not less than the specified 28-day strength.

.3 Shore adequately beams, columns and slabs subjected to any construction loads (building materials, construction equipment, etc.) in addition to full load, to the Department Representative or designate’s approval.

.4 Do not laterally load concrete walls until 14 days after placing concrete and as specified in Section 31 23 02.

1.10 INSPECTION AND TESTING COST

.1 Payment for initial sampling, inspection and testing of materials and concrete will be paid by the Owner.

.2 Payment for retesting, required due to unsatisfactory results, by the Contractor.

1.11 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

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

.3 Prevent plasticizers, water-reducing agents and air-entraining agents from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with an inert, non-combustible material and remove for disposal. Dispose of all waste in accordance with applicable local, provincial and national regulations.

.4 Choose least harmful, appropriate cleaning method which will perform adequately.

PART 2 PRODUCTS

2.1 MATERIALS

.1 General: material, storage of materials and testing of materials shall conform to requirements of CAN/CSA-A23.1 and CAN/CSA-A23.2, except as amended or extended herein.

.2 Coarse aggregate: hard crushed stone with maximum size for each class of concrete as given in Clause 2.2.5 and in accordance with CAN/CSA-A23.1, Clause 5.

.3 Portland Cement to CAN/CSA-3001 – General Use Hydraulic Cement (Type GU).

.4 Supplementary cementing materials: Cementitious Hydraulic Slag, Type “S” to CAN/CSA-A3000. Use 25% substitution for Portland Cement.

.5 Water: to CAN/CSA-A23.1.

.6 Air entraining admixture: to ASTM C260.

.7 Water Reducing Admixture: to ASTM C494, Type A – Normal Setting, “Polyheed”, as manufactured by Master Builders Inc., or Department Representative or designate approved equal.

.8 Set Retarding Admixture: to ASTM C494, Type B and D.

.9 Superplasticizer: to ASTM C494, Type A – Normal Setting, Rheobuild 1000 as supplied by Master Builders Inc., or Department Representative or designate approved equal.

.10 Non-metallic Non-shrink Grout: pre-mixed “Masterflow 713 Grout” as manufactured by Master Builders Inc., or Department Representative or designate approved equal.

.11 Under slab moisture vapour barrier: Perminator (10mil) by W.R. Meadows or Department Representative or designate approved equal.

.12 Dampproofing: Emulsified asphalt, mineral colloid type, unfilled: to CAN/CGSB-37.2.

.13 Bonding Agent:

.1 "Sikadur 32 Hi-Mod" two component epoxy bonding agent by Sika Canada Inc. or Department Representative or designate approved equal.

.14 Dowling Epoxy: Use "Hilti HIT HY150" system, as manufactured by Hilti Canada Limited, or Department Representative or designate approved equal.

.15 Expansion Anchors: "Hilti Kwik Bolt II", Stainless 316, as manufactured by Hilti Canada Limited, or Department Representative or designate approved equal.

2.2 PRODUCTION OF CONCRETE

.1 Measurement of materials, uniformity of concrete, mixing and delivery of concrete and concrete testing and sampling shall conform to requirements of CAN/CSA-A23.1 and CAN/CSA-A23.2, except as amended or extended herein.

.2 All concrete shall be proportioned on basis of Alternative No. 1 as defined in CAN/CSA-A23.1, except minimum cement content in kilograms per cubic metre of concrete and maximum water: cement ratio by weight, is specified in table under Clause 2.2.5 of this Section. Trial mix designs shall be made and specimens tested, by and at the Contractor's expense, prior to concreting operations. Once design mix has been established and reviewed by the Department Representative or designate, composition and source of materials shall not vary, unless approved by the Department Representative or designate.

.3 Control charts and Frequency Distribution Curves may be prepared by the Department Representative or designate for each class of concrete. A concrete strength test shall consist of the average of two 28-day compressive tests.

.4 Make adjustments to design mix, when requested by the Department Representative or designate, to meet acceptance standards of strength, workability and requirements for watertightness.

.5 Class of concrete and concrete design criteria for mix proportions are given in table below:

Class	Location/ Exposure	28-Day Strength (MPa)	Minimum Cement Content (kg/m³)	Maximum W/C Ratio (Note 1)	Maximum Coarse Aggregate (mm)	Slump (mm)	Notes
I	Lean Concrete/N	10	-	-	20	60-90	
II	Working Slab, Fill Concrete, Pipe Encasement/N	15	-	0.70	20	60-90	
III	Concrete Pile Caps, Exterior Concrete, Steel Column Fill C-1	35	370	0.40	20**	125-200 ++	5-8% Entrained Air, Super-plasticizer
VI	Caissons***	30	-	-	-	-	Tremie Mix
V	Sub-on-Grade Repairs/N	30	350	0.45	20	60-90	

Note: ++ Slump shown is after superplasticizer is added. Generally, slump values before and after mixing superplasticizer should be specified.

** Provide maximum size aggregate permitted by CAN/CSA-A23.1and/or installation equipment for Basement (Pit) floor slab to reduce shrinkage.

*** Tremie Mix, designed by Contractor.

Notes:

1) W/C ratio by weight based on total water content including moisture content of aggregates.
2) Properties listed above apply to concrete placed by conventional methods. Adjustments to design mixes shall be required for pumped concrete.
3) Do not use admixtures formulated with calcium chloride.

6. Fabrication and operation of batching plants shall conform to the requirements of CAN/CSA-A23.1. Batching plants shall be located within a 25 km radius of project site.

2.3 ADMIXTURES

.1 Dosages of all admixtures to be submitted with mix designs required in Clause 1.8 of this Section.

.2 Air-entraining admixture shall be used only in concrete specified in Clause 2.2.5 of this Section.

.3 Set-retarding admixture shall be added to concrete mixtures for all concrete slabs and mats. Amount of retarder shall be in accordance with site atmospheric conditions.

.4 Superplasticizer shall be added to concrete designed to retain water, columns and suspended slabs and beams.

.5 Water-reducing admixture shall be added to all concrete for foundations walls, except to concrete that has superplasticizer specified.

.6 All concrete admixtures shall be supplied by the same manufacturer, compatible with one another and used in accordance with the manufacturer's instructions.

.7 Admixtures other than air-entraining, water-reducing, set-retarding and superplastisizing shall be used only with written approval of the Department Representative or designate and shall be without additional cost to the Owner. When an admixture is permitted, it shall be used without alteration to requirements of "Production of Concrete", specified in Clause 2.2 of this Section.

PART 3 EXECUTION

3.1 COLD WEATHER REQUIREMENTS

.1 Concrete placement during cold weather as defined by CAN/CSA-A23.1 shall be in accordance with CAN/CSA-A23.1, Clause 21, "Curing and Protection".

.2 General:

.1 Concrete placement during cold weather as defined by CAN/CSA-A23.1 shall be in accordance with CAN/CSA-A23.1, except as amended or extended herein.

.2 The ambient daily temperature will be obtained by the Department Representative or designate from thermometer readings. If wind velocity at site exceeds 25 km/hr, 5°C shall be deducted from thermometer readings in establishing ambient temperature, unless work is completely protected by a windproof shelter.

.3 When the air temperature is at or below 5°C or when there is a probability of it falling to that limit within 24 hours of placing, the temperature of the concrete as placed shall be more than 10°C, but not more than 25°C.

.4 Concrete shall not be placed against any surface or subgrade that is at a temperature less than 5°C or more than 7°C colder than the concrete at the time of the pour.

.3 Protection:

.1 Design protection for the worst conditions that can be reasonably anticipated from forecasts and local weather records. The protective systems shall retain the initial heat of the concrete and produce the specified curing condition in the concrete by retention of the heat generated by hydration, plus where necessary, the supply of additional heat.

.2 Maintain the concrete as closely as possible to an optimum temperature of 20°C for a period of seven days. During the seven-day curing period, the concrete temperature shall not fall below 10°C.

.3 Three classes of protection, Class A, B and C, are defined in OPSS 904. The class of protection shall be provided in accordance with Tables 2, 3 and 4 of OPSS 904 for the type of concrete sections and the conditions of exposure.

.4 Loose or absorbent insulation material shall be completely contained in waterproof liners. Straw is not an acceptable insulation material.

.5 Concrete shall not be placed in insulated formwork when the air temperature is below the range for which it was designed. Insulating material shall be fastened tightly and secured against the forms. Seal all joints and tears.

.6 Protective housing shall be designed to take into account weather and construction procedures. Housing shall provide the required environment for the curing of concrete. Where heating is necessary, provide equipment of sufficient capacity to establish and maintain the specified curing conditions. The use of salamanders, coke stoves, oil or gas burners and similar spot heaters which have an open flame and intense local heat, shall not be permitted. Fresh concrete shall be protected from exposure to carbon dioxide. Properly vent heating equipment to the outside to avoid damage to the concrete. Have available at the site adequate fire protection at all times that heating equipment is required. A watchman or attendant shall be maintained to keep heating units in continuous operation.

3.2 HOT WEATHER REQUIREMENTS

.1 Concrete placement during hot weather as defined by CAN/CSA-A23.1 shall be in accordance with CAN/CSA-A23.1, Clause 21, "Curing and Protection".

3.3 PLACING CONCRETE

.1 Do cast-in-place concrete work in accordance with CAN/CSA-A23.1.

.2 Provide Department Representative or designate with 24 hours' notice prior to placing concrete.

.3 Handling, depositing and consolidation of concrete shall be in accordance with CAN/CSA-A23.1, except as amended or extended herein.

.4 All concrete shall be placed in the "dry". Any water shall be diverted from inside forms and excavation pits through proper side drains, or removed by other Department Representative or designate -approved methods.

.5 Placing of concrete by pumping equipment shall be permitted, provided properties of concrete are not altered by method of pumping and placing.

.6 Pumping equipment shall be of suitable kind with adequate pumping capacity. Loss of slump shall not exceed 50 mm. Concrete shall not be conveyed through pipe made of aluminum or aluminum alloy.

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

.8 In locations where new concrete is dowelled to existing work, drill holes in existing concrete. Place steel reinforcing dowels in epoxy grout to anchor in accordance with the epoxy manufacturer's recommendations.

.9 Do not place load upon new concrete until authorized by Department Representative or designate.

3.4 INSERTS

.1 Set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere. Sleeves and openings greater than 100 mm x 100 mm not indicated on Structural Drawings must be approved by Department Representative or designate.

.2 No sleeves, ducts, pipes or other openings shall pass through joists, beams, column capitals or columns, except where expressly detailed on Structural Drawings or approved by Department Representative or designate.

.3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Department Representative or designate before placing of concrete.

.4 Check locations and sizes of sleeves and openings shown on Structural Drawings with Architectural, Mechanical, Electrical and Process Drawings.

.5 Anchor bolts:

- .1 Place anchor bolts to templates under supervision of trade supplying anchors prior to placing concrete.
- .2 With Department Representative or designate 's approval, grout anchor bolts in preformed holes or holes drilled after concrete has set. Formed holes to be at least 100 mm in diameter. Drilled holes to be minimum 25 mm larger in diameter than bolts used.
- .3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
- .4 Set bolts and fill holes with shrinkage compensating grout.
- .5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to temperature at time of erection.

3.5 FINISHING OF CONCRETE

.1 General:

- .1 Finishing of non-formed concrete surfaces and treatment of formed concrete surfaces after formwork has been removed shall be in accordance with CAN/CSA-A23.1, except as amended or extended herein.
- .2 Fill tie holes solid and patch defects with grout to match adjacent concrete in texture and colour. Completely remove all fins.

.3 Excessive honeycomb in any part of structure may be considered sufficient cause for rejection of honeycombed section. If the Department Representative or designate gives permission for honeycombing and defects to be made good, the corrective method of treatment shall be carried out as directed by the Department Representative or designate.

.4 Tops of walls, horizontal offsets, etc. adjacent to formed surfaces shall be struck smooth after concrete is placed and wood float finished, except as otherwise specified herein.

.2 Architectural concrete: the quality of finish shall be such that when forms are stripped, it meets the standards set out below, without further finishing work other than clean-up:

.1 Dense, even concrete free of major defects such as deep or extreme honeycombing, inconsistencies in plane, severe cold joint lines and major loss of fines. Minor imperfections may be acceptable. Major defects will necessitate replacement. The judgment as to what constitutes major or minor defects will be the Department Representative or designate 's. Patching will not be permitted and if used, will constitute a major defect. Repairs, i.e., removal of sections of a member, may be carried out if approved by the Department Representative or designate, but the repair shall match the colour and texture of the surrounding concrete.

.2 Concrete members of generally uniform colour.

.3 Concrete members with sharp, accurate definition at corners, arrises, reglets and the like, generally free of chipped or spalled areas and within dimensional tolerances set out in CAN/CSA-A23.1. Members shall be visually straight.

.4 Plane surfaces without protuberances, indentations, ridges or bulges.

.5 Under no circumstances shall repair to any architectural concrete be undertaken without the Department Representative or designate's written consent. Concrete members which are repaired without the Department Representative or designate’s consent will be classified as defective work and the Department Representative or designate may require their removal and replacement.

.3 Interior non-formed concrete surfaces:

.1 See Room Finish Schedule on the Drawings for architectural finish for each area of concrete floor slab.

.2 All other exposed concrete floor slabs, and concrete floor toppings shall be floated and steel-trowelled to a dense, non-slip finish.

.4 Exterior non-formed concrete surfaces:

.1 Surface of concrete ramps shall be wood floated to a non-slip finish and after floating receive a broom finish.

.2 Concrete slabs, stair treads and landings shall be wood floated to a non-slip finish after screeding.

3.6 CONSTRUCTION JOINTS

.1 All joints shall be constructed in accordance with CAN/CSA-A23.1, except as amended or extended herein. Location and details of construction joints are shown on the Drawings.

.2 Preparation of construction joints before placing fresh concrete against set concrete shall conform to CAN/CSA-A23.1. Where construction joints are made in walls, or slab-on-grade, apply concrete bonding agent to previously placed concrete immediately before placing fresh concrete. Reinforcing bars extending through joints shall be cleaned of concrete and foreign matter prior to placing adjacent concrete.

.3 In addition to bonding agent, horizontal construction joints at junction of walls and footings shall have a 50 mm layer of concrete of the quality specified, but containing an excess of mortar, worked into the surface of hardened concrete immediately before placing fresh concrete.

3.7 EQUIPMENT BASES AND PADS

.1 Construct all concrete bases for equipment, machines, etc. to size and location as shown on the Drawings.

.2 Co-ordinate size and location with Mechanical and Electrical Shop Drawings.

.3 Inserts, sleeves, conduits, frames, anchor bolts, etc., extending into concrete of bases shall be provided and set as defined under Clause 1.2.

.4 Finish on concrete surfaces of bases shall match adjacent concrete, unless otherwise directed by the Department Representative or designate.

3.8 GROUT

.1 Grout between column and beam base plates and concrete supports and other locations shown on the Drawings using non-metallic non-shrink grout.

.2 Ensure that all voids are completely filled with grout.

3.9 MOISTURE VAPOUR BARRIER

.1 Install polyethylene sheet under concrete slabs-on-grade inside building.

.2 Lap polyethylene sheet minimum 300 mm at joints and seal.

.3 Seal punctures in polyethylene sheet before placing concrete. Use patching material at least 300 mm larger than puncture and seal.

3.10 FIELD QUALITY CONTROL

.1 The Department Representative or designate will arrange for inspection and testing to be performed by an independent Inspection and Testing Company specializing in this work.

.2 Provide, at no cost, all concrete samples requested by the Department Representative or designate for testing and allow access to the Department Representative or designate to all areas of work, and extend full co-operation. In addition, provide suitable storage facilities for the Department Representative or designate to conduct and store test equipment and specimens.

.3 Inspection and testing of concrete shall be in accordance with CAN/CSA-A23.1 and CAN/CSA-A23.2.

.4 Number and frequency of cylinder tests taken shall be as follows: two 28-day and one 7-day test specimen taken for each 50 cubic metres of concrete, or fraction thereof, for each class of concrete cast daily.

.5 Department Representative or designate may take additional test cylinders during cold weather concreting. Cure cylinders on site under same conditions as concrete which they represent.

.6 Frequency of slump and air content tests shall be determined by the Department Representative or designate.

.7 Inspection and testing by Department Representative or designate will not augment or replace Contractor quality control nor relieve him of his contractual responsibility.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 03 30 00 – Cast-in-Place Concrete.

1.2 REFERENCES

.1 ASTM C309-07, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.2 Canadian Standards Association (CSA):

.1 CAN/CSA-A23.1-14, Concrete Materials and Methods of Concrete Construction.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Provide adequate and suitable facilities for storage and protection of curing materials and be responsible for any loss of, or damage to, when handling and delivering.

.2 Store and protect membrane curing compounds in accordance with manufacturer's instructions.

1.5 TEMPERATURE

.1 When air temperature is at or below 5°C or there is a probability of it falling to that limit within 24 hours of placing, the additional requirements of "Cold Weather Requirements," Section 03 30 00 shall apply.

.2 When air temperature is at or above 25°C or there is a probability of it rising to 25°C during the placing period, the additional requirements of "Hot Weather Requirements", Section 03 30 00 shall apply.

1.6 ALTERNATIVE FOR CURING

.1 Unformed concrete surfaces, except surfaces against which additional concrete or other material is to be bonded, may be protected by a membrane curing compound in lieu of water curing, if approved (in writing) by the Department Representative or designate.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Burlap: to OPSS Form 1306.

.2 Polyethylene: opaque white pigmented 0.1 mm (4 mil) sheet.

.3 Water to CSA A23.1.

.4 Membrane Curing Compound for floor and concrete work other than water retaining structures: Sealtight CS-309 by W.R. Meadows, or Department Representative or designate approved equal.

.5 Provide written certification from manufacturer that membrane curing compound is compatible with:
- .1 Floor Hardener/Sealant.
- .2 Tile Overlay.
- .3 Bonding Agent.

PART 3 EXECUTION

3.1 APPLICATION

.1 Keep loosened forms on wall surfaces completely and continuously wet, for full 7-day curing period.

.2 Cure all unformed concrete surfaces, except as noted below using burlap and water or polyethylene sheets or by keeping surface completely and continuously wet with water spray.

.3 Use damp burlap in two layers, carefully laid on concrete surface. Overlap strips by 75 mm and hold down against displacement by wind, etc. Maintain burlap in place and keep thoroughly wet for full curing period.

.4 Use polyethylene sheets of a size and so placed as to minimize number of laps. Sheets shall be placed and held down around edges and at laps to prevent displacement, to provide an effective vapour barrier, and to prevent any flow of air between polyethylene and concrete surface, for full curing period.

.5 Membrane curing compound may be applied after surfaces are finished or concrete has set sufficiently so as not to be marred by the application. Rate and method of application shall be in accordance with manufacturer's instructions and the Department Representative or designate's approval. In very hot weather, the Department Representative or designate may call for water spray in addition to membrane curing compound. All traffic shall be kept off treated surfaces for a period of 48 hours.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM):
- .1 ASTM A36/A36M-14, Specification for Structural Steel.
- .2 ASTM A123/A123M-15, Standard Specification for Zinc (Hot-dipped Galvanized) Coatings on Iron and Steel Products.
- .3 ASTM A1085/A1085M-13, Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS).
- .4 ASTM A325-10e1, Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
- .5 ASTM A325M-13, Specification for High-Strength Bolts for Structural Steel Joints (Metric).
- .6 ASTM A490M-12, Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric).
- .7 ASTM A563-15, Standard Specification for Carbon and Alloy Steel Nuts.
- .8 ASTM A194/A194M-17, Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service or Both.
- .9 ASTM F436/F436M-16, Standard Specification for Hardened Steel Washers Inch and Metric Dimensions.
- .10 ASTM F1554-15e2, Standard Specification for Anchor Bolts, Steel, 36, 55, and 105 – Ksi Yield Strength.

.2 Canadian Standards Association (CSA International):
- .1 CAN/CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .2 CAN/CSA-S16-14 (including supplement CAN/CSA-S16S1-05), Limit States Design of Steel Structures.
- .3 CAN/CSA-S136-12 (including supplement CAN/CSA-S136S1-12), North American Specification for the Design of Cold-Formed Steel Structural Members (using the Appendix B provisions applicable to Canada).
- .4 CSA W47.1-09 (R2014), Certification of Companies for Fusion Welding of Steel Structures.
- .5 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding.
- .6 CSA W59-13, Welded Steel Construction (Metal Arc Welding) (Metric).

.3 Do structural steel work in accordance with CAN/CSA-S16 and CAN/CSA S136, except where specified otherwise.

.4 Do structural steel work in accordance with the Canadian Institute of Steel Construction Code of Standard Practice for Structural Steel, latest edition.

.5 Where there are differences between the Specifications and the Drawings and the standards or codes, the more stringent requirement shall apply.

1.3 DESIGN REQUIREMENTS

.1 Design details and connections in accordance with requirements of CAN/CSA-S16 to resist forces, moments and shears and allow for movements indicated.

.2 Unless shown otherwise, the fabricator's engineer shall design and be solely responsible for all connections between all steel members including but not limited to columns, beams, girders, trusses, braces, etc. and their supporting member, whether steel or concrete. The fabricator's engineer shall also be responsible for the design of stiffeners, doubler plates and the like, required to maintain the local strength and stability of a member.

.3 Design connections to safely withstand the combined effects of axial forces, shear, moment and torque and any secondary effects due to welding.

.4 Make shop connections with high-tensile bolts or welding. Field connections between steel members shall be made with high-tensile bolts and shall be friction-type connections unless shown otherwise on the Drawings. Field connections to plates cast into concrete walls shall be welded connections. No ordinary bolts shall be used except where shown on the Drawings or approved by the Department Representative or designate. Welding and bolting shall not be combined in a connection to share in the resistance of forces.

.5 Beam-to-column and beam-to-beam shear connections shall be in accordance with CISC Handbook of Steel Construction, except single angle and end plate connections are not acceptable, except where shown on the Drawings. The connections shall be of type and strength specified for "Double Angle Beam Connections" of CISC. Select or design connections to support reaction from maximum uniformly distributed load that can be safely supported by beam in bending, provided no point loads act on beam, when shears are not indicated.

.6 Column-to-base plate connections shall develop full compression strength of column and a moment of 1.5 kNm, unless otherwise shown on the Drawings.

.7 Connections for hollow structural sections (HSS) shall be detailed and fabricated in accordance with "Design Manual for Connections" prepared by Stelco Inc.

.8 Fillet welds shall be not less than 5 mm.

.9 Submit sketches and design calculations stamped and signed by qualified professional engineer licensed in Province of Ontario, Canada for connections.

1.4 SHOP DRAWINGS

.1 Submit shop drawings including fabrication and erection documents and materials list in accordance with Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.

.2 Erection drawings: indicate details and information necessary for assembly and erection purposes including:

- .1 Description of methods.
- .2 Sequence of erection.
- .3 Type of equipment used in erection.
- .4 Temporary connections and bracings.
- .5 All information necessary for fabrication of component parts, including extent of shop paint coverage.
- .6 Wall Plate and Anchor Bolt Details and Setting Out Plan.
- .7 Location and size of all members and details of field connections.
- .8 Complete welding procedure for welded construction, showing type, size, location and position of each weld, number and sequence of passes, type of electrodes and preheat required.
- .9 State on the Drawings that friction-type high-tensile bolt connections are used. Show on the Drawings grade of steel for each component part.

.3 Ensure Fabricator drawings showing designed assemblies, components and connections are stamped and signed by qualified professional engineer licensed in the province of Ontario, Canada.

.4 Submit structural steel shop drawings in complete packages so that individual parts and the assembly can be viewed together. Clearly reference on each shop and erection drawing the Structural Drawings used in their preparation to facilitate review.

.5 When shop drawings are revised and resubmitted, all revisions to the shop drawings shall be clearly identified by means of bubbles, clouds or other obvious means.

.6 Erection Drawings:

- .1 Submit erection drawings for review prior to preparation of detailed shop drawings and include erection drawing with each submission, clearly indicating or highlighting member marks that are being submitted.
- .2 Show all setting dimensions for the structural steel work, including dimensions that have been confirmed by site measurements. Tie dimensions into relevant grid lines or reference points.

1.5 QUALITY ASSURANCE

.1 If requested, submit 4 copies of mill test reports 4 weeks prior to fabrication of structural steel:

.1 Mill test reports to show chemical and physical properties and other details of steel to be incorporated in project.

.2 Provide mill test reports certified by metallurgists qualified to practice in Province of Ontario, Canada.

.2 Provide structural steel Fabricator's affidavit stating that materials and products used in fabrication conform to applicable material and products standards specified and indicated.

.3 Provide specimen samples and Laboratory Test Reports for examination, as requested by the Department Representative or designate.

.4 Welding shall be subjected to a searching, visual examination. Notwithstanding the requirements of CSA W59, the Department Representative or designate may request non-destructive testing of critical welds. All complete penetration splices will require non-destructive testing. Should any welds prove defective, the cost of preparing and repairing the welds shall be borne by the Contractor. Non-destructive testing, if required, shall be carried out in accordance with CSA W59.

.5 The Contractor shall provide, at no additional cost, all materials requested by the Department Representative or designate for testing and shall allow the Department Representative or designate access to the facility and extend full co-operation.

1.6 QUALIFICATIONS

.1 Fabricator, erector and subcontractors performing structural steel work shall be certified to the requirements of Division 1 or Division 2.1 of CSA W47.1.

.2 Fabricator and erector shall have in place a quality control program satisfying the requirements of ISO 9002 or another quality control program acceptable to the Department Representative or designate.

.3 Design calculations shall be carried out by or under the supervision of a qualified Professional Engineer, licensed in the Province of Ontario, with a minimum of five years Canadian experience in the design of structural steel, including connections and weldments.

.4 Professional engineers responsible for welding design, procedures and practice shall be certified in accordance with CSA W47.1.

.5 Submit qualification statement of professional engineer taking responsibility for the design of structural steel connections and details shown on the shop drawings.

1.7 INSPECTION AND TESTING

.1 The Department Representative or designate may arrange for inspection and testing of materials, welds and bolts to be performed by an independent inspection and testing company.

.2 The independent testing and inspection company shall be responsible only to the Department Representative or designate and shall make only such inspections and tests as the Department Representative or designate may direct.

.3 The Department Representative or designate's general review during construction and the inspection and testing by independent inspection and testing companies reporting to the Department Representative or designate are undertaken for the benefit of the Owner and shall not replace the Contractor's quality control procedures or relieve the Contractor of his contractual responsibilities.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Provide adequate and suitable facilities for storage and protection of all materials and accessories and be responsible for any loss of, or damage to, when handling and delivering.

.2 Obtain any permits required to transport oversize loads on municipal roads or provincial highways.

1.9 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

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

.3 Divert unused metal materials from landfill to metal recycling facility.

.4 Divert unused paint material from landfill to official hazardous material collections site.

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

PART 2 PRODUCTS

2.1 MATERIALS

.1 Structural wide flange and welded wide flange shapes (W, WWF): to CAN/CSA G40.20/G40.21, Grade 350W.

.2 Hollow structural sections (HSS): to CAN/CSA G40.20/G40.21, Grade 350W, Class C or ASTM A1085/A1085M, Grade 50 ksi (345 MPa).

.3 Angles, channels and plates (L, C, PL): to CAN/CSA G40.20/G40.21, Grade 300W.

.4 Anchor bolts: to ASTM F1554, Grade 105, (galvanized) unless otherwise noted on the drawings.

.5 Anchor Bolt Washers: to ASTM F436/F436M, Type 1

.6 Anchor Bolt Nuts: to ASTM 4563, Grade DH or ASTM A194, Grade 2H.

.7 High tensile bolts, nuts and washers: to ASTM A325 / A325M (galvanized).

.8 Welding materials: to CSA W48 Series, CSA W59 and certified by Canadian Welding Bureau.

.9 Welding electrodes ("basic", low hydrogen type): to CSA W48 series E48OXX, compatible with steel grades to be welded, and certified by Canadian Welding Bureau.

.10 Hot dip galvanizing: galvanize steel, where indicated, to ASTM A123/A123M.

.11 Concrete anchors: Kwik Bolt Stud Anchor (Stainless Steel) as manufactured by Hilti (Canada) Ltd., or consultant accepted equal, unless otherwise noted on the drawings.

2.2 FABRICATION

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

.2 Prior to fabrication of structural steel, take all necessary field measurements where structural steel is connected to existing work. Modify erection methods and connection details to suit site conditions, to the approval of the Department Representative or designate.

.3 Continuously seal members by continuous welds and grind smooth.

.4 Unless shown otherwise on the drawings, provide 12 mm thick cap plate for all hollow sections. Continuously seal weld cap plate to the member.

.5 Splices, other than those shown on the Drawings, shall not be permitted without the Department Representative or designate's approval. If approved by the Department Representative or designate, welded splices shall be non-destructively tested at no additional cost to the Owner.

.6 Detailing of connections for members framing into concrete walls shall allow horizontal adjustment of connection angles.

.7 Cutting of holes in structural members will not be permitted unless detailed on the Drawings or approved in writing by the Department Representative or designate.

2.3 GALVANIZING

.1 Structural members, noted on the Drawings to be galvanized, shall be hot-dip galvanized in accordance with ASTM A123/A123M with a minimum mass of zinc coating of 750 g/m^2 of surface area.

PART 3 EXECUTION

3.1 GENERAL

.1 Structural steel work: in accordance with CAN/CSA-S16.

.2 Welding: in accordance with CSA W59.

.3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.

3.2 CONNECTION TO EXISTING WORK

.1 Check all dimensions and elevations at job site and verify location of all column bases, wall plates and anchor bolts before erecting steel members. Report all defects and discrepancies from Contract and Shop Drawings, which affect this work, to the Department Representative or designate before proceeding with erection. Commencement of erection shall imply acceptance of other work.

3.3 MARKING

.1 Mark materials in accordance with CAN/CSA G40.20/G40.21. Do not use die stamping. If steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection.

3.4 ERECTION

.1 Erect structural steel, as indicated and in accordance with CAN/CSA-S16 and in accordance with reviewed erection drawings.

.2 Field cutting or altering structural members: to approval of Department Representative or designate.

.3 Continuously seal members by continuous welds where indicated. Grind smooth.

.4 Erection procedures and erection bracing are the sole responsibility of the Contractor.

.5 Provide additional bracing and anchor bolts, supplementary to that in the finished structure, to resist forces present during construction. Ensure that all connections are adequate to sustain construction forces through all stages of construction.

.6 Where horizontally adjustable connections are used, provide field welded connections after final erection and adjustment of steel members.

.7 Touch up galvanized members with two coats of zinc rich primer.

3.5 FIELD QUALITY CONTROL

.1 Inspection and testing of materials and workmanship may be carried out by testing laboratory designated by Department Representative or designate.

.2 Provide safe access and working areas for testing on site, as required by testing agency and as authorized by Department Representative or designate.

.3 Submit test reports to Department Representative or designate within 1 week of completion of inspection.

.4 Payment for initial sampling, inspection and testing of materials will be paid from the Cash Allowance.

.5 Payment for retesting required due to unsatisfactory results, by Contractor.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 23 - Submittal Procedures for Shop Drawings, Product Data and Samples.

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

.3 Section 05 12 23 - Structural Steel for Buildings.

.4 Section 08 50 00 - Glazing

1.2 REFERENCES

.1 2015 National Building Code of Canada.

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

.1 ASTM A53/A53M-12, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Steamless.

.2 ASTM A307-12, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.3 ASTM A123/A123M-15 Standard Specification for Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products.

.3 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-1.181-92, Ready-Mixed, Organic Zinc-Rich Coating.

.4 Canadian Standards Association (CSA International):

.1 CAN/CSA-G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel.

.2 CAN/CSA-S16.1-14, Limit States Design of Steel Structures.

.3 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).

.4 CSA W59-13, Welded Steel Construction (Metal Arc Welding) (Imperial Version).

.5 Canadian Institute of Steel Construction (CISC/CPMA)

.1 CISC/CPMA Standard 2-75, A Quick Drying Primer for Use on Structural Steel.

.6 The Environmental Choice Program:

.1 CCD-047a-98, Paints, Surface Coatings.

.2 CCD-048-98, Surface Coatings - Recycled Water-borne.

1.3 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 23 - Submittal Procedures for Shop Drawings, Product Data and Samples.

.2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 23 - Submittal Procedures for Shop Drawings, Product Data and Samples. Indicate VOC's:

.1 For finishes, coatings, primers and paints.

.2 Shop Drawings:

.1 Submit shop drawings in accordance with Section 01 33 23 - Submittal Procedures for Shop Drawings, Product Data and Samples.

.2 Show general arrangement, details of construction, fabrication and installation of all components of the work.

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

.4 Erection drawings: indicate details and information necessary for assembly and erection purposes including:

.1 Description of methods.

.2 Sequence of erection.

.3 Type of equipment used in erection.

.4 Temporary bracings.

.5 All information necessary for fabrication of component parts, including extent of shop paint coverage.

.6 Wall Plate and Anchor Bolt Details and Setting Out Plan.

.7 Location and size of all members and details of field connections.

.5 Ensure each drawing submitted bears stamp and signature stamped and signed by a qualified Professional Engineer, licensed in the Province of Ontario, and experienced in structural design.

.6 Submit samples of materials specified herein for approval to the Department Representative or designate upon request.

1.4 QUALITY ASSURANCE

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

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

.3 Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Section 01 31 19 – Project Meetings.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Provide adequate and suitable facilities for storage and protection of all materials and accessories and be responsible for any loss of, or damage to, when handling and delivering.

.2 Obtain any permits required to transport oversize loads on municipal roads or Provincial highways.

.3 Storage and Protection:

.1 Cover exposed stainless steel surfaces with pressure sensitive heavy protection paper or apply strippable plastic coating, before shipping to job site.

.2 Leave protective covering in place until final cleaning of building. Provide instructions for removal of protective covering.

1.6 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, corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility approved by Department Representative or designate.

1.7 DESIGN REQUIREMENTS

.1 Contractor is responsible for design and details of stair treads, railings, railing supports, guards, gratings and significant metal fabrications.

.2 Coordinate Metal Fabrication design , including connection details, with structural steel fabricator and glazing supplier.

.3 Submit Shop Drawings stamped and signed by a qualified Professional Engineer, licensed in the Province of Ontario, and experienced in structural design.

.4 Design guards and railings to NBC requirements: to resist a minimum specified horizontal force of 3.0 kN/m, or a point load of 1.0 kN, and a vertical load of 1.5 kN/m, with a ULS wind force of 2.18 kPa.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Comply with the 2015 National Building Code of Canada and the relevant CSA Specifications and ensure materials are free from scale, buckles, pits and other defects.

.2 Use only new material of the best commercial quality for the purpose intended and with the necessary structural properties to safely withstand or sustain stresses to which they will be normally subjected.

.3 The kind or type of finish of materials shall be in strict accordance to that hereinafter specified and equal in all respects to samples provided for approval.

.4 Steel sections and plates: to CAN/CSA-G40.20/G40.21, Grade 350W for sections, Grade 300W for plates and Grade 350, Class C for HSS.

.5 Steel pipe: to ASTM A53/A53M standard weight with galvanized finish.

.6 Welding materials: to CSA W59 for structural steel, CSA S157/S157.1-05 for aluminum.

.7 Welding electrodes: to CSA W48 Series, weld stainless steel to standard mild steel using stainless steel electrodes. Weld aluminum that is to be anodized later with aluminum alloy 5356 welding rod.

.8 Bolts: to ASTM A325.

.9 Anchor Bolts: to ASTM A307.

.10 Aluminum pipe: 6061-T6 Schedule 40 to ASTM 429

.11 Stainless steel: Type 316L, unless noted otherwise.

.12 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours, pull-out strength 7.9 MPa.

.13 Structural glazing – refer to Section 08 50 00 - Glazing

2.2 FABRICATION

.1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

.2 Use self-tapping shake-proof flat headed screws on items requiring assembly by screws or as indicated.

.3 Where possible, fit and shop assemble work, ready for erection.

.4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

.5 Detailing of connections for members framing into concrete walls shall allow horizontal adjustment of connection angles.

2.3 FINISHES

.1 Galvanizing: hot dipped galvanizing with zinc coating 750 g/m^2 to ASTM A123/A123M.

.2 All steel required to be hot-dipped galvanized and later painted shall have an unpassivated surface treatment or wipe coat treatment, depending on location and use of the steel.

.3 Steel required to be hot-dipped galvanized, but not to be painted, may be supplied with the standard passivated treatment.

.4 Shop coat primer: to CISC/CPMA Standard 2-75.

.5 Zinc primer: zinc rich, ready mix to CAN/CGSB-1.181 Suitable for final finish as specified in Section 09 91 00 Painting and Protective Coatings.

.6 Aluminum railings and guardrails to be supplied with clear satin anodized finish.

2.4 ISOLATION COATING

.1 Isolate aluminum from following components, by means of bituminous paint:

- .1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.
- .2 Concrete, mortar and masonry.
- .3 Wood.

.2 Paint all aluminum work embedded in or in contact with concrete with two coats of an approved bituminous paint.

.3 Prevent contact of aluminum and steel by:

.1 Coating contact areas with aluminum impregnated caulking compound immediately prior to assembly, or

.2 Installing a synthetic rubber gasket or nylon washer between aluminum and steel.

2.5 SHOP PAINTING

.1 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.

.2 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 degrees C.

.3 Clean surfaces to be field welded; do not paint.

2.6 CONCRETE ANCHORS

.1 For securing metal fabrications to concrete and masonry surfaces, use Hilti "Kwik-Bolt" or Molly "Parabolt" type stainless steel anchors of size and spacing suitable to maintain the design loading requirements for the item.

2.7 ANCHOR BOLTS

.1 Anchor bolts and nuts shall be supplied for all equipment and appurtenances and shall be of adequate number and design for the service intended.

.2 Anchor bolts and nuts shall be of low carbon steel to ASTM A 307-00 and shall be cadmium-plated. Threads shall be American Standard. Bending and configurations shall be as shown on the Drawings or as recommended by the Equipment Supplier. The Department Representative or designate may approve the use of expansion shields in certain applications.

.3 Expansion shields shall be long standard, zinc alloy type with stainless steel bolts, "Star Loxin" as manufactured by Star Expansion Industries Corporation, or Department Representative or designate approved equivalent.

2.8 STEEL STAIRS – GRATING TYPE

.1 Supply and install grating type steel stairs as indicated on the Drawings.

.2 Stairs to be open riser type with grating treads, landings and connections designed to support a minimum uniform live load of 4.8 kPa in addition to dead load of the work.

.3 Fabricate stringer from structural steel channels. Stringers at landings to form base 95 mm high above finished landing surface. Frame landings as indicated, or required to suit design loadings. Bolt Stringers to finished floor through clip angles.

.4 Gratings for stair treads and landings: ALGRIP® Type 19-4 slip-resistant metal grating as manufactured by Ross Technology Corporation or Department Representative or designate approved equivalent, of welded steel construction with galvanized finish after fabrication.

.5 Treads to include grating manufacturer's standard cast abrasive safety nosings and welded lugs for bolting to stringers. Include safety nosing on landing edges overlooking stairs.

.6 Nosing to overlap preceding treads by 28 mm.

.7 Provide 6 mm thick welded steel plate closures at exposed ends of stringers.

.8 All members to be welded or bolted into a rigid, structurally sound unit, all welds ground and buffed smooth.

.9 Railings to be aluminum as specified under "Pipe rails".

2.9 ALUMINUM RAILS AND GUARDS

.1 Supply and install all pipe rails to locations shown on the Drawings. Design pipe rails and anchorage of system to accommodate loadings required by code.

.2 Fabricate pipe rail of standard weight ANSI Schedule 40 aluminum pipe, mill finish, with vertical balusters of 11mm diameter solid aluminum rod spaced at 100mm centers, top and bottom rails and posts of 48.3mm OD aluminum pipe with posts at not more than 1500 mm centres, and 42mm diam. clear anodized aluminum handrails mounted inside guards to posts as indicated.

.3 Height of pipe handrails and guardrails shall be as indicated

.4 Pipe rails shall be fabricated with all joints neatly and accurately fitted, welded and buffed smooth.

.5 Pipe rails installed on galvanized steel stairs shall have post supports bolted to stringers. Design of post supports shall be by pipe rail manufacturer.

.6 Provide sections of structural laminated safety glazing as illustrated.

2.10 STEEL ANGLE FRAMING

.1 Provide steel angle framing where cast in or bolted to concrete, to support steel grating in locations shown on the Drawings.

.2 Angle framing: structural steel, to sizes, profile and extent indicated, continuously along perimeter of grating. Assemblies to include:

.1 Welded steel anchors as detailed on the Drawings.

.2 Mitred and welded corners to form square, level and rigid units with exposed welds ground flush and smooth.

.3 Running lengths straight and true without twists or warps. Butt ends square, smooth and free of burrs.

.4 Steel bar welded to horizontal leg of framing angle to provide stop for grating or checker plate.

.5 Galvanized finish after fabrication.

2.11 STEEL GRATING

.1 Supply and install steel grating to thickness where indicated on the Drawings.

.1 Grating: ALGRIP® Type 19-4 slip-resistant metal grating as manufactured by Ross Technology Corporation or Department Representative or designate approved equivalent, of welded steel construction with standard bearing bars. Galvanized finish after gratings are fabricated to require configurations and banded.

.2 Design gratings to support a minimum live load of 4.8 kPa (or greater where indicated on drawings), with a maximum deflection $1/240^{th}$ of span.

.3 Fabricate grating sections to required configurations, and weld continuous steel banding to ends of bearing bars. Remove burrs and sharp edges and buff all welds smooth before galvanizing.

.4 Secure grating sections on supporting frames with galvanized or stainless steel saddle clips and bolts.

.5 Install gratings true and level with full bearing on supporting frames, and all grating sections flush and level.

.6 Gratings for stair treads are specified under “Steel Stairs – Grating Type”.

2.12 ALUMINUM SAFETY CHAINS

.1 Supply and install aluminum chains at locations indicated on the Drawings.

.2 Chains to have 20 mm links with aluminum or stainless steel safety snap hooks at each end. Provide fixed aluminum eyes on handrail posts for chains.

.3 Include safety chains in stair entrance opening at grade level.

PART 3 EXECUTION

3.1 WORKMANSHIP

.1 All work shall be, as far as possible, fitted and shop assembled ready for erection, executed in strict accordance with reviewed Shop Drawings.

.2 Fabricate and erect all items true to dimensions, square, straight, plumb and level.

.3 Joints and intersections shall be substantially constructed, closely fitted and securely anchored.

.4 Anchorage systems shall be to the best standard methods and as approved.

.5 For close fit, actual field measurements shall be taken prior to fabrication.

.6 All anchors, braces, hangers and fixings required to complete this work or joined to others, shall be installed, carefully fitted and secured.

.7 All exposed surfaces shall be finished smooth with even close joints and neat, moisture-excluding connections.

.8 All welds to be full fillet and ground smooth.

3.2 SHOP PAINTING

.1 Material to be thoroughly cleaned and given a minimum of one coat of primer before leaving the shop.

.2 Parts inaccessible shall receive a second coat before erection.

.3 After installation, all metalwork shall be cleaned and all damaged paint areas shall be touched up.

3.3 ISOLATION JOINTS

.1 All contact surfaces, e.g., bolted connections between dissimilar materials, shall be isolated using approved neoprene or nylon gaskets, washers or sleeves.

3.4 ERECTION

.1 Notify and direct other trades of any preparations necessary, and supply materials to be built in by others for attachment of this work. Provide templates where required for proper setting of built-in items.

.2 Supply and install materials at such time that no delays occur.

.3 Erect metalwork square, plumb, straight and true, accurately fitted, and with tight joints and intersections.

.4 Provide suitable and acceptable means of anchorage, to suit design requirements and Department Representative or designate's approval.

.5 Fasteners located in chambers, reservoirs, tanks pumping stations, etc., shall be Type 316 stainless steel.

.6 Touch up damaged galvanized surfaces with colour matched zinc rich primer.

3.5 CLEANING

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

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

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data, and Samples.

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

.3 Section 05 50 00 – Metal Fabrications

1.2 SCOPE

.1 This section describes the requirements for the supply and installation of :

.1 Safety laminated and tempered structural glass at guards around landings and platforms as part of the metal guard and handrail construction described in Section 05 50 00 Metal Fabrications and as illustrated on the drawings.

.2 The intent is for one source of responsibility, such that glazing sections are integrated within the railing and guard system.

1.3 REFERENCES

.1 American Society for Testing and Materials (ASTM):

.1 ANSI/ASTM E330-02, Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

.2 Canadian General Standards Board (CGSB).

.1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.

1.4 PERFORMANCE REQUIREMENTS

.1 Performance Requirements:

.1 Thickness of glazing indicated on drawings is the minimum thickness required. Size structural glass to withstand wind loads, dead loads and positive and negative live loads acting normal to plane of glass to a design pressure of 2.0 kPa (unfactored) as measured in accordance with ANSI/ASTM E330.

.2 Size structural glass to also withstand uniform environmental loads (snow load, snow drifting, rain, ice, wind etc.) at the site as established by NBC Supplementary guides, of 2.0 Kpa unless noted.

.3 Size structural glass to withstand live loads normally applied to guards as stipulated by current edition of National Building Code of Canada, and supplementary commentary.

.4 Limit glass deflection to flexural limit of glass with full recovery of glazing materials.

Provide design drawings or written confirmation that structural glazing, attachments, and supporting structure will meet these performance criteria, sealed by a qualified Engineer, licenced to practice in Ontario.

1.5 SYSTEM DESCRIPTION

.1 Glazing infill panels attached to metal support framing at locations indicated on drawings.

.2 Provide concealed stainless steel attachments, brackets, gaskets, spacers, cover plates etc. for a complete installation, that is vandal resistant and durable.

.3 Anti-bird strike film or pattern to be provided on exterior surface of glazing.

1.6 SUBMITTALS

.1 Product Data Sheets
- .1 Submit Product Data Sheets in accordance with Section 01 33 23 - Submittal Procedures for Shop Drawings, Product Data, and Samples.

.2 Shop Drawings
- .1 Submit Shop Drawings in accordance with Section 01 33 23 - Submittal Procedures for Shop Drawings, Product Data, and Samples.
- .2 Submit manufacturer’s shop drawings, including elevations, sections, and details, indicating dimensions, tolerances, materials, framing, and finish.
- .3 Shop drawings to be sealed by a qualified structural Engineer, licenced to practice in the Province of Ontario.

.3 Samples
- .1 Submit Samples in accordance with Section 01 33 23 - Submittal Procedures for Shop Drawings, Product Data, and Samples.
- .2 Glass: Submit manufacturer's sample of laminated safety glass, approx. 150 mm x 150mm, in duplicate.
- .3 Attachments: submit duplicate samples of hardware, cover plates and attachment materials

.4 .Maintenance Manual
- .1 Submit manufacturer’s maintenance and cleaning instructions for glazing.

.5 Warranty
.1 Submit manufacturer’s standard warranty.

1.7 CLOSEOUT SUBMITTALS

.1 Operations and Maintenance Data
.1 Submit Operations and Maintenance Data in accordance with Section 01 78 23 - Operating and Maintenance Data.

.2 Submit manufacturer’s contact information, source of glazing, and requirements for re-order should panels need to be replaced in the future.

1.8 QUALITY ASSURANCE

.1 Fabricator Qualifications
.1 Work of this Section shall be performed by fabricators having a minimum of five (5) years documented experience in the fabrication of laminated safety glazing.

.2 Installation
.1 Work shall be performed in strict accordance with manufacturer's printed installation instructions, and in accordance with all warranty requirements.

1.9 DELIVERY, STORAGE, AND HANDLING

.1 Delivery: Do not deliver glazing to the Place of the Work until installation can commence, or until adequate secure storage is provided. Deliver materials to site in manufacturer’s original, unopened containers and packaging, with labels clearly identifying opening door mark and manufacturer.

.2 Do not remove wrapping until time of installation.

PART 2 PRODUCTS

2.1 STRUCTURAL LAMINATED TEMPERED GLASS

.1 Safety glass: to CAN/CGSB-12.1, laminated.
.1 Laminated and tempered, consisting of two layers of 8 mm tempered glass laminated to 1.52 mm polyvinyl butyral (PVB) transparent (clear) interlayer
.2 Provide holes and glass attachment hardware.
.3 Edge treatment: polished with slightly bevelled or rounded edges on all sides.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Examine areas to receive glazing. Notify Department Representative or designate of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 PREPARATION

.1 .1 Ensure attachment points are smooth, plumb, level, square, and in tolerance.

3.3 INSTALLATION

.1 Install glazing in accordance with manufacturer's instructions.

.2 Install glazing plumb, level, square, true to line, and without warp or rack.

.3 Anchor securely in place with manufacturer supplied spacers, gaskets, fasteners, and cover mouldings.

.4 Remove and replace damaged components that cannot be successfully repaired as determined by Department Representative or designate.

.5 Clean glazing on all surfaces.

3.4 CLEANING

.1 Clean glazing promptly after installation in accordance with manufacturer's instructions using a mild detergent and water.

3.5 PROTECTION

.1 Protect installed glazing to ensure that, except for normal weathering, glazing will be clean and without damage or deterioration at time of substantial completion.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International):
- .1 CSA C22.1-15, Canadian Electrical Code, Part 1 (latest edition), Safety Standard for Electrical Installations.
- .2 CAN3-C235, Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC):
- .1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.

.3 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC):
- .1 IEEE SP1122, The Authoritative Dictionary of IEEE Standards Terms, Latest Edition.

.4 Ontario Electrical Safety Code.

1.2 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.

1.3 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard:
- .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.3 Language operating requirements: provide identification nameplates and labels for control items in English.

1.4 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.

.2 Single line electrical diagrams shall be in glazed frames and locate in:
- .1 Electrical distribution system in main electrical rooms; and
- .2 Electrical power generation and distribution systems in solar plant room.

.3 Shop drawings:

.1 Submit drawings and where required 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 one copy of drawings and product data to Department Representative or designate.

.6 If changes are required, notify Department Representative or designate of these changes before they are made.

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

.1 Provide CSA certified equipment and material. Where CSA certified equipment and material is not available, submit such equipment and material to inspection authorities for special approval before delivery to site.

.2 Submit test results of installed electrical systems and instrumentation.

.3 Permits and fees: in accordance with General Conditions of contract.

.4 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Department Representative or designate.

.5 Manufacturer's Field Reports: submit to Department Representative or designate manufacturer’s written report, within 5 days of review, verifying compliance of Work and electrical system and instrumentation testing , as described in PART 3 - FIELD QUALITY CONTROL.

1.5 QUALITY ASSURANCE

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

.2 Qualifications: electrical Work to be carried out by qualified, licensed electricians or apprentices in accordance with authorities having jurisdiction and as per the conditions of Provincial Act respecting manpower vocational training and qualification:

.1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.

.3 Site Meetings:

.1 Site Meetings: as part of Manufacturer's Field Services described in Part 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed:

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

.2 Upon completion of Work, after cleaning is carried out.

.4 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29 - Health & Safety Requirements.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Material Delivery Schedule: provide Department Representative or designate with schedule within 2 weeks after award of Contract.

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

1.7 SYSTEM STARTUP

.1 Instruct Department Representative or designate and operating personnel in operation, care and maintenance of systems, system equipment and components.

.2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant will aspects of its care and operation.

1.8 OPERATING INSTRUCTIONS

.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.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

.1 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from inspection authorities before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.

.2 Factory assemble control panels and component assemblies.

2.2 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of authority having jurisdiction or inspection authorities or Department Representative or designate .

.2 Decal signs, minimum size 175 x 250 mm.

2.3 WIRING TERMINATIONS

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

2.4 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates and labels as follows:
- .1 Nameplates: lamicoid 3 mm matt white finish face, black core, lettering accurately aligned and engraved into core mechanically attached with self tapping screws.
- .2 Sizes as follows:

NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

.2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.

.3 Wording on nameplates and labels to be approved by Department Representative or designate prior to manufacture.

.4 Allow for minimum of twenty-five (25) letters per nameplate and label.

.5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.6 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.7 Terminal cabinets and pull boxes: indicate system and voltage.

.8 Transformers: indicate capacity, primary and secondary voltages.

2.5 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, numbered coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

2.6 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 5 m intervals.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour:

	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
Telephone	Green	
Other Communication Systems	Green	Blue
Other Security Systems	Red	Yellow

2.7 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel:
- .1 Paint outdoor electrical equipment light gray to EEMAC 2Y-1.
- .2 Paint indoor switchgear and distribution enclosures light gray to EEMAC 2Y-1 or ASA-61.

PART 3 EXECUTION

3.1 INSTALLATION

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

.2 Do overhead and underground systems in accordance with CSA C22.3 No.1 and No. 7 except where specified otherwise.

3.2 NAMEPLATES AND LABELS

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

3.3 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete:
- .1 Sleeves through concrete: plastic, 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.

3.4 FIELD QUALITY CONTROL

.1 The scope of the work under this item shall include all devices and equipment supplied and installed under this contract including contractor purchased equipment and equipment pre-purchased by the Owner or supplied by others.

.2 The Contractor shall engage the services of a recognized independent testing firm for the purposes of protective device testing and inspections. The testing firm shall be experienced with this type of project and selection is subject to the approval of the Owner.

Included are visual and mechanical testing of all equipment to insure that the equipment has been installed per the manufacturer's specifications, the meggering and high-potential testing of cables and equipment, any adjustments to the equipment in the field application of the final relay settings and testing of all relays during commissioning.

.3 The testing firm shall maintain written records of all tests, calibrations and settings and upon completion of the project, assemble and certify final test reports. Submit six (6) copies of all test reports to the Department Representative or designate.

.4 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

.5 Carry out tests in presence of Department Representative or designate.

.6 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.7 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.5 CLEANING

.1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 CSA C22.2 No .0.3-01 Latest Edition, Test Methods for Electrical Wires and Cables.

.2 CAN/CSA-C22.2 No. 131-M89 (Latest Edition), Type TECK 90 Cable.

1.2 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.

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 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

.3 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 PRODUCTS

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 14 AWG.

.2 Copper conductors: size as indicated, with 600 V insulation of chemically cross-linked thermosetting polyethylene material rated T90, RW 90 or RWU 90.

.3 Use T90 or RW90 for building installations in above ground applications.

.4 Use RWU90 for grade slab in embedded conduits systems or for underground installations.

2.2 TECK CABLE

.1 Cable: to CAN/CSA-C22.2 No. 131.

.2 Conductors:
- .1 Grounding conductor: copper.
- .2 Circuit conductors: copper, size as indicated.

.3 Insulation:
.1 Chemically cross-linked thermosetting polyethylene rated type RW90, 600 V.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: interlocking galvanized steel.

.6 Overall covering: polyvinyl chloride material.

.7 Fastenings:
.1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
.2 Channel type supports for two or more cables at 300 mm centers.
.3 Threaded rods: 6 mm dia. to support suspended channels.

.8 Connectors:
.1 Watertight, approved for TECK cable.
.2 Explosion proof for hazardous locations, approved for TECK cable

2.3 ARMOURED CABLES

.1 Conductors: insulated, copper, size as indicated.

.2 Type: AC90.

.3 Armour: interlocking type fabricated from galvanized steel strip.

2.4 CONTROL CABLES

.1 Low energy 300 V control cable: stranded annealed copper conductors sized as indicated, with PVC insulation type polyethylene insulation with shielding of metallized tapes over each pair and over all conductors and overall covering of PVC jackets interlocked armour of flat galvanized steel.

.2 600 V type: stranded annealed copper conductors, sizes as indicated with cross-linked polyethylene type RW90 (x-link).

PART 3 EXECUTION

3.1 INSTALLATION OF BUILDING WIRES

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

3.2 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible.

3.3 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduit or underground ducts.

.2 Ground control cable shield at one end only.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 23 - Submittal Procedures for Shop Drawing, Product Data and Samples.

.2 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)

.1 ANSI/IEEE 837-[Latest Edition], Standard for Qualifying Permanent Connections Used in Substation Grounding.

.2 Canadian Standards Association (CSA International)

.1 CAN/CSA-B72-[Latest Edition], Installation Code for Lightning Protection Systems.

1.3 DESCRIPTION OF SYSTEM

.1 System to consist of metallic air terminals, lightning conductors connecting air terminals to ground and interconnected ground electrodes, and/or ground cables.

.2 Sky wire cone, where sky line elevated at height to protected structure beneath, but having no direct connection to sky line which is connected to system of ground electrodes.

1.4 SUBMITTAL

.1 Contractor to submit lightning protection plan stamped by a licenced engineer.

1.5 REGULATORY REQUIREMENTS

.1 System subject to: approval by authority having jurisdiction.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Air terminals: copper solid rod.

.2 3/0 gauge, bare copper, stranded conductor.

.3 Fastenings and attachment straps: copper.

.4 Electrodes: 3 m x 19 mm diameter copper coated steel.

.5 Single, Two, Three or Four mast fabricated steel structure as indicated inter-connected with copper cable. With down runs and cable clamps as indicated to form a complete sky-cone system.

.6 Use aluminum conductors, terminals, connectors and fastenings for aluminum sheathed buildings, and copper conductors, terminals, connectors and fastenings for buildings sheathed in other than aluminum.

.7 Connections: copper connections formed by thermit process.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install lightning protection to CAN/CSA-B72.

.2 Bond discharge conductors to service mast or other non-current-carrying electrical parts.

.3 Submit certificate of installation to Department Representative or designate.

3.2 INSPECTION

.1 Obtain inspection certificate from Department Representative or designate for discharge conductor passing through any fire supporting membrane.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials (ASTM):

.1 ASTM C127-15, Standard Test Method for Density, Relative Density (Specific Gravity) and Absorption of Coarse Aggregate.

.2 ASTM D698-(12e2), Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.

.3 ASTM D 4253-16, Standard Test Methods for Maximum Index Density of Soils Using a Vibratory Table.

1.2 DEFINITION

.1 Corrected maximum dry density is defined as:

.1 D = F1 x D1 + 0.9 x D2 x F2:

Where: D = corrected maximum dry density kg/m^3

F1 = fraction (decimal) of total field sample passing ASTM 4.75 mm sieve.

F2 = fraction (decimal) of total field sample retained on ASTM 4.75 mm sieve (equal to 1 – F1).

D1 = maximum dry density, kg/m^3 of material passing ASTM 4.75 mm sieve determined in accordance with ASTM D 698-00a.

D2 = bulk density, kg/m^3, of material retained on 4.75 mm sieve, equal to 1000 G, where G is bulk specific gravity material (dry basis) when tested to ASTM C 127-88 (2001).

.2 For free draining aggregates, determine D1 (maximum dry density) to ASTM D 4253-00 wet method.

PART 2 PRODUCTS– NOT APPLICABLE

PART 3 EXECUTION– NOT APPLICABLE

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data and Samples.

.2 Section 03 30 00 – Cast-In-Place Concrete.

.3 Section 31 23 02 – Backfill and Compaction for Structures.

1.2 MEASUREMENT PROCEDURES

.1 Earth excavation:

- .1 Payment for earth excavation to be included in Lump Sum Price bid in Bid Form. Include all excavation necessary for the installation, maintenance and removal of the dewatering system, removal of existing fill material, and excavation for all foundations as shown on the Drawings or as specified.
- .2 Payment for additional earth excavation shall be determined in accordance with the General Conditions, except as otherwise stated hereinafter.
- .3 No extra payment will be made for excess excavation needed on account of soil heaving at bottom of excavation or collapse of excavation walls.
- .4 No extra payment will be made for measures ordered by Department Representative or designate to correct problems caused by excess excavation.
- .5 No extra payment will be made for haul on any part of site or for haul required in disposing of excavated material off site.
- .6 No payment will be made for hauling back to site excavated material suitable for backfill that has been removed from site.
- .7 No extra payment will be made for stockpiling or double handling of excavated materials.
- .8 No extra payment will be made for construction methods required to keep excavation stable, free from disturbance and dry.
- .9 No extra payment will be made for crushed stone or other granular material used to facilitate drainage or dewatering during construction of structure or for excavation related thereto.
- .10 No extra payment will be made for removal and replacement of soil weakened or disturbed by unsuitable construction methods or procedures or by action of workmen.
- .11 No extra payment will be made for additional shoring required by additional excavating.
- .12 No extra payment will be made for disposing of excavated material at a waste disposal site.

.2 Shoring and Bracing:

.1 Include in Lump Sum Price bid all sheathing, lagging, braces, wales, stringers, soldier piles, labour and plant and for the installation of any shoring necessary for the construction of the foundations and all concrete work shown on the Drawings.

.2 Payment for additional shoring and bracing, required due to changes in the foundations requested by the Department Representative or designate, will be determined in accordance with the General Conditions.

.3 Steel piling:

.1 Include in Lump Sum Price bid all steel piling, anchors, angles, monitoring, etc., labour and plant required for the supply and installation of any piling necessary for the construction of the foundations and all concrete work shown on the Drawings.

.2 Payment for additional steel piling, required due to changes in the foundations requested by the Department Representative or designate, will be determined in accordance with the General Conditions.

1.3 REFERENCES

.1 Canadian Standards Association (CSA):

.1 CAN/CSA-G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.2 CAN/CSA-O86-14 (including Supplement CAN/CSA-O86S1-05), Engineering Design in Wood.

.3 CAN/CSA-W47.1-09 (R2014), Certification of Companies for Fusion Welding of Steel.

.4 CAN/CSA-W48-14, Filler Metals and Allied Metals for Metal Arc Welding.

.2 Ontario Provincial Standard Specifications (OPSS):

.1 OPSS 1010, April 2013, Material Specification for Aggregates – Base, SubBase, Select Subgrade, and Backfill Material.

.3 Health and Safety:

.1 Occupational Health and Safety Act, 1990 and Ontario Regulation 213/91 and all amendments, regulations and local authorities having jurisdiction.

1.4 DEFINITION

.1 Earth excavation: excavation of materials of whatever nature, including removal of frozen earth.

.2 Additional excavation: all excavation ordered in writing by Department Representative or designate beyond that specified.

.3 Excess excavation: all excavation beyond that specified and performed without written order of the Department Representative or designate.

.4 Backfill: fill material used below subgrade or finish grade.

.5 Native site material: any material obtained from excavating or grading under Contract.

1.5 SOURCE QUALITY CONTROL: HOT ROLLED STEEL SHEET PILING

.1 When requested, provide Department Representative or designate with certified copy of mill test report of steel piling, showing physical and chemical analysis, minimum five weeks prior to commencing reinforcing work.

.2 Inform Department Representative or designate of proposed source of material to be supplied.

1.6 SOIL INVESTIGATION REPORT

.1 A soil investigation of the site was completed by Golder Associates Ltd., Report No. 1776745-R01, dated August 2017. The Engineer does not guarantee the accuracy of the Report and data contained therein.

.2 The geotechnical report is provided as Appendix A of the Tender Documents for review.

1.7 JOB CONDITIONS

.1 Existing utilities: any damage to existing services and utilities incurred by the Contractor during excavation operations shall be repaired and/or replaced to the entire satisfaction of the parties concerned, at the Contractor's expense.

.2 Dewatering: excavations and subgrade areas shall be kept free of water at all times. The Contractor shall provide and operate pumps and have other equipment as required in readiness for this purpose.

.3 Subgrade condition: obtain written permission from the Department Representative or designate before starting excavation in frozen ground.

.4 Handling of steel piling:

.1 Use slings for lifting piling so that mass is evenly distributed and piling is not subjected to excessive bending stresses.

.2 Store sheet piling on level ground or provide supports so that sheet piling is level when stored. Provide blocking at a spacing so that there is no excessive sagging in piling. Overhang at ends not to exceed 0.5 m. Block between lifts directly above blocking in lower lift.

.5 Disturbance of Foundation Material:

.1 Care shall be taken during construction to prevent disturbance of foundation bearing subsoils by traffic, water or any other means.

.2 Construction traffic at the base of the excavation shall be held to a minimum.

.3 The final 300 mm of excavation shall be made by equipment which moves away from the excavated area.

.4 To avoid disturbance, delay excavation to final grade until concrete working slab or base slab can be placed.

.5 To protect the exposed subgrade under the new construction, the concrete working slab or base slab shall be placed during the same working day that the subsoil is excavated to final grade. Excavation to final grade shall not be carried out during periods of rain.

.6 All disturbed subsoil and debris shall be removed before concrete slabs are placed.

.6 Adjacent properties: the Contractor shall be responsible for repairing any damage to adjacent properties caused by his operations.

1.8 SUBMITTALS AND SHOP DRAWINGS

.1 Submit to Department Representative or designate a copy of agreement for disposal site required in Clause 1.9.

.2 Submit to Department Representative or designate drawings, calculations and supporting data for design of shoring and bracing system prior to commencing, as required in Clause 3.2.

.3 Submit to Department Representative or designate Shop Drawings, erection drawings, calculations and supporting data for design and installation of the steel piling prior to commencing, as required in Clause 3.3.

.4 Submit monitoring procedure drawings, calculations and supporting data prior to commencing excavation work.

.5 The Detail Drawings and Design Calculations for steel piling, shoring, bracing and monitoring procedure shall bear the signature and stamp of a Professional Engineer registered or licensed in Province of Ontario, Canada, and experienced in the design of these structures.

.6 Submit shop drawings in accordance with Section 01 33 23 – Submittal Procedures for Shop Drawings, Product Data, and Samples.

1.9 DISPOSAL SITES

.1 All surplus excavated materials to be disposed of off-site.

.2 Obtain from property owner a written agreement setting out terms, conditions and ultimate responsibility for materials as placed.

.3 Arrange with Department Representative or designate to have Regional Environmental Officer of Ministry of the Environment do an inspection of disposal site prior to and after dumping operations are completed.

.4 Keep disposal site stable and dump materials in a manner not to cause nuisance, injury, or inconvenience until property owner assumes responsibility under terms of agreement.

1.10 STABILITY OF EXCAVATION

.1 Employ such construction methods, plant procedures and precautions as shall ensure that excavations are stable, free from disturbance and, unless designated as sub-aqueous work, dry.

.2 Such construction methods may include, but are not limited to:
- .1 Interlocking timber or steel sheeting and shoring.
- .2 Groundwater control systems employing well points, deep wells or eductors.
- .3 Surface water or free water control systems employing ditches, stone drains, pipes and/or pumps.
- .4 Soil stabilization methods employing cement grouting, chemical grouting or chemical freezing.
- .5 Sloping back excavation to form a stable slope.

1.11 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Granular materials:
- .1 Granular "A": to OPSS 1010.
- .2 Granular "B": to OPSS 1010, Type 2, maximum aggregate size = 65 mm.

.2 Fill concrete: Class II concrete as specified in Section 03 30 00.

.3 Timber lagging: CAN/CSA 086, Select Structural Grade, Species Group D or better.

.4 Steel sheet piles: CAN/CSA-G40.21, Grade 350W of new structural steel.

.5 Structural steel for wales, soldier piles and bracing: conform to CAN/CSA G40.21, Grade 300W minimum.

.6 Welding electrodes: Conform to CSA W48, Compatible with steel grades to be welded.

.7 Do not use any material without approval from the Department Representative or designate.

PART 3 EXECUTION

3.1 SHORING AND BRACING

.1 Design, supply, install, maintain and remove shoring and bracing required to support and protect sides, bottom and roof (if any) of an excavation where necessary for the construction of the foundations.

.2 Follow procedures for extracting shoring and bracing and placing backfill to ensure that backfill load is applied gradually and disturbance of the works and foundation material does not occur.

.3 The safety and structural adequacy of all work within and including the shoring system and adjacent to the shoring will be solely the responsibility of the Contractor.

.4 The Professional Engineer, whose signature and seal appear on the Construction Procedure Drawings, shall inspect the work and certify, in writing, that the construction is in accordance with calculations and Construction Procedure Drawings submitted to the Department Representative or designate. Submit such certification to the Department Representative or designate.

3.2 STEEL PILING

.1 Design, supply, install and maintain steel piling required to support and protect sides and bottom of an excavation where necessary for the construction of the foundations.

.2 Submit full details of method and sequence of installation of piling to Department Representative or designate for approval prior to start of pile installation work.

.3 The safety and structural adequacy of all work within and including the piling system and adjacent to the piling will be solely the responsibility of the Contractor.

.4 The Professional Engineer, whose signature and seal appear on the Steel Piling Drawings, shall inspect the work and certify, in writing, that the piling construction is in accordance with calculations and Drawings submitted to the Department Representative or designate. Submit such certification to the Department Representative or designate.

.5 Templates or other means shall be used to ensure that piles are driven to line and to maintain interlock.

.6 Pile driving equipment shall have sufficient driving energy to advance piles to the correct tip elevation without damage to piles. Jetting of piles will not be permitted.

.7 The top of piles shall be cut off to a straight line at the required elevation, after all driving is complete.

3.3 DEWATERING

.1 Dewater excavation unless noted otherwise.

3.4 REMOVAL OF FROZEN GROUND

.1 Do not use backhoe bucket or drop weight to break frozen ground.

.2 Adopt method of removal of frozen ground that will not cause excessive noise, ground vibration or damage to adjacent properties or utilities.

3.5 EXCAVATION

.1 Excavation shall be carried out to lines and grades indicated on the Drawings.

.2 Excavations shall be cut just large enough to permit placing of footings, slabs on grade, base slabs and working slabs as shown on the Drawings. Footings and working slabs shall rest on undisturbed soil or engineered fill as shown on the Drawings.

.3 Care shall be taken during construction to prevent disturbance of foundation bearing subsoils by traffic, water or any other means. Construction traffic at the base of excavations shall be held to a minimum. All disturbed subsoil and debris shall be removed before working slabs or foundations are placed.

.4 Excavation may be sloped back to form a stable slope or shall be properly supported with approved sheeting, unless otherwise shown on the Drawings.

.5 Notify Inspector if bottom of excavation appears to be unsuitable for foundation. Excavate unsuitable material as directed or agreed to by the Department Representative or designate until satisfactory foundation is attained and backfill with approved granular material or concrete as directed.

.6 Stockpile excavated materials suitable for backfill in designated areas.

.7 Separate and dispose of materials that are unsuitable for backfill, such as sod, muck, frozen lumps, cinders, ashes, organic or other deleterious substances, as directed by the Department Representative or designate.

.8 Perform corrective measures ordered by the Department Representative or designate to rectify deficiencies caused by excess excavation.

.9 Remove and replace weakened or disturbed soil with fill concrete (Class II concrete) where excavated surface below or beside proposed structure is disturbed or weakened by unsuitable construction methods or procedures which may include inadequate control of ground water or free water or action of workers.

.10 All finished excavations shall be leveled as required and stepped as shown on the Drawings or as directed by the Department Representative or designate.

.11 Ascertain location of all existing services and protect during excavation operations.

3.6 ADDITIONAL EXCAVATION

.1 If, in the opinion of the Department Representative or designate, subsoil does not provide adequate bearing, additional excavation to firm bearing will be necessary. Such additional excavation will be classed as extra work and will be paid for in accordance with the General Conditions.

.2 Unit Prices shall be applied to the net difference in quantities between excavation shown on the Drawings and that actually performed for all structural excavation. Unit prices for such additional excavation is to be mutually agreed to by Department Representative or designate and Contractor.

3.7 UNAUTHORIZED EXCAVATION

.1 If excavation is carried below elevations shown on the Drawings, or below elevations approved by the Department Representative or designate, the Contractor shall, at his own expense, restore bottom of excavation to correct elevation as follows:

.1 Under footings, backfill with fill concrete (Class II concrete) as specified in Clause 2.1.

.2 Under slabs, backfill with compacted Granular Material "A" or "B" as specified in Clause 2.1, or with fill concrete if so directed by the Department Representative or designate.

3.8 DISPOSAL OF MATERIAL

.1 Selected excavated material to be used for backfill, in accordance with Section 31 23 02, shall be effectively separated so that materials are not reworked or contaminated by deleterious material and may be stockpiled on site if approved by the Department Representative or designate.

.2 Surplus excavated material or material not suitable for backfill shall be disposed of off the site to an approved location and at no expense to the Owner.

3.9 FIELD QUALITY CONTROL

.1 All excavations shall be inspected and approved by the Department Representative or designate before concrete is placed.

.2 The Professional Engineer responsible for the steel piling and shoring design shall inspect the work and certify, in writing, that the construction is in accordance with the design previously submitted, and meets with his approval.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 03 30 00 – Cast-In-Place Concrete.

.2 Section 31 05 10 – Corrected Maximum Dry Density.

.3 Section 31 23 03 – Compaction Control and Testing.

1.2 REFERENCES

.1 Ontario Provincial Standard Specifications (OPSS):
- .1 OPSS 1001, November 2013, Material Specification for Aggregates – General.
- .2 OPSS 1002, April 2013, Material Specification for Aggregates – Concrete.
- .3 OPSS 1010, April 2013, Material Specification for Aggregates – Base, SubBase, Select Subgrade, and Backfill Material.

.2 Health and Safety:
- .1 Occupational Health and Safety Act, 1990, and Ontario Regulation 213/91 and all amendments, regulations and local authorities having jurisdiction.
- .2 Reference shall be made to the General Conditions for additional safety regulations and provisions.

1.3 SOURCE QUALITY CONTROL

.1 Sampling and testing of materials shall be performed by an independent Inspection and Testing Company specializing in this work and selected by the Department Representative or designate. The Department Representative or designate shall provide, at no extra cost, all materials requested by the Department Representative or designate for sampling and testing, and allow Department Representative or designate access to the work and material source.

1.4 JOB CONDITIONS

.1 Existing Utilities:
- .1 Any damages to existing services incurred by the Contractor during backfilling operations shall be repaired and/or replaced to the entire satisfaction of the parties concerned at the Contractor's expense.

.2 Subgrade Condition:
- .1 Backfill shall not be placed unless subgrade is completely free of frost. The Contractor shall provide heating and enclosures if necessary to remove frost from sub-grade prior to backfilling, if so directed by the Department Representative or designate.

.2 When work is done in cold weather, adequate precautions must be taken to prevent freezing of sub-grade on which concrete is to be placed. The Contractor's attention is directed to "Cold Weather Requirements" in Section 03 30 00 of this Specification.

.3 Backfill Sequence:

.1 Temporary supports for excavation shall be removed during backfilling operations. If, however, temporary unbalanced earth pressures are liable to develop in walls, the Contractor shall provide and place necessary shoring and bracing to counteract unbalance and shall leave these members in place until their removal is approved by the Department Representative or designate.

.2 No fill shall be placed against walls until 14 days after placing concrete in walls and the top slab has been in place for seven days, but in no case until the concrete has achieved 70 percent of its design strength, unless walls are shored and braced to approval of Department Representative or designate.

.3 No fill shall be placed against cantilevered retaining walls until 28 days after placing concrete in walls, unless walls are shored and braced to approval of Department Representative or designate.

1.5 INSPECTION AND TESTING COST

.1 Payment for initial sampling and testing of materials and compaction tests shall be paid by Owner.

.2 Payment for retesting required due to unsatisfactory results shall be paid by the Contractor.

.3 Refer to Section 31 23 03 for additional requirements.

1.6 BASIS OF PAYMENT

.1 Payment for backfill materials, placement and compaction shall be included in Lump Sum Price bid in Bid Form.

.2 Include in Lump Sum Price cost of all backfill for complete construction of structure, including engineered fill backfill necessary to bring grades up to rough grades shown on the Drawings, berms surrounding structure and as required to restore grades after removal of dewatering system.

.3 Payment for backfilling additional excavation shall be determined in accordance with the General Provisions and General Conditions.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Native site material:
- .1 Excavated material approved by the Department Representative or designate.
- .2 Material free from frozen lumps, cinders, ashes, refuse, vegetable or organic matter, rocks and boulders over 150 mm in any dimension, or other deleterious materials.

.2 Imported material:
- .1 Material from source approved by the Department Representative or designate.
- .2 Material free from frozen lumps, cinders, ashes, refuse, vegetable or organic matter, rocks and boulders over 150 mm in any dimension, or other deleterious materials.

.3 Granular materials:
- .1 Granular "A": to OPSS 1010.
- .2 Granular "B": to OPSS 1010, Type 2, maximum aggregate size = 65 mm.
- .3 Crushed stone: to OPSS 1002, nominal size, 19.0 mm coarse aggregate.
- .4 Sand: to OPSS 1001.

.4 Fill concrete: Class II concrete as specified in Section 03 30 00.

.5 Do not use any material without approval from the Department Representative or designate.

PART 3 EXECUTION

3.1 PLACING AND COMPACTION

.1 Materials shall be placed in horizontal lifts by approved equipment, for full width of excavation and simultaneously on all sides of structures as shown on the Drawings, and compacted to the minimum dry density (as a percent of Standard Proctor Maximum Dry Density in conformance with Section 31 05 10) as tabulated below, at or near optimum moisture content, before next lift is placed:

Location	Material	Lift Thickness	Dry Density
Below Footings, Mat Foundations and other building foundations	Granular "A"	150 mm	100%
Berms, behind exterior concrete walls	Granular "B"	200 mm	95%
Below Floor Slabs	Granular "A	150 mm	100%
	Granular "B"	200 mm	100%

.2 Hauling equipment will not be accepted in lieu of compacting equipment.

.3 Material shall be moistened or dried as required for maximum density and thoroughly compacted by mechanical vibrators capable of producing required compaction.

.4 All backfill or fill material shall be completely free of frozen lumps, large rocks, debris and organic matter.

.5 Do not proceed with backfill operations until the Department Representative or designate has inspected work in place.

3.2 BACKFILLING SHORED EXCAVATIONS

.1 Withdraw sheathing gradually as backfilling progresses.

.2 Do not remove bracing until backfill reaches level of bracing.

.3 Place and compact backfill in a manner to fill voids left by pulled sheathing.

.4 Place and compact backfill around and over sheathing left in place.

3.3 SUPPORT AT STRUCTURES

.1 Where a pipe is laid into a structure across an excavated area, provide one of the following:

- .1 Backfill excavation below pipe with fill concrete (Class II concrete) up to first pipe joint at undisturbed soil.
- .2 Install a reinforced concrete beam capable of supporting pipe and overburden between structure and undisturbed soil. Place backfill to level of underside of beam before placing beam.
- .3 Provide a flexible pipe joint 300 mm from outside face of structure.

3.4 RESTORATION

.1 Upon completion of work, remove surplus materials and debris, trim slopes, and correct defects noted by the Department Representative or designate.

.2 Replace topsoil as directed.

.3 Reinstate areas affected by equipment outside of area of work to condition which existed prior to commencement of work and leave site in rake-clean condition.

3.5 FIELD QUALITY CONTROL

.1 Inspection and tests for compaction shall be performed by an independent Inspection and Testing Company specializing in this work and selected by the Department Representative or designate. The Contractor shall provide access to the work, as requested by the Department Representative or designate, and extend full co-operation.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 Ontario Provincial Standard Specifications (OPSS):
  .1 OPSS 501, November 2014, Construction Specification for Compacting.

1.2 BASIS OF PAYMENT

.1 Payment for initial inspection and testing to be paid by Contractor.

.2 Payment for retesting required due to unsatisfactory results by Contractor.

PART 2 PRODUCTS– NOT APPLICABLE

PART 3 EXECUTION

3.1 GENERAL

.1 OPSS 501 shall apply except as extended or amended herein for site work.

3.2 MATERIAL TESTING

.1 Testing of material to be performed by an independent testing agency.

.2 Supply representative samples of granular materials for gradation test.

.3 Provide labour to obtain and handle samples at work site or at source of materials.

3.3 COMPACTION TESTING

.1 Compaction tests to be performed by independent testing agency.

.2 Testing to be performed throughout progress of work to determine adequacy of compaction.

.3 Co-operate with inspection staff during testing period.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 25 – Submittal Procedures for Shop Drawings, Product Data and Samples

.2 Section 03 20 00 – Concrete Reinforcing

.3 Section 03 30 00 – Cast-In-Place Concrete

1.2 MEASUREMENT PROCEDURES

.1 Measure bored piles in units incorporated into work.

.2 Amount of bored pile shaft added or deducted in event actual bearings are below or above elevations indicated will be measured in [cubic] metres.

.3 Measure load test, when ordered.

.4 Base tender on number and lengths of piles as indicated.

.5 Actual lengths of piles installed: established by Department Representative or designate from piling records.

.6 Measure piles in metres measured from base elevation including rock socket to cut-off elevation at pile cap.

1.3 REFERENCE STANDARDS

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM A36/A36M-14, Standard Specification for Carbon Structural Steel.

.2 ASTM A53/A53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

.3 ASTM A252-10, Standard Specification for Welded and Seamless Steel Pipe Piles.

.4 ASTM A283/A283M-13, Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.

.5 ASTM A1008/A1008M-16, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

.2 Canadian Standards Association (CSA International)

.1 CSA-A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CAN/CSA-G30.18-09, Billet Steel Bars for Concrete Reinforcement.

.3 CSA-G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.4 CAN/CSA S16-14, Limit States Design of Steel Structures.

.5 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding.

.6 CSA W59-13, Welded Steel Construction (Metal Arc Welding) (Metric).

.7 CSA W186-M1990 (R2002), Welding or Reinforcing Bars in Reinforced Concrete Construction.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 23 - Submittal Procedures for Shop Drawings, Product Data and Samples.

.2 Product data: submit manufacturer's printed product literature, specifications and datasheet.

.3 Shop Drawings:

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

.4 Quality assurance submittals:

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

.2 Instructions: submit manufacturer's installation instructions.

.3 Records and reports: submit concrete tests and Mill test report as described in PART 2 - SOURCE QUALITY CONTROL.

.4 Submit for review by Department Representative or designate copies of pile installation records as described in PART 3 - FIELD QUALITY CONTROL.

.5 Submit detailed method statement and procedures for controlling and monitoring verticality and alignment of piles before starting pile installation.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for recycling in accordance the General Conditions.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Concrete mixes and materials: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.2 Reinforcing steel: to CAN/CSA-G30.18 and Section 03 20 00 - Concrete Reinforcing.

.3 Steel pipe shell: to ASTM A252, Grade [2], diameters and mass per metre as indicated, plain ends.

.4 Steel casing: to ASTM A283/A283M, grade C.

.5 High carbon steel cutting edge collar: to ASTM A53/A53M, welded to bottom of first pipe shell.

.6 Wide welded plate sleeves: to ASTM A1008/A1008M, and as indicated.

.1 External [300] mm forming connections between lengths of steel pipe formed from flat plate.

.7 Welding materials: to CSA W59.

.8 Grout: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

2.2 SOURCE QUALITY CONTROL

.1 Mill report to CAN/CSA-S16.

.2 Concrete tests: to CSA-A23.1/A23.2.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for pile installation in accordance with manufacturer’s written instructions.

.1 Visually inspect substrate in presence of Department Representative or designate.

.2 Inform Department Representative or designate of unacceptable conditions immediately upon delivery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Department Representative or designate.

3.3 INSTALLATION

.1 Bore holes to diameters and depths as indicated until required bearing stratum as determined by Department Representative or designate is reached.

.2 Department Representative or designate to inspect and test bottom of bore holes.

.3 Belled piles:

.1 Upon confirmation of allowable service load bearing value by Department Representative or designate, excavate bell to details where indicated.

.4 Structural steel casing:

.1 Vibrate or push down shell to founding level as indicated.

.2 Splice shell if required, by welding piles together by shielded electric welding.

.1 To prevent distortion, tack opposite points first and then opposite sections.

.2 Ensure top member is held in vertical alignment during splicing operation.

.3 Remove material from inside of shell continuously as driving proceeds by method approved by Department Representative or designate.

.5 Protective steel casing:

.1 Where required, use steel protective casing approved by Department Representative or designate.

.1 Ensure penetration of casing to required depths either by self mass or driving.

.6 Check each bored shaft for toxic and explosive gases and provide appropriate protective measures for personnel working in shaft.

.7 Dispose of excavated materials off site as indicated, as directed Department Representative or designate.

.8 Department Representative or designate to inspect pile excavation prior to placing of concrete.

.1 Remove loose material, foreign matter and water as directed by Department Representative or designate.

.9 Perform internal inspection of steel shell, joints and bearing prior to placing concrete as direct by Department Representative or designate.

.10 Fill pile excavations with concrete to elevations as indicated.

.1 Place concrete in one continuous pour in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.11 Steel protective casing is to be removed, unless otherwise specified.

.12 Provide concrete with minimum slump of 125 mm and with retarder to prevent arching or setting of concrete.

.1 Withdraw casing in conjunction with concrete placing, keeping bottom of casing 600 mm below level of concrete.

.2 Do not vibrate concrete internally.

.13 Use tremie pipe or concrete pumping as specified in Section 03 30 00 – Cast-In-Place Concrete.

3.4 REINFORCING STEEL

.1 Install steel reinforcement in accordance with Section 03 20 00 – Concrete Reinforcing and as indicated.

.2 Make reinforcement into cages sufficiently rigid enough to resist damage or displacement during handling.

.1 When reinforcement is made up from more than one segment, include sufficient bar length required to lap splice.

.2 Weld lap splicing.

.3 Weld stirrups, lateral ties or spiral ties to main bars.

.4 Welders to be certified by Canadian Welding Bureau (CWB) who hold welding certification required for Work.

.5 Use spacers specifically designed to achieve accurate placement of reinforcement as approved by Department Representative or designate.

.1 Proceed with reinforcement placement only after receipt of written approval from Department Representative or designate.

3.5 CONCRETE PLACEMENT

.1 Concrete and placement methods: to Section 03 30 00 - Cast-in-Place Concrete.

.2 Complete placing of concrete to required elevation within shell as approved in writing by Department Representative or designate.

.3 Clean off concrete laitance accrued at top of shell.

.4 Cut off top of shell neatly and squarely at elevations as indicated.

.5 Protect steel reinforcement core projecting above concrete in caisson.

.6 When tremie concrete is used, with approval of Department Representative or designate, proceed as follows:

.1 Equalize water level inside and outside of caisson.

.2 Place reinforcement.

.3 Lower sealed tremie pipe to bottom of socket.

.4 Fill tremie pipe and hopper with low slump, cement rich concrete and tremie as specified in Section 03 30 00 Cast-In-Place Concrete.

.5 Withdraw tremie pipe, allow concrete to set, pump water out, clean up all laitance and complete concreting in the dry.

.6 In case of losing concrete charge during tremie operations, withdraw pipe and reinforcement, remove concrete and start again.

3.6 DEFECTIVE CAISSONS

.1 Replace, repair or modify caissons in accordance with written instructions from Department Representative or designate.

.2 Where pile has encountered obstruction during driving prior to reaching specified bearing stratum conform to Department Representative or designate instructions. Payment on used sections as outlined in Measurement Procedures article in this section.

3.7 FIELD QUALITY CONTROL

.1 Field Records: maintain installation record for each shell, including elevation of bedrock, driven depth of pile, cut-off elevation of shell and protruding core.

3.8 CLEANING

.1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION