

Section Number	Section Title	No. of Pages
Division 00		
00 01 10	Table of Contents	2
00 01 15	List of Drawings	1
Division 01 – General Requirements		
01 11 00	General Requirements	8
01 31 19	Project Meetings	2
01 32 16.19	Construction Progress Schedule – Bar (GANTT) Chart	2
01 33 00	Submittal Procedures	4
01 35 29.06	Health and Safety Requirements	7
01 35 43	Environmental Procedures	3
01 45 00	Quality Control	2
01 51 00	Temporary Utilities	2
01 56 00	Temporary Barriers and Enclosures	2
01 61 00	Common Product Requirements	4
01 73 00	Execution	2
01 74 00	Cleaning	1
01 74 19	Waste Management and Disposal	2
01 78 00	Closeout Submittals	7
01 91 13	General Commissioning (Cx) Requirements	9
01 91 31	Commissioning (Cx) Plan	9
01 91 33	Commissioning Forms	3
01 91 41	Commissioning: Training	4
Division 03 – Concrete		
03 30 00	Cast-in-Place Concrete	4
Division 26 – Electrical		
26 05 00	Common Work Results for Electrical	11
26 05 03	Electrical Removals and Alterations	3
26 05 20	Wire and Box Connectors (0-1000V)	2
26 05 21	Wires and Cables (0-1000V)	4
26 05 28	Grounding – Secondary	3
26 05 29	Hangers and Supports for Electrical Systems	3
26 05 31	Junction and Pull Boxes	2
26 05 32	Outlet Boxes, Conduit Boxes and Fittings	2
26 05 34	Conduits, Conduit Fastenings and Conduit Fittings	5
26 05 43.01	Installation of Cables in Trenches and in Ducts	3
26 12 16.01	Dry Type Transformers up to 600V Primary	3
26 24 01	Service Equipment	1
26 24 02	Service Entrance Board	10
26 28 16.02	Molded Case Circuit Breakers	2
Division 31 – Earthwork		
31 23 33.01	Excavating, Trenching and Backfilling	9

Division 32 – Exterior Improvements

32 11 16.01	Granular Subbase	3
32 11 23	Granular Base	3
32 91 19.13	Topsoil Placement & Grading	5
32 92 23	Sodding	4

Division 33 – Utilities

33 65 73	Concrete Encased Duct Banks	4
33 65 76	Direct Buried Underground Cable Ducts	3
33 71 73.02	Underground Electrical Service	4

END OF SECTION

Number	Title
Electrical	
E1	Electrical Site Plan
E2	Holland Building Electrical
E3	Murray Building Electrical
E4	Power Distribution Single Line Diagrams
E5	Power Distribution Single Line Diagrams
E6	Power Distribution Single Line Diagrams
E7	Existing Switchgear Elevations
Landscape	
L1	Landscape Site Plan

END OF SECTION

Part 1 General

1.1 DESCRIPTION OF WORK

- .1 The work covered under this project consists of the furnishing of all labour, and equipment, for electrical secondary services upgrades located at the Holland and Murray Buildings, Bedford Institute of Oceanography, Dartmouth, NS, in strict accordance with Specifications and accompanying drawings and subject to all terms and conditions of the contract.
- .2 The work consists of but is not necessarily limited to the following:
 - .1 Replacement of the existing underground feeder to the Holland Building, including extending existing spare underground conduits to the padmount transformer and to the new main service entrance board in the building.
 - .2 Replacement of existing concrete transformer pad, extension of existing primary utility conduits, and coordination with Nova Scotia Power.
 - .3 Removal of the existing timber retaining wall around the padmount transformer and sectionalizing cabinet, filling and sloping of existing grades, installation of shredded bark mulch.
 - .4 Upgrade the existing service entrance switchboard in the Holland Building and connection to the new main service entrance board.
 - .5 Upgrade the existing service entrance switchboard in the Murray Building.
 - .6 Replacement of the three single-phase transformers in the Murray Building.
 - .7 Removal of abandoned and obsolete electrical equipment.
 - .8 Temporary power, phasing, and scheduling of work to minimize interruptions of operations.
 - .9 Restoration of indoor and outdoor areas to pre-construction conditions.
 - .10 Commissioning process and documentation to CSA Z320-11 (R2016).
- .3 All other materials required for the execution of this Contract must be supplied by the Contractor.

1.2 SITE OF WORK

- .1 Work will be carried out at the Holland and Murray Buildings, Bedford Institute of Oceanography, Dartmouth, NS in the location as shown on the accompanying drawings.

1.3 SEQUENCE OF WORK

- .1 This proposed sequence of work is to be used as a guideline only. The Contractor shall draft and submit a detailed sequence of work for review by the Departmental Representative prior to any work proceeding.
 - .1 Holland Building Service Entrance Board (SEB) Retrofit, must be completed by March 31, 2020:
 - .1 Arrange and pay for Nova Scotia Power (NSP) to de-energize the padmount transformer for the Holland Building (HB).
 - .2 Disconnect the feeders from the HB SEB breakers.

- .3 Upgrade existing HB SEB.
- .4 Reconnect the feeders to the new SEB breakers.
- .5 Arrange and pay for NSP to re-energize the padmount transformer for the HB.
- .2 Murray Building SEB Retrofit, must be completed by March 31, 2020:
 - .1 Arrange and pay for NSP to de-energize the padmount transformer for the Murray Building (MB).
 - .2 Disconnect the feeders from the MB SEB breakers.
 - .3 Upgrade existing MB SEB.
 - .4 Reconnect the feeders to the new SEB breakers.
 - .5 Arrange and pay for NSP to re-energize the padmount transformer for the MB.
- .3 Murray Building Transformers Replacement, must be completed by March 31, 2020:
 - .1 Work must be done during a separate weekend shutdown than the SEB retrofit.
 - .2 Open MB SEB main breaker.
 - .3 Remove 3 existing distribution transformers and associated wire and conduit.
 - .4 Install 3 new distribution transformers and associated wire and conduit.
 - .5 Make connections.
 - .6 Close MB SEB main breaker and energize distribution and transformers.
- .4 Holland Building New Service Entrance, must begin and be completed in September 2020:
 - .1 Install temporary feeder between Murray Building (MB) electrical room and Holland Building (HB) electrical room.
 - .2 Arrange and pay for NSP to de-energize the padmount sectionalizing cabinet and transformer for the HB.
 - .3 Shut off HB SEB main breaker.
 - .4 Connect temporary feeder to spare breaker in MB SEB distribution.
 - .5 Connect temporary feeder to spare breaker in HB SEB distribution.
 - .6 Energize HB SEB distribution from temporary MB feeder.
 - .7 Arrange and pay for NSP to remove padmount transformer and primary cables from sectionalizer.
 - .8 Cut and remove concrete pad below transformer.
 - .9 Excavate and extend spare conduits to secondary side of transformer. Remove retaining wall.
 - .10 Excavate and extend primary conduits to primary side of transformer.
 - .11 Excavate and prepare earth for new concrete transformer pad.
 - .12 Install transformer grounding to NSP requirements.
 - .13 Install sectionalizing cabinet grounding to NSP requirements.
 - .14 Install concrete transformer pad to NSP requirements.

- .15 Install secondary feeders from transformer in underground conduits to new HB electrical room.
- .16 Arrange and pay for NSP to install primary feeders, transformer and terminate primary, secondary and grounding conductors.
- .17 Install ground plates outside new HB electrical room and ground wire in underground conduit to new electrical room.
- .18 Install SEB in new HB electrical room and connect feeder to main breaker and grounding to ground bus.
- .19 Extend existing feeder conduits in new meeting room to new HB SEB and to upgraded HB SEB.
- .20 Install grounding conduit from new HB SEB to existing water entrance.
- .21 Remove obsolete MI feeder cables to upgraded HB SEB. Weatherseal wall penetrations.
- .22 Install feeder from new HB SEB to upgraded SEB in conduit and terminate both ends.
- .23 Install ground wire from new HB SEB ground bus to water entrance and terminate both ends.
- .24 Disconnect neutral grounding at upgraded HB SEB.
- .25 Remove temporary feeder cable from HB and MB SEB distribution breakers.
- .26 Turn on HB SEB main breakers.
- .27 Arrange and pay for NSP to re-energize sectionalizing cabinet and padmount transformer.
- .28 Regrade and repair landscape.

1.4 FAMILIARIZATION WITH SITE

- .1 Before submitting a bid, it is recommended that bidders inspect and examine the site of work and satisfy themselves as to the form and nature of the work, existing conditions, materials, obstructions, the means of access to the site, and the temporary facilities required for completion of the work. Means of access to the site, severity, exposure and uncertainty of weather, soil conditions, any accommodations they may require, and in general shall themselves obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect their bid. No allowance shall be made subsequently in this connection on account of error or negligence to properly observe and determine the conditions that will apply.
- .2 Obtain prior permission from the Departmental Representative before carrying out such site inspection.
- .3 Contractors, bidders or those they invite to site are to review specification Section 01 35 29.06 – Health and Safety Requirements before visiting site. Take all appropriate safety measures for any visit to site, either before or after acceptance of bid.
- .4 Bidders are required to wear all appropriate personal protective equipment and take all precautionary measures necessary to ensure their safety during any pre-tender visit.

- .5 Contractor shall make own assessment of the site conditions, and difficulties in carrying out the work as specified.

1.5 CODES AND STANDARDS

- .1 Perform work in accordance with the 2015 National Building Code of Canada and any other of provincial or local application including all amendments up to project tender closing date provided that in any case of conflict or discrepancy, the more stringent requirements shall apply.
- .2 Materials and workmanship must meet or exceed requirements of specified standards, codes and referenced documents.

1.6 WORK SCHEDULE

- .1 Contractor is to note that Departmental Representative intends to carry on business and day-to-day activities in the buildings as usual. Work activities must be coordinated with Departmental Representative.
- .2 Submit within 7 work days of notification of acceptance of bid, a construction schedule showing commencement and completion of all work within the time stated on the Bid and Acceptance Form and the date stated in the bid acceptance letter.
- .3 Provide sufficient details in schedule to clearly illustrate entire implementation Plan, depicting efficient coordination of tasks and resources, to achieve completion of work on time and permit effective monitoring of work progress in relation to established milestones.
- .4 As a minimum, work schedule to be prepared and submitted in the form of Bar (GANTT) Charts, indicating work activities, tasks and other project elements, their anticipated durations and planned dates for achieving key activities and major project milestones provided in sufficient details and supported by narratives to demonstrate a reasonable plan for completion of project within designated time. Generally, Bar Charts derived from commercially available computerized project management system are preferred but not mandatory.
- .5 Contractor must ensure that schedule is adhered to meet the requirements without exception.
- .6 Where Work involves breaking into or connecting to existing services, give Departmental Representative 7 days of notice for necessary interruption of electrical service throughout course of work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of 6:00 to 18:00 weekdays.

1.7 ABBREVIATIONS

- .1 Following abbreviations of standard specifications have been used in this specification and on the drawings: CGSB - Canadian Government Specifications Board CSA - Canadian Standards Association ASTM - American Society for Testing and Materials.

- .2 Where these abbreviations and standards are used in this project, latest edition in effect on date of bid call will be considered applicable.

1.8 MEASUREMENT RESPONSIBILITIES

- .1 Notify Departmental Representative at least 72 hours in advance of operations to permit required licensed electrical inspectors to inspect the work done, for payment purposes.

1.9 CONTRACTOR'S USE OF SITE

- .1 Cooperate with users of existing facilities. Maintain access to the buildings.
- .2 Should interference occur, take directions from Departmental Representative.
- .3 Construction operations, including storage of materials for this contract, not to interfere with the operations of the buildings.
- .4 Be responsible for arranging the storage of materials on or off site, and any materials stored at the site which interfere with any of the day to day activities at or near the site will be moved promptly at the Contractor's expense, upon request by Departmental Representative. Obtain and pay for use of additional storage or work areas needed for operations.
- .5 Exercise care so as not to obstruct or damage public or private property in the area.
- .6 Do not unreasonably encumber site with materials or equipment.
- .7 At completion of work, restore area to its original condition. Damage to ground and property will be repaired by Contractor. Remove all construction materials, residue, excess, etc. and leave site in a condition acceptable to Departmental Representative.
- .8 Comply with all regulations and authorities having jurisdiction over the work, whether on land or on water.

1.10 PROTECTION

- .1 Store all materials and equipment to be incorporated into work to prevent damage by any means.
- .2 Repair or replace all materials or equipment damaged in transit or storage to the satisfaction of Departmental Representative and at no cost.

1.11 ACCEPTANCE

- .1 Prior to the issuance of the Certificate of Substantial Performance, in company with Departmental Representative, make a check of all work. Correct all discrepancies before final inspection and acceptance.

1.12 EXISTING SERVICES

- .1 Execute work with least possible interference or disturbance to occupants, public and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.
- .2 Where work involves breaking into or connecting to existing services, carry out work at times directed by governing authorities, with minimum of disturbance to site operations.
- .3 Before commencing work, establish location and extent of service lines in area of work and notify Departmental Representative of findings.
- .4 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility. Adhere to approved schedule and provide notice to affected parties.
- .5 Provide temporary services when directed by Departmental Representative to maintain critical facility systems.
- .6 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
- .7 Protect, relocate or maintain existing active services as required. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction over service. Record locations of maintained, re-routed and abandoned service lines.
- .8 The buildings shall remain in full service to the users during the duration of the construction contract.

1.13 WORK COORDINATION

- .1 Be responsible for coordinating the work of the various trades, where the work of such trades interfaces with each other. Site Superintendent to be on site at all times of work.
- .2 The Contractor is to note there may be other Contractors on site working on other projects. Contractor must coordinate this work with other Contractors and projects on site. Contract boundaries may change as work progresses. Contractor is responsible for all activities within own Contract boundary.
- .3 Convene meetings between trades whose work interfaces and ensure that they are fully aware of the areas and the extent of where interfacing is required. Provide each trade with the plans and specifications of the interfacing trade, as required, to assist them in planning and carrying out their respective work.
- .4 Departmental Representative will not be responsible for or held accountable for any extra costs incurred as a result of the failure to carry out coordination work. Disputes between the various trades as a result of their not being informed of the areas and extent of interface work shall be the sole responsibility to the General Contractor and shall be resolved at no extra cost to the Departmental Representative.

1.14 WORK COMMENCEMENT

- .1 Mobilization to project site is to commence immediately after acceptance of bid and submission and acceptance of Site Specific Safety Plan.
- .2 Project work on site is to commence as soon as possible, with a continuous reasonable work force, unless otherwise agreed by Departmental Representative.
- .3 Weather conditions, short construction season, delivery challenges and the location of the work site may require the use of longer working days and additional work force to complete the project within the specified completion time.
- .4 Make every effort to ensure that sufficient material and equipment is delivered to site at the earliest possible date after acceptance of bid and replenished as required.

1.15 DOCUMENTS

- .1 Maintain at job site, one copy each of the following:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Reviewed Shop Drawings.
 - .5 List of outstanding Shop Drawings.
 - .6 Change Orders.
 - .7 Other modifications to Contract.
 - .8 Field Test Reports.
 - .9 Copy of Approved Work Schedule.
 - .10 Health and Safety Plan and other safety related documents.
 - .11 Electrical Lock-out.
 - .12 Fire Safety Hot Work Permit.
 - .13 Permits, Codes and Acts.
 - .14 Waste Management Plan.
 - .15 Other documents as stipulated elsewhere in the Contract Documents, Drawings and these Specifications.

1.16 PERMITS

- .1 In accordance with the General Conditions, certificates, licenses and other permits as required by authorities having jurisdiction.
- .2 Provide appropriate notifications of project to municipal and provincial inspection authorities.
- .3 Obtain compliance certificates as prescribed by legislative and regulatory provisions of authorities having jurisdiction.
- .4 Submit to Departmental Representative, copy of application forms and approval documents received from above referenced authorities.

- .5 Comply with all requirements, recommendations and advice by all regulatory authorities unless otherwise agreed in writing by Departmental Representative. Make requests for such deviations to these requirements sufficiently in advance of related work.

1.17 FACILITY SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions.

1.18 CUTTING, FITTING AND PATCHING

- .1 Execute cutting, 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 Do not cut, bore, or sleeve load-bearing members.
- .4 Make cuts with clean, true, smooth edges. Make patches inconspicuous in final assembly.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

- .1 Schedule and administer project meetings throughout the progress of the work at the call of Departmental Representative. Should other projects be ongoing in this space, Departmental Representative may schedule an overall coordination meeting, attendance is mandatory.
- .2 Prepare agenda for meetings.
- .3 Preside at meetings.
- .4 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.
- .5 Reproduce and distribute copies of minutes within three days after meetings and transmit to meeting participants.
- .6 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.2 PRECONSTRUCTION MEETING

- .1 Within 15 days after award of Contract, attend a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Agenda to include:
 - .1 Appointment of official representative of participants in the Work.
 - .2 Schedule of Work: in accordance with Section 01 32 16.19 – Construction Progress Schedules - Bar (GANTT) Chart.
 - .3 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 51 00 – Temporary Utilities.
 - .5 Site security in accordance with Section 01 56 00 – Temporary Barriers and Enclosures.
 - .6 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, administrative requirements.
 - .7 Departmental Representative provided products.
 - .8 Record drawings in accordance with Section 01 33 00 – Submittal Procedures.
 - .9 Maintenance manuals in accordance with Section 01 78 00 – Closeout Submittals.
 - .10 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 – Closeout Submittals.
 - .11 Monthly progress claims, administrative procedures, photographs, hold backs.

- .12 Appointment of inspection and testing agencies or firms.
- .13 Insurances, transcript of policies.

1.3 PROGRESS MEETINGS

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

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 DEFINITIONS

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

1.2 REQUIREMENTS

- .1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
- .2 Plan to complete Work in accordance with prescribed milestones and time frame.
- .3 Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit to Departmental Representative within 1 week of Contract Award.

1.4 MASTER PLAN

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

- .2 Departmental Representative will approve or reject revised schedules within 5 working days.
- .3 Revise impractical schedule and resubmit within 5 working days.
- .4 Accepted revised schedule will become Master Plan and be used as baseline for updates.
- 1.5 PROJECT SCHEDULE
 - .1 Develop detailed Project Schedule derived from Master Plan.
 - .2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
 - .1 Award.
 - .2 Shop Drawings, Samples.
 - .3 Permits.
 - .4 Mobilization.
 - .5 Excavating and trenching for new electrical services.
 - .6 Transformer pad replacement.
 - .7 Holland Building main switchboard upgrade and connection to new main disconnect switch.
 - .8 Murray Building main switchboard upgrade.
 - .9 Murray Building transformer replacement.
 - .10 Substantial Completion.
- 1.6 PROJECT SCHEDULE REPORTING
 - .1 Update Project Schedule as required.
 - .2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.
- 1.7 PROJECT MEETINGS
 - .1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.
 - .2 Weather related delays with their remedial measures will be discussed and negotiated.
- Part 2 Products
 - 2.1 NOT USED
- Part 3 Execution
 - 3.1 NOT USED

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

- .1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Present shop drawings, product data and samples in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are coordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative's review.
- .10 Keep one reviewed copy of each submission on site.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .3 Allow 5 days for Departmental Representative's review of each submission.

- .4 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .5 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
- .6 Accompany submissions with transmittal letter containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
- .7 Submissions 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.
- .8 After Departmental Representative's review, distribute copies.
- .9 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.

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

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

1.3 SCHEDULES, PERMITS AND CERTIFICATES

- .1 Upon acceptance of bid, submit to Departmental Representative copy of Work Schedule and various other schedules, permits certification documents and project management plans as specified in other sections of the Specifications.
- .2 Submit copy of permits, notices, compliance Certificates received by Regulatory Agencies having jurisdiction and as applicable to the work.
- .3 Submission of above documents to be in accordance with Submittal General Requirements procedures specified in this section.
- .4 Immediately after award of Contract, submit Workers' Compensation Board Status.
- .5 Submit transcription of insurance immediately after award of Contract.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Province of Nova Scotia
 - .1 Occupational Health and Safety Act, S.N.S. – Updated 2017.

1.2 DEFINITIONS

- .1 COSH: Canada Occupational Health and Safety Regulations made under Part II of the Canada Labour Code.
- .2 Competent Person: means a person who is:
 - .1 Qualified by virtue of personal knowledge, training and experience to perform assigned work in a manner that will ensure the health and safety of persons in the workplace, and;
 - .2 Knowledgeable about the provisions of occupational health and safety statutes and regulations that apply to the Work and;
- .3 Medical Aid Injury: any minor injury for which medical treatment was provided and the cost of which is covered by Workers' Compensation Board of the province in which the injury was incurred.
- .4 PPE: personal protective equipment
- .5 Work Site: where used in this section shall mean areas, located at the premises where Work is undertaken, used by Contractor to perform all of the activities associated with the performance of the Work.

1.3 CONTRACTOR QUALIFICATIONS

- .1 Certificate of Recognition (COR) Program: The Contractor shall maintain a valid Letter of Good Standing in the Nova Scotia Construction Safety Association (NSCSA) COR Program, or alternatively;
 - .1 Provide evidence of COR status from other member associations of the Canadian Federation of Construction Safety Associations using the NSCSA Reciprocal Process, or;
 - .2 Subject to the conditions specified at Paragraph 1.2.3 in this Section, provide evidence of an audited safety program certified by an independent agency.
- .2 Independent Agency: Acceptance of an audited safety program certified by an independent agency will be evaluated by the Departmental Representative using NSCSA Safety Audit Instrument. Acceptance of an audited safety program is at the discretion of the Departmental Representative.
- .3 The Contractor shall maintain a valid COR until Final Completion.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within 10 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site-specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
- .3 Submit electronic copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative.
- .4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Submit WHMIS SDS - Safety Data Sheets as required.
- .7 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 10 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 10 days after receipt of comments from Departmental Representative.
- .8 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.

1.5 HEALTH AND SAFETY PLAN

- .1 Prior to commencement of Work, develop written Health and Safety Plan specific to the Work. Implement, maintain, and enforce Plan for entire duration of Work and until final demobilization.
- .2 Health and Safety Plan shall include the following components:
 - .1 List of health risks and safety hazards identified by hazard assessment.
 - .2 Control measures used to mitigate risks and hazards identified.
 - .3 On-site Contingency and Emergency Response Plan as specified below.
 - .4 On-site Communication Plan as specified below.
 - .5 Name of Contractor's designated Health & Safety Site Representative and information showing proof of his/her competence and reporting relationship in Contractor's company.
 - .6 This designated Health & Safety Site Representative, in addition to their regular duties, will act as Health and Safety Supervisor and be responsible for implementing, enforcing and monitoring health and safety provisions.
 - .7 Names, competence and reporting relationship of other supervisory personnel used in the Work for occupational health and safety purposes.

- .3 On-site Contingency and Emergency Response Plan shall include:
 - .1 Operational procedures, evacuation measures and communication process to be implemented in the event of an emergency.
 - .2 Name, duties and responsibilities of persons designated as Emergency Warden(s) and deputies.
 - .3 Emergency Contacts: name and telephone number of officials from:
 - .1 General Contractor and subcontractors.
 - .2 Pertinent Federal and Provincial Departments and Authorities having jurisdiction.
 - .3 Local emergency resource organizations.
- .4 On-site Communication Plan:
 - .1 Procedures for sharing of work related safety information to workers and subcontractors, including emergency and evacuation measures.
- .5 Address all activities of the Work including those of subcontractors.
- .6 Review Health and Safety Plan regularly during the Work. Update as conditions warrant to address emerging risks and hazards, such as whenever new trade or subcontractor arrives at Work Site.
- .7 Departmental Representative will respond in writing, where deficiencies or concerns are noted and may request re-submission of the Plan with correction of deficiencies or concerns.
- .8 Post copy of the Plan, and updates, prominently on Work Site.

1.6 FILING OF NOTICE

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

1.7 HAZARD ASSESSMENT

- .1 Perform site specific health and safety hazard assessment of the Work and its site.
- .2 Carry out initial assessment prior to commencement of Work with further assessments as needed during progress of work, including when new trades and subcontractors arrive on site.
- .3 Record results and address in Health and Safety Plan.
- .4 Keep documentation on site for entire duration of the Work.
- .5 Implement and carry out a health and safety hazard assessment program as part of the work. Program to include:
 - .1 Initial hazard assessments carried out immediately upon notification of contract award and prior to commencement of work.

- .2 On-going hazard assessments performed during the progress of work identifying new or potential health risks and safety hazards not previously known. As a minimum, hazard assessments shall be carried out when:
 - .1 New subtrade work, new subcontractor(s) or new workers arrive at the site to commence another portion of the work.
 - .2 The scope of work has been changed by Change Order.
 - .3 Potential hazards or weakness in current health and safety practices are identified by Departmental Representative or by an authorized safety representative.
 - .6 Each hazard assessment to be made in writing. Keep copies of all assessments on site for duration of work. Upon request, make available to Departmental Representative for inspection.
- 1.8 PROTECTION
 - .1 Provide temporary facilities for protection and safe passage of public pedestrians and vehicular traffic around and adjacent to work site.
 - .2 Provide safety barricades, lights and signage of work site as required, providing a safe working environment for workers.
 - .3 Carry out work placing emphasis on Health & Safety of the Public, Facility Personnel, Construction Works and Protection of the Environment.
- 1.9 MEETINGS
 - .1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.
- 1.10 RESPONSIBILITY
 - .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
 - .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.
- 1.11 SITE CONTROL AND ACCESS
 - .1 Control the Work and entry points to Work Site. Approve and grant access only to workers and authorized persons. Immediately stop and remove non-authorized persons.
 - .2 Isolate Work Site from other areas of the premises by use of appropriate means.
 - .1 Erect fences, hoarding, barricades and temporary lighting as required to effectively delineate the Work Site, stop non-authorized entry, and to protect pedestrians and vehicular traffic around and adjacent to the Work and create a safe environment.

- .2 Post signage at entry points and other strategic locations indicating restricted access and conditions for access.
- .3 Provide safety orientation session to persons granted access to Work Site. Advise of hazards and safety rules to be observed while on site.
- .4 Ensure persons granted site access wear appropriate PPE. Supply PPE to inspection authorities who require access to conduct tests or perform inspections.

1.12 COMPLIANCE REQUIREMENTS

- .1 Comply with Occupational Health and Safety Act, Occupational Safety General Regulations, N.S. Reg. 53/2013.
- .2 Comply with R.S.Q., c. S-2.1, an Act respecting Health and Safety, and c. S-2.1, r.4 Safety Code for the Construction Industry.
- .3 Comply with Occupational Health and Safety Regulations, 1996.
- .4 Comply with Occupational Health and Safety Act, Occupational Safety General Regulations, O.I.C. 2013-65.
- .5 Comply with Canada Labour Code - Part II (entitled Occupational Health and Safety) and the Canada Occupational Health and Safety Regulations (COSH) as well as any other regulations made pursuant to the Act.
 - .1 The Canada Labour Code can be viewed at: [www.http://laws.justice.gc.ca/en/L-2/](http://laws.justice.gc.ca/en/L-2/)
 - .2 COSH can be viewed at: [www.http://laws.justice.gc.ca/eng/SOR-86-304/ n e.html](http://laws.justice.gc.ca/eng/SOR-86-304/n e.html)
 - .3 A copy may be obtained at: Canadian Government Publishing Public Works & Government Services Canada Ottawa, Ontario, K1A 0S9 Tel: (819) 956-4800 (1-800-635-7943) Publication No. L31-85/2000 E or F)

1.13 UNFORESEEN 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 Departmental Representative verbally and in writing.
- .2 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, advise Health and Safety coordinator and follow procedures in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.

1.14 HEALTH AND SAFETY COORDINATOR

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Coordinator. Health and Safety Coordinator must:
 - .1 Have working knowledge of occupational safety and health regulations.

- .2 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
- .3 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
- .4 Be on site during execution of Work.

1.15 POSTING OF DOCUMENTS

- .1 Post permits, licenses and compliance certificates, specified in Section 01 11 00 – Summary of Work, at Work Site.
- .2 Where a particular permit or compliance certificate cannot be obtained, notify Departmental Representative in writing and obtain approval to proceed before carrying out applicable portion of work.
- .3 Obtain permits, licenses and compliance certificates, at appropriate times and frequency as stipulated by authorities having jurisdiction.

1.16 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.17 BLASTING

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

1.18 WORK STOPPAGE

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

1.19 PROJECT/SITE CONDITIONS

- .1 Following are potential health, environmental and safety hazards at the site for which Work may involve contact with:
 - .1 Pedestrians, vehicles or trucks.
 - .2 Fire Hazards.
 - .3 Underground utilities.
 - .4 Lock Out Procedures required.
 - .5 PPE Requirements.
 - .6 Heights.

.2 Facility on-going operations:

- .1 The Contractor will cooperate with users of existing facilities. Maintain access and services to the buildings and consult with the Departmental Representative for site access limitations.
- .2 Should interferences occur, take directions from Departmental Representative.
- .3 Do not unreasonably encumber site with materials.
- .4 Move stored products or equipment which interfere with operations.
- .5 Comply with all regulations and authorities having jurisdiction over the work, whether on land or on water.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 DEFINITIONS

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

1.2 FIRES

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

1.3 DISPOSAL OF WASTES AND HAZARDOUS MATERIALS

- .1 Do not bury rubbish and waste materials on site. Dispose at approved landfill sites as specified in Section 01 74 19 – Waste Management and Disposal.
- .2 Do not dispose of hazardous waste or volatile materials, such as mineral spirits, paints, thinners, oil or fuel into waterways, storm or sanitary sewers or waste landfill sites.
- .3 Store, handle and dispose of hazardous materials and hazardous waste in accordance with applicable federal and provincial laws, regulations, codes and guidelines.
- .4 Dispose of construction waste materials and demolition debris, resulting from work, at approved landfill sites only. Carry out such disposal in strict accordance with provincial and municipal rules and regulations. Separate out and prevent improper disposal of items banned from landfills.
- .5 Establish method and undertake construction practices which will minimize waste and optimize use of construction materials. Separate at source, all construction waste materials, demolition debris and product packaging and delivery containers into various waste categories in order to maximize recycling abilities of various materials and avoid disposal of debris at landfill site(s) in a "mixed state". Where recycling firms, specializing in recycling of specific materials exist, transport such materials to the recycling facility and avoid disposal at landfill sites.
- .6 Communicate with landfill operator prior to commencement of work, to determine what specific construction, demolition and renovation waste materials have been banned from disposal at the landfill and at transfer stations.

1.4 DRAINAGE

- .1 Provide temporary drainage and pumping required to keep excavations and site free from water.
- .2 Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.
- .4 Pumped water must meet applicable federal, provincial, and municipal standards before it can be discharged to a surface water body. If regulatory guidelines are not met, the Departmental Representative has the right to issue stop pumping instructions to the Contractor. Contractor will not be compensated for any delays associated with retrofitting equipment to meet guidelines.
- .5 Provide control devices such as filter fabrics, sediment traps and settling ponds to control drainage and prevent erosion of adjacent lands. Maintain in good order for duration of work.

1.5 SITE CLEARING AND PLANT PROTECTION

- .1 Protect trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of two (2) m minimum. Ensure that control measures used for protection are in compliance with Municipal laws and regulations.
- .2 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage.
 - .1 Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .3 Minimize stripping of topsoil and vegetation.
- .4 Restrict tree removal to areas required for execution of the Work and as designated by the Departmental Representative. Obtain permits before tree removal in accordance with the requirements of the authorities having jurisdiction.

1.6 PERMITS

- .1 All guidelines and instructions stated on permits must be strictly adhered to.

1.7 POLLUTION CONTROL

- .1 Maintain temporary erosion and pollution control features installed under this Contract.
- .2 Control emissions from equipment and plant in accordance with local authorities' emission requirements.
- .3 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

- .4 Maintain inventory of hazardous materials and hazardous waste stored on site. List items by product name, quantity and date when storage began.
- .5 Have emergency spill response equipment and rapid clean-up kit, appropriate to work, at site. Locate adjacent to work and where hazardous materials are stored. Provide personal protective equipment as required for clean-up.
- .6 Report, to Federal and Provincial Department of Environment, spills of petroleum and other hazardous materials as well as accidents having potential of polluting the environment. Also notify Departmental Representative and submit a written spill report to Departmental Representative within 24 hours of occurrence.

1.8 WILDLIFE PROTECTION

- .1 Should nests of migratory birds in wetlands be encountered during work, immediately notify Departmental Representative for directives to be followed.
 - .1 Do not disturb nest site and neighbouring vegetation until nesting is completed.
 - .2 Minimize work immediately adjacent to such areas until nesting is completed.
 - .3 Protect these areas by following recommendations of Canadian Wildlife Service.

1.9 NOTIFICATION

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

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 INSPECTION

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

1.2 INDEPENDENT INSPECTION AGENCIES

- .1 Independent Inspection/Testing Agencies may be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Departmental Representative. Inspection by Departmental Representative does not relieve Contractor of any Quality Control obligations.
- .2 Provide equipment required for executing inspection and testing by appointed agencies.
- .3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and reinspection.

1.3 ACCESS TO WORK

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

1.4 PROCEDURES

- .1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.

- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in 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 Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.
- .3 If in opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Departmental Representative will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Departmental Representative.

1.6 REPORTS

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

1.7 EQUIPMENT AND SYSTEMS

- .1 Submit adjustment and balancing reports for electrical systems.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

- Part 1 General
- 1.1 INSTALLATION AND REMOVAL
- .1 Provide temporary utilities in order to execute work expeditiously.
 - .2 Remove from site all such work after use.
- 1.2 ACCESS
- .1 Provide and maintain adequate access to project site.
 - .2 Maintain access roads for duration of contract and make good resulting from Contractor's use of road.
- 1.3 POWER
- .1 Contractor may use designated building convenience outlets for power tools (if available). Obtain Departmental Representative's approval prior to using any outlet.
 - .2 Arrange, pay for and maintain temporary electrical power supply as required for work during power outages.
- 1.4 DEWATERING
- .1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.
- 1.5 BARRICADES
- .1 Provide and maintain sufficient barricades, fencing, notices, warning signs, light signals, etc. for the protection of adjoining property and to warn others and workmen engaged on the job of the dangers caused by work.
 - .2 Types and location of barricades, etc. to be in accordance with local regulations and to the satisfaction of Departmental Representative.
 - .3 The presence of such barricades, lights, etc. shall not relieve the Contractor of the responsibility for any damages.
- 1.6 SECURITY
- .1 Contractor to make own arrangements for security of his equipment, materials, damages resulting from fire and theft.
- 1.7 CONSTRUCTION SIGN AND NOTICES
- .1 Contractor or subcontractor advertisement signboards are not permitted on site.
 - .2 Only notices of safety or instructions are permitted on site.

- .3 Safety and Instruction Signs and Notices:
 - .1 Signs and notices for safety and instruction shall be in both official languages.
Graphic symbols shall conform to CAN3-Z321-96(R2006).
- .4 Maintenance and Disposal of Site Signs:
 - .1 Maintain approved signs and notices in good condition for duration of project
and dispose of off site on completion of project or earlier if directed by
Departmental Representative.
- 1.8 TEMPORARY LIGHTING
 - .1 Provide and pay for temporary lighting as required for the work.
- Part 2 Products
 - 2.1 NOT USED
- Part 3 Execution
 - 3.1 NOT USED

END OF SECTION

Part 1 General

1.1 INSTALLATION AND REMOVAL

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

1.2 HOARDING

- .1 Erect temporary site enclosures using 38 x 89 mm construction grade lumber framing at 600 mm centres and 1200 x 2400 x 13 mm exterior grade fir plywood to CSA O121 to keep public out of construction areas.
- .2 Apply plywood panels vertically flush and butt jointed.
- .3 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

1.3 GUARD RAILS AND BARRICADES

- .1 Provide secure, rigid guard rails and barricades around excavations and site work.

1.4 DUST TIGHT SCREENS

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

1.5 ACCESS TO SITE

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

1.6 PUBLIC TRAFFIC FLOW

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

1.7 FIRE ROUTES

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

- 1.8 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY
 - .1 Protect surrounding private and public property from damage during performance of Work.
 - .2 Be responsible for damage incurred.
- 1.9 PROTECTION OF BUILDING FINISHES
 - .1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.
 - .2 Provide necessary screens, covers, and hoardings.
 - .3 Confirm with Departmental Representative locations and installation schedule 3 days prior to installation.
 - .4 Be responsible for damage incurred due to lack of or improper protection.
- 1.10 WASTE MANAGEMENT AND DISPOSAL
 - .1 Separate waste materials for recycling and reuse in accordance with Section 01 74 19 – Waste Management and Disposal.
- Part 2 Products
- 2.1 NOT USED
- Part 3 Execution
- 3.1 NOT USED

END OF SECTION

Part 1 General

1.1 QUALITY

- .1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 Acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.
- .3 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .4 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
- .5 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.2 AVAILABILITY

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

1.3 STORAGE, HANDLING AND PROTECTION

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.

- .3 Store products subject to damage from weather in weatherproof enclosures.
 - .4 Store cementitious products clear of earth or concrete floors, and away from walls.
 - .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
 - .6 Store sheet materials on flat, solid supports and keep clear of ground. Slope to shed moisture.
 - .7 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.
 - .8 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.
- 1.4 TRANSPORTATION
- .1 Pay costs of transportation of products required in performance of Work.
- 1.5 MANUFACTURER'S INSTRUCTIONS
- .1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
 - .2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Departmental Representative will establish course of action.
 - .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.
- 1.6 QUALITY OF WORK
- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.
 - .2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.
- 1.7 COORDINATION
- .1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.
 - .2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.8 CONCEALMENT

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

1.9 REMEDIAL WORK

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

1.10 LOCATION OF FIXTURES

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

1.11 FASTENINGS

- .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
- .2 Prevent electrolytic action between dissimilar metals and materials.
- .3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.
- .4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- .5 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.12 FASTENINGS - EQUIPMENT

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.
- .3 Bolts may not project more than one diameter beyond nuts.

- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.
- 1.13 PROTECTION OF WORK IN PROGRESS
 - .1 Prevent overloading of parts of building. Do not cut, drill or sleeve load bearing structural member, unless specifically indicated without written approval of Departmental Representative.
- 1.14 EXISTING UTILITIES
 - .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and pedestrian and vehicular traffic and/or building occupants.
 - .2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.
- Part 2 Products
 - 2.1 NOT USED
- Part 3 Execution
 - 3.1 NOT USED

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

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

1.2 MATERIALS

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

1.3 PREPARATION

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

1.4 EXECUTION

- .1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.
- .2 Perform all cutting, patching and painting necessary for proper installation of work and repair any damage done employing only the services of skilled workmen. Provide all such necessary detail and information as required to determine the scope of particulars of cuttings, painting and patching relevant to his work.
- .3 Fit several parts together, to integrate with other Work.
- .4 Uncover Work to install ill-timed Work.
- .5 Remove and replace defective and non-conforming Work.
- .6 Remove samples of installed Work for testing.
- .7 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .8 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .9 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .10 Restore work with new products in accordance with requirements of Contract Documents.
- .11 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .12 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material, full thickness of the construction element.
- .13 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .14 Conceal wiring in wall and ceiling construction of finished areas except where indicated otherwise.

1.5 WASTE MANAGEMENT AND DISPOSAL

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

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Departmental Representative or other Contractors.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .3 Clear snow and ice for access to Work, bank/pile snow in designated areas only.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide and use marked separate bins for recycling. Refer to Section 01 74 19 - Waste Management and Disposal.
- .6 Clean interior areas prior to start of finishing work and maintain areas free of dust and other contaminants during finishing operations.
- .7 Store volatile waste in covered metal containers and remove from premises at end of each working day.
- .8 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .9 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .10 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.2 WASTE MANAGEMENT AND DISPOSAL

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

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 DISPOSAL OF WASTE

- .1 Separate and recycle waste materials designated for disposal.
- .2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard and packaging material in appropriate on-site bids for recycling.
- .3 Place materials defined as hazardous or toxic in designated containers.
- .4 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.
- .5 Fold up metal banding, flatten and place in designated area for recycling.
- .6 Unused paint or coating material must be disposed of at an official hazardous material collections site as approved by Departmental Representative.
- .7 Do not dispose of unused paint material into sewer system, streams, lakes, onto ground, or in any other location where it will pose a health or environmental hazard.
- .8 Disposal of waste volatile materials, mineral spirits, oil, and paint thinner into waterways, storm, or sanitary sewers is strictly prohibited.
- .9 Dispose of unused material at an official hazardous material collections site. Do not dispose of unused hazardous material into the sewer system, streams, lakes, on ground or in any other location where they will pose a health or environmental hazard.
- .10 Do not dispose of preservative treated wood through incineration.
- .11 Do not dispose of preservative treated wood with other materials destined for recycling or reuse.
- .12 Dispose of treated wood, end pieces, wood scraps and sawdust at a sanitary landfill.
- .13 Dispose of unused preservative material at an official hazardous material collections site. Do not dispose of unused preservative material into the sewer system, streams, and lakes, on ground or in any other location where they will pose a health or environmental hazard.
- .14 Burying of rubbish and waste materials is prohibited.
- .15 All waste material not designated for recycle to be disposed of at an approved waste disposal site in accordance with appropriate environmental guidelines.

1.2 STORAGE AND HANDLING OF WASTE

- .1 Store materials to be reused, recycled and salvaged in locations as directed by Departmental Representative.
- .2 Unless specified otherwise, materials for removal become property of the Contractor.
- .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.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 APPLICATION

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

3.2 CLEANING

- .1 Remove tools and waste materials on completion of work and leave work area in clean and orderly condition.
- .2 Clean-up work area as work progresses.
- .3 Source separate materials to be reused or recycled into specific sort areas.

3.3 DIVERSION OF MATERIALS

- .1 Separate materials from general waste and stockpile in separate piles or containers, to approval of Departmental Representative, and consistent with applicable fire regulations. Mark containers or stockpile areas. Provide instruction on disposal practices.
- .2 On-site sale of salvaged, recovered, reusable, or recyclable materials is not permitted.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE REQUIREMENTS

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

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 FORMAT

- .1 Organize data as instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3 When multiple binders are used correlate data into related consistent groupings.
 - .1 Identify contents of each binder on spine.
- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by systems, under Section numbers and sequence of Table of Contents.

- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab.
 - .1 Bind in with text; fold larger drawings to size of text pages.
- .9 Provide a digital copy of the binder and drawings in PDF format.

1.4 CONTENTS - PROJECT RECORD DOCUMENTS

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

1.5 AS -BUILT DOCUMENTS AND SAMPLES

- .1 Maintain one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Field test records.
 - .7 Inspection certificates.
 - .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction.
 - .1 Provide files, racks, and secure storage.

- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
 - .1 Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition.
 - .1 Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Departmental Representative.

1.6 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

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

1.7 EQUIPMENT AND SYSTEMS

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

1.8 MATERIALS AND FINISHES

- .1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .4 Additional requirements: as specified in individual specifications sections.

1.9 MAINTENANCE MATERIALS

.1 Spare Parts:

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

.2 Extra Stock Materials:

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

.3 Special Tools:

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

1.10 DELIVERY, STORAGE AND HANDLING

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

1.11 WARRANTIES

- .1 Develop warranty management plan to contain information relevant to Warranties.

- .2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Departmental Representative for approval.
- .3 Warranty management plan to include required actions and documents to assure that Departmental Representative receives warranties to which it is entitled.
- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Submit, warranty information made available during construction phase, to Departmental Representative for approval prior to each monthly pay estimate.
- .6 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:
 - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
 - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
 - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
 - .4 Verify that documents are in proper form, contain full information, and are notarized.
 - .5 Co-execute submittals when required.
 - .6 Retain warranties and bonds until time specified for submittal.
- .7 Except for items put into use with Departmental Representative's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .8 Conduct joint 9 month warranty inspection, measured from time of acceptance, by Departmental Representative.
- .9 Include information contained in warranty management plan as follows:
 - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
 - .2 Provide list for each warranted equipment, item, feature of construction or system indicating:
 - .1 Name of item.
 - .2 Model and serial numbers.
 - .3 Location where installed.
 - .4 Name and phone numbers of manufacturers or suppliers.
 - .5 Names, addresses and telephone numbers of sources of spare parts.
 - .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
 - .7 Cross-reference to warranty certificates as applicable.
 - .8 Starting point and duration of warranty period.

- .9 Summary of maintenance procedures required to continue warranty in force.
- .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
- .11 Organization, names and phone numbers of persons to call for warranty service.
- .12 Typical response time and repair time expected for various warranted equipment.
- .3 Contractor's plans for attendance at 9 month post-construction warranty inspections.
- .4 Procedure and status of tagging of equipment covered by extended warranties.
- .5 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .10 Respond in timely manner to oral or written notification of required construction warranty repair work.
- 1.12 WARRANTY TAGS
 - .1 Tag, at time of installation, each warranted item. Provide durable, oil and water-resistant tag approved by Departmental Representative.
 - .2 Attach tags with copper wire and spray with waterproof silicone coating.
 - .3 Leave date of acceptance until project is accepted for occupancy.
 - .4 Indicate following information on tag:
 - .1 Type of product/material.
 - .2 Model number.
 - .3 Serial number.
 - .4 Contract number.
 - .5 Warranty period.
 - .6 Inspector's signature.
 - .7 Construction Contractor.
- Part 2 Products
 - 2.1 NOT USED
- Part 3 Execution
 - 3.1 NOT USED

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 91 31 – Commissioning (Cx) Plan.
- .2 Section 01 91 33 – Commissioning Forms.
- .3 Section 01 91 41 – Commissioning Training.

1.2 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA International)
 - .1 Z320-11 (R2016), Building Commissioning Standard.
 - .2 CSA C282-15, Emergency Electrical Power Supply for Buildings.
- .2 Acronyms:
 - .1 BMM – Building Management Manual.
 - .2 Cx – Commissioning.
 - .3 CxA – Commissioning Agent / Authority.
 - .4 EMCS – Energy Monitoring and Control Systems.
 - .5 O&M – Operation and Maintenance.
 - .6 PI – Product Information.
 - .7 PV – Performance Verification.
 - .8 TAB – Testing, Adjusting and Balancing.

1.3 GENERAL

- .1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:
 - .1 Verify installed equipment, systems and integrated systems operate in accordance with Contract Documents and design criteria and intent.
 - .2 Ensure appropriate documentation is compiled into the BMM.
 - .3 Effectively train O&M staff.
- .2 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required. Provide material, tools, labour and supervision necessary to assist the CxA in the verification and commissioning of the equipment and systems as outlined in this and related Sections.
 - .1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be commissioned interactively with each other as intended in accordance with Contract Documents and design criteria.

- .2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.
 - .3 Design Criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements.
- 1.4 COMMISSIONING OVERVIEW
 - .1 Refer to Section 01 91 31 – Commissioning (Cx) Plan for additional information.
 - .2 Cx to be a line item of Contractor's cost breakdown.
 - .3 Cx activities supplement field quality and testing procedures described in relevant technical sections.
 - .4 Cx is conducted in concert with activities performed during stage of project delivery. Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the built facility is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities includes transfer of critical knowledge to facility operational personnel.
 - .5 Departmental Representative will issue Interim Acceptance Certificate when:
 - .1 Completed Cx documentation has been received, reviewed for suitability and approved by Departmental Representative and CxA.
 - .2 Equipment, components and systems have been commissioned.
 - .3 O&M training has been completed.
- 1.5 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS
 - .1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, correct deficiencies, re-verify equipment and components within the unfunctional system, including related systems as deemed required by CxA, to ensure effective performance.
 - .2 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor. Above costs to be in form of progress payment reductions or hold-back assessments.
- 1.6 PRE-CX REVIEW
 - .1 Before Construction:
 - .1 Review Contract Documents, confirm by writing to CxA.
 - .1 Adequacy of provisions for Cx.
 - .2 Aspects of design and installation pertinent to success of Cx.
 - .2 During Construction:
 - .1 Coordinate provision, location and installation of provisions for Cx.

- .3 Before start of Cx:
 - .1 Have completed Cx Plan up-to-date.
 - .2 Ensure installation of related components, equipment, sub-systems, systems is complete.
 - .3 Fully understand Cx requirements and procedures.
 - .4 Have Cx documentation shelf-ready.
 - .5 Understand completely design criteria and intent and special features.
 - .6 Submit complete start-up documentation to the Departmental Representative and CxA.
 - .7 Have Cx schedules up-to-date.
 - .8 Ensure systems have been cleaned thoroughly.
 - .9 Complete TAB procedures on systems, submit TAB reports to the Departmental Representative and CxA for review and approval.
 - .10 Ensure "As-Built" system schematics are available.
- .4 Inform the Departmental Representative and CxA in writing of discrepancies and deficiencies in finished works.

1.7 CONFLICTS

- .1 Report conflicts between requirements of this section and other sections to Departmental Representative and CxA before start-up and obtain clarification.
- .2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

1.8 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals: submit to Departmental Representative and CxA in accordance with Section 01 33 00 – Submittal Procedures.
 - .1 Submit no later than 4 weeks after award of Contract:
 - .1 Name of Contractor's CxA.
 - .2 Draft Cx documentation.
 - .3 Preliminary Cx schedule.
 - .2 Request in writing to CxA for changes to submittals and obtain written approval at least 8 weeks prior to start of Cx.
 - .3 Submit proposed Cx procedures to CxA where not specified and obtain written approval at least 8 weeks prior to start of Cx.
 - .4 Provide additional documentation relating to Cx process required by CxA.

1.9 COMMISSIONING DOCUMENTATION

- .1 CxA to review and approve Cx documentation.
- .2 Provide completed and approved Cx documentation to CxA.

1.10 COMMISSIONING SCHEDULE

- .1 Provide detailed Cx schedule as part of construction schedule in accordance with Section 01 32 16.19 – Construction Progress Schedule – Bar (GANTT).
- .2 Provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:
 - .1 Approval of Cx reports.
 - .2 Verification of reported results.
 - .3 Repairs, retesting, re-commissioning, re-verification.
 - .4 Training.

1.11 COMMISSIONING MEETINGS

- .1 Convene Cx meetings following project meetings.
- .2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.
- .3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.
- .4 At 60% construction completion stage, CxA to call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Issues at meeting to include:
 - .1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.
 - .2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.
- .5 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.
- .6 Meeting will be chaired by Contractor, who will record and distribute minutes.
- .7 Ensure subcontractors and relevant manufacturer representatives are present at 60% and subsequent Cx meetings and as required.

1.12 STARTING AND TESTING

- .1 Contractor assumes liabilities and costs for inspections including disassembly and re-assembly after approval, starting, testing and adjusting, including supply of testing equipment.

1.13 WITNESSING OF STARTING AND TESTING

- .1 Provide 14 days notice prior to commencement.
- .2 Cx Team to witness start-up and testing.
- .3 Departmental Representative reserves the right to witness start-up and testing.

- .4 Contractor's CxA to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

1.14 MANUFACTURER'S INVOLVEMENT

- .1 Factory testing, manufacturer to:
 - .1 Coordinate time and location of testing.
 - .2 Provide testing documentation for approval by the Departmental Representative.
 - .3 Arrange for Departmental Representative to witness tests.
 - .4 Obtain written approval of test results and documentation from the Departmental Representative before delivery to site.
- .2 Obtain manufacturer's installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with CxA.
 - .1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.
 - .2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.
- .3 Integrity of warranties:
 - .1 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.
 - .2 Verify with manufacturer that testing as specified will not void warranties.
- .4 Qualifications of manufacturer's personnel:
 - .1 Experienced in design, installation and operation of equipment and systems.
 - .2 Ability to interpret test results accurately.
 - .3 To report results in clear, concise, logical manner.

1.15 PROCEDURES

- .1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.
- .2 Conduct start-up and testing in following distinct phases:
 - .1 Included in delivery and installation:
 - .1 Verification of conformity to specification, approved shop drawings and completion of PI report forms.
 - .2 Visual inspection of quality of installation.
 - .2 Start-up: follow accepted start-up procedures.
 - .3 Operational testing: document equipment performance.
 - .4 System PV: include repetition of tests after correcting deficiencies.
 - .5 Post-substantial performance verification: to include fine-tuning.
- .3 Correct deficiencies and obtain approval from the Departmental Representative and CxA after distinct phases have been completed and before commencing next phase.

- .4 Document required tests on approved PV forms.
- .5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by the Departmental Representative. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:
 - .1 Minor equipment/systems: implement corrective measures approved by Departmental Representative.
 - .2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by the Departmental Representative.
 - .3 If evaluation report concludes that major damage has occurred, the Departmental Representative shall reject equipment.
 - .1 Rejected equipment to be remove from site and replace with new.
 - .2 Subject new equipment/systems to specified start-up procedures.
- 1.16 START-UP DOCUMENTATION
 - .1 Assemble start-up documentation and submit to the Departmental Representative and CxA for approval before commencement of commissioning.
 - .2 Start-up documentation to include:
 - .1 Factory and on-site test certificates for specified equipment.
 - .2 Pre-start-up inspection reports.
 - .3 Signed installation/start-up check lists.
 - .4 Start-up reports.
 - .5 Step-by-step description of complete start-up procedures, to permit facility personnel to repeat start-up at any time.
- 1.17 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS
 - .1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.
 - .2 With assistance of manufacturer, develop written maintenance program and submit to the Departmental Representative and CxA for approval before implementation.
 - .3 Operate and maintain systems for length of time required for commissioning to be completed.
 - .4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.
- 1.18 TEST RESULTS
 - .1 If start-up, testing and/or PV produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.
 - .2 Provide manpower and materials, assume costs for re-commissioning.

1.19 START OF COMMISSIONING

- .1 Notify the Departmental Representative and CxA at least 21 days prior to start of Cx.
- .2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

1.20 INSTRUMENTS / EQUIPMENT

- .1 Submit to the Departmental Representative and CxA for review and approval:
 - .1 Complete list of instruments proposed to be used.
 - .2 Listed data including, serial number, current calibration certificate, calibration date, calibration expiry date and calibration accuracy.
- .2 Provide the following equipment as required:
 - .1 2-way radios.
 - .2 Ladders.
 - .3 Equipment as required to complete work.

1.21 COMMISSIONING PERFORMANCE VERIFICATION

- .1 Carry out Cx:
 - .1 Under actual operating conditions, over entire operating range, in all modes.
 - .2 On independent systems and interacting systems.
- .2 Cx procedures to be repeatable and reported results are to be verifiable.
- .3 Follow equipment manufacturer's operating instructions.

1.22 WITNESSING COMMISSIONING

- .1 CxA and the Departmental Representative to witness activities and verify results.

1.23 AUTHORITIES HAVING JURISDICTION

- .1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority to witness procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.
- .2 Obtain certificates of approval, acceptance and compliance with rules and regulations of authority having jurisdiction.
- .3 Provide copies to the Departmental Representative and CxA within 5 days of test and with Cx report.

1.24 EXTENT OF VERIFICATION

- .1 Provide manpower and instrumentation to verify reported results based on the sampling strategy outlined in the Commissioning Plan, unless specified otherwise in other sections.

- .2 Number and location to be at discretion of CxA.
 - .3 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.
 - .4 Review and repeat commissioning of systems if inconsistencies found in more than 10% of reported results.
 - .5 Perform additional commissioning until results are acceptable to CxA and the Departmental Representative.
- 1.25 REPEAT VERIFICATIONS
- .1 Assume costs incurred by CxA and the Departmental Representative for third and subsequent verifications where:
 - .1 Verification of reported results fail to receive the CxA or Departmental Representative's approval.
 - .2 Repetition of second verification again fails to receive approval.
 - .3 CxA or Departmental Representative deems Contractor's request for second verification was premature.
- 1.26 SUNDRY CHECKS AND ADJUSTMENTS
- .1 Make adjustments and changes which become apparent as Cx proceeds.
 - .2 Perform static and operational checks as applicable and as required.
- 1.27 DEFICIENCIES, FAULTS, DEFECTS
- .1 Correct deficiencies found during start-up and Cx to satisfaction of the Departmental Representative and CxA.
 - .2 Report problems, faults or defects affecting Cx to the Departmental Representative and CxA in writing. Stop Cx until problems are rectified. Proceed with written approval from the Departmental Representative.
- 1.28 COMPLETION OF COMMISSIONING
- .1 Upon completion of Cx, leave systems in normal operating mode.
 - .2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx prior to issuance of Interim Certificate of Completion.
 - .3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by the Departmental Representative and CxA.
- 1.29 ACTIVITIES UPON COMPLETION OF COMMISSIONING
- .1 When changes are made to baseline components or system settings established during Cx process, provide updated Cx form for affected item.

- 1.30 TRAINING
 - .1 In accordance with Section 01 91 41 – Commissioning: Training.
- 1.31 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS
 - .1 Supply, deliver, and document maintenance materials, spare parts, and special tools as specified in contract.
- 1.32 OCCUPANCY
 - .1 Cooperate fully with the Departmental Representative and CxA during stages of acceptance and occupancy of facility.
- 1.33 INSTALLED INSTRUMENTATION
 - .1 Use instruments installed under Contract for TAB and PV if:
 - .1 Accuracy complies with these specifications.
 - .2 Calibration certificates have been deposited with the Departmental Representative and CxA.
- 1.34 PERFORMANCE VERIFICATION TOLERANCES
 - .1 Application tolerances:
 - .1 Specified range of acceptable deviations of measured values from specified values or specified design criteria. Except for special areas, to be within +/- 10% of specified values.
 - .2 Instrument accuracy tolerances:
 - .1 To be of higher order of magnitude than equipment or system being tested.
 - .3 Measurement tolerances during verification:
 - .1 Unless otherwise specified actual values to be within +/- 2% of recorded values.
- 1.35 DEPARTMENTAL REPRESENTATIVE'S PERFORMANCE TESTING
 - .1 Performance testing of equipment or system by CxA or the Departmental Representative will not relieve Contractor from compliance with specified start-up and testing procedures.
- Part 2 Products
 - 2.1 NOT USED
- Part 3 Execution
 - 3.1 NOT USED

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 91 13 – General Commissioning (Cx) Requirements.
- .2 Section 01 91 33 – Commissioning Forms.
- .3 Section 01 91 41 – Commissioning Training.

1.2 ACRONYMS

- .1 Cx – Commissioning.
- .2 CxA – Commissioning Agent / Authority.
- .3 BMM – Building Management Manual.
- .4 EMCS – Energy Monitoring and Control Systems.
- .5 ICL – Installation/Start-Up Check List.
- .6 MMS – Maintenance Management System.
- .7 SDS – Safety Data Sheets.
- .8 PI – Product Information.
- .9 PV – Performance Verification.
- .10 RFI – Request for Information.
- .11 TAB – Testing, Adjusting and Balancing.
- .12 WHMIS – Workplace Hazardous Materials Information System.
- .13 WHMIS Safety Data Sheets (SDS).

1.3 GENERAL

- .1 The goals of the Cx process are to provide:
 - .1 Systems, equipment and components to meet user's functional requirements before date of acceptance and operate consistently at peak efficiencies and within specified energy budgets under normal loads.
 - .2 Facility user and O&M personnel fully trained in aspects of installed systems.
 - .3 Optimized life cycle costs.
 - .4 Complete documentation relating to installed equipment and systems.

- .2 Use this Cx Plan as master planning document for Cx:
 - .1 Outlines organization, scheduling, allocation of resources, documentation, pertaining to implementation of Cx.
 - .2 Communicates responsibilities of team members involved in Cx Scheduling, documentation requirements, and verification procedures.
 - .3 Sets out deliverables relating to O&M, process and administration of Cx.
 - .4 Describes process of verification of how built works meet the Departmental Representative 's design requirements.
 - .5 Produces a complete functional system prior to issuance of Certificate of Occupancy.
 - .6 Management tool that sets out scope, standards, roles and responsibilities, expectations, deliverables, and provides:
 - .1 Overview of Cx.
 - .2 General description of elements that make up Cx Plan.
 - .3 Process and methodology for successful Cx.
- .3 Commissioning terms used in this Section:
 - .1 Bumping: short term start-up to prove ability to start and prove correct rotation.
 - .2 Deferred Cx - Cx activities delayed for reasons beyond Contractor's control due to lack of occupancy, weather conditions, need for heating/cooling loads.

1.4 DEVELOPMENT OF FINAL CX PLAN

- .1 The Contractor with input from the manufacturer is responsible for engaging the CxA, developing the preliminary and final Cx Plan.
- .2 Contractor to provide a preliminary Cx Plan that sets out scope, standards, roles and responsibilities, expectations and deliverables. It is subject to change as project progresses.
- .3 The CxA and Departmental Representative are responsible for approving the plans.
- .4 Cx Plan to be finalized as per CxA and Departmental Representative's requirements to take into account:
 - .1 Approved shop drawings and product data.
 - .2 Approved changes to contract.
 - .3 Contractor's project schedule.
 - .4 Cx schedule.
 - .5 Contractor's, sub-contractor's, suppliers' requirements.
 - .6 Project construction team's and Cx team's requirements.
- .5 Submit completed Cx Plan to Departmental Representative and obtain written approval.
- .6 The CxA and Departmental Representative must approve the final Cx Plan prior to the start of the commissioning activities.

1.5 REFINEMENT OF CX PLAN

- .1 During construction phase, the CxA will revise, refine and update Cx Plan to include:
 - .1 Changes resulting from program modifications.
 - .2 Approved design and construction changes.

1.6 COMPOSITION, ROLES AND RESPONSIBILITIES OF CX TEAM

- .1 Departmental Representative to maintain overall responsibility for project and is sole point of contact between members of commissioning team and the CxA.
- .2 The CxA will coordinate the commissioning process. The Cx Team is expected to cooperate fully with the CxA.
- .3 All members of the Cx Team to work together to fulfill their contracted responsibilities and meet the objectives of the contract documents.
- .4 A general description of the Cx roles is as follows:
 - .1 CxA:
 - .1 Reports to the Departmental Representative.
 - .2 Approves the Cx Plan developed by the Manufacturer.
 - .3 Coordinates the Cx process.
 - .4 Reviews Cx documentation and test reports for compliance with the contract documents.
 - .5 Monitors operations and Cx activities.
 - .6 Witnessing, certifying accuracy of reported results.
 - .7 Witnessing and certifying TAB and other tests.
 - .8 Ensuring implementation of final Cx Plan.
 - .9 Performing verification of performance of installed systems and equipment.
 - .10 Prepares final Cx report, with the assistance of the Cx Team.
 - .2 Cx Team: contractor, sub-contractors, suppliers and support disciplines, is responsible for construction/installation in accordance with Contract Documents, including:
 - .1 Assigning a CxA as point of contact with Departmental Representative for administrative and coordination purposes.
 - .2 Testing.
 - .3 TAB.
 - .4 Performance of Cx activities.
 - .5 Delivery of training and Cx documentation.
 - .6 Developing BMM.
 - .7 Implementation of Training Plan.
 - .3 Contractor's CxA implements specified Cx activities including:
 - .1 Demonstrations.
 - .2 Training.

- .3 Testing.
- .4 Preparation, submission of test reports.
- .4 Departmental Representative:
 - .1 Develops design criteria and intent, project specifications and drawings.
 - .2 Provides clarification on design criteria and intent to the Cx Team as required.
 - .3 Responds to RFI's relating to the commissioning process.
 - .4 Reviews installed equipment and systems for compliance with the tender documents prior to the commencement of Cx activities.
 - .5 Gives final approval of the Cx work.
 - .6 Coordinates the involvement of user representatives in the Cx and training process.
 - .7 Participates in the training process as required.

1.7 CX PARTICIPANTS

- .1 Employ the following Cx participants to verify performance of equipment and systems:
 - .1 Installation contractor/subcontractors:
 - .1 Equipment and systems.
 - .2 Manufacturer: equipment specified to be installed and started by manufacturer.
 - .1 To include performance verification.
 - .3 Specialist subcontractor: equipment and systems supplied and installed by specialist subcontractor.
 - .4 Specialist Cx agency:
 - .1 Possessing specialist qualifications and installations providing environments essential to the program but are outside scope or expertise of Cx specialists on this project.
 - .5 Facility Personnel: equipment for which they are the specialists.
- .2 Ensure that Cx participants:
 - .1 Could complete work within scheduled time frame.
 - .2 Are available for emergency and troubleshooting service during first year of occupancy by user for adjustments and modifications outside responsibility of O&M personnel, including:
 - .1 Modify ventilation rates to meet changes in off-gassing.
 - .2 Changes to heating or cooling loads beyond scope of EMCS.
 - .3 Changes to EMCS control strategies beyond level of training provided to O&M personnel.
 - .4 Redistribution of electrical services.
 - .5 Modifications of fire alarm systems.
 - .6 Modifications to voice communications systems.
- .3 Provide names of participants and details of instruments and procedures to be followed for Cx to CxA and Departmental Representative for review and approval.

1.8 EXTENT OF CX

- .1 Commissioning and training for systems and equipment listed below to be verified as part of the Cx process. Final systems and equipment list will be provided in the final Cx plan.
- .2 Systems and equipment to be commissioned includes, but is not limited to:
 - .1 Electrical systems and equipment:
 - .1 Low voltage below 750 V:
 - .1 Holland Building new main service entrance board.
 - .2 Holland Building retrofitted service entrance board.
 - .3 Murray Building retrofitted service entrance board.
 - .4 Murray Building transformers.

1.9 DELIVERABLES RELATING TO O&M PERSPECTIVES

- .1 General requirements:
 - .1 Compile English documentation.
 - .2 Documentation to be computer-compatible format ready for inputting for data management.
- .2 Provide deliverables:
 - .1 Warranties.
 - .2 Project record documentation.
 - .3 Inventory of spare parts, special tools and maintenance materials.
 - .4 Maintenance Management System (MMS) identification system used.
 - .5 WHMIS information.
 - .6 WHMIS Safety Data Sheets (SDS).

1.10 DELIVERABLES RELATING TO THE CX PROCESS

- .1 General:
 - .1 Start-up, testing and Cx requirements, conditions for acceptance and specifications form part of relevant technical sections of these specifications.
- .2 Definitions:
 - .1 Cx as used in this section includes:
 - .1 Cx of components, equipment, systems, subsystems, and integrated systems.
 - .2 Factory inspections and performance verification tests.
- .3 Deliverables:
 - .1 Cx Specifications.
 - .2 Startup, pre-Cx activities and documentation for systems, and equipment.
 - .3 Completed installation checklists (ICL).
 - .4 Completed product information (PI) report forms.
 - .5 Completed performance verification (PV) report forms.

- .6 Results of Performance Verification Tests and Inspections.
 - .7 Description of Cx activities and documentation.
 - .8 Description of Cx of integrated systems and documentation.
 - .9 Tests witnessed by CxA.
 - .10 Tests performed by the Departmental Representative.
 - .11 Training plans.
 - .12 Cx Reports.
 - .13 Prescribed activities during warranty period.
 - .4 CxA to witness and certify tests and reports of results provided to the Departmental Representative.
- 1.11 PRE-CX ACTIVITIES AND RELATED DOCUMENTATION
- .1 Items listed in this Cx Plan include the following:
 - .1 Pre-Start-Up inspections: by the Departmental Representative prior to permission to start up and rectification of deficiencies to the Departmental Representative's satisfaction.
 - .2 Include completed documentation with Cx report.
 - .3 Conduct pre-start-up tests: conduct pressure, static, flushing, cleaning, and "bumping" during construction as specified in technical sections. To be witnessed and certified by Cx Team.
 - .4 CxA to monitor some of these inspections and tests.
 - .5 Include completed documentation in Cx report.
- 1.12 START-UP
- .1 Start up components, equipment and systems.
 - .2 Equipment manufacturer, supplier, installing specialist sub-contractor, as appropriate, to start-up, under Contractor's direction, following equipment, systems:
 - .1 Electrical systems and components.
 - .2 Holland Building new main service entrance board.
 - .3 Holland Building retrofitted service entrance board.
 - .4 Murray Building retrofitted service entrance board.
 - .5 Murray Building transformers.
 - .3 CxA to monitor start-up activities.
 - .4 Rectify start-up deficiencies to satisfaction of CxA.
 - .5 Performance Verification (PV):
 - .1 Cx Team to participate in PV.
 - .2 Use procedures to suit project requirements. These tests will include, but will not be limited to;
 - .1 Automatic transfer upon loss of Utility power.

- .2 Automatic retransfer upon restoration of Utility power.
- .3 Generator shutdown and power system retransfer to normal on restoration of Utility power.
- .4 Verification of operation of all electrical components installed by the project.
- .3 Repeat when necessary until results are acceptable to CxA and the Departmental Representative.
- .4 Cx Team to witness and certify reported results using approved PI and PV forms.
- .5 CxA to approve completed PV reports and provide to the Departmental Representative.
- .6 Failure of randomly selected item shall result in rejection of PV report or report of system startup and testing.

1.13 CX ACTIVITIES AND RELATED DOCUMENTATION

- .1 Perform Cx using Cx Plan developed by the Contractor and Manufacturer and approved by the CxA and the Departmental Representative.
- .2 CxA to monitor Cx activities.
- .3 Upon satisfactory completion, prepare final Cx Report.
- .4 CxA to witness, certify reported results of Cx activities and forward to the Departmental Representative.
- .5 The Departmental Representative reserves right to verify a percentage of reported results at no cost to contract.

1.14 CX OF INTEGRATED SYSTEMS AND RELATED DOCUMENTATION

- .1 Cx to be performed by specified Cx specialist, using procedures developed by Cx Team and approved by CxA.
- .2 Tests to be witnessed by CxA and documented on approved report forms.
- .3 Upon satisfactory completion, Cx specialist to prepare Cx Report, to be certified by CxA and submitted to the Departmental Representative for review.
- .4 The Departmental Representative reserves right to verify percentage of reported results.
- .5 Identification:
 - .1 In later stages of Cx, before hand-over and acceptance, Contractor and Cx Manager to cooperate to complete inventory data sheets and provide assistance in full implementation of MMS identification system of components, equipment, sub-systems, systems.

1.15 INSTALLATION/START-UP CHECK LISTS (ICLs)

- .1 Commissioning forms and checklists to be developed by the Manufacturer and commonly used in their operation.

1.16 DELIVERABLES RELATING TO ADMINISTRATION OF CX

.1 General:

- .1 Because of risk assessment, complete Cx of occupancy, weather and seasonal-sensitive equipment and systems in these areas before building is occupied.

1.17 CX SCHEDULES

- .1 Prepare detailed Cx Schedule and submit to CxA and Departmental Representative for review and approval at same time as project Construction Schedule. Include:

- .1 Milestones, testing, documentation, training and Cx activities of components, equipment, subsystems, systems and integrated systems, including:
 - .1 Design criteria, design intents.
 - .2 Pre-TAB review: 28 days after contract award, and before construction starts.
 - .3 Contractor's CxA credentials: 60 days before start of Cx.
 - .4 Cx procedures: 3 months after award of contract.
 - .5 Notification of intention to start TAB: 21 days before start of TAB.
 - .6 TAB: after successful start-up, correction of deficiencies and verification of normal and safe operation.
 - .7 Notification of intention to start Cx: 14 days before start of Cx.
 - .8 Notification of intention to start Cx of integrated systems: after Cx of related systems is completed 14 days before start of integrated system Cx.
 - .9 Identification of deferred Cx.
 - .10 Implementation of training plans.
 - .11 Cx reports: immediately upon successful completion of Cx.
- .2 Detailed training schedule to demonstrate no conflicts with testing, completion of project and hand-over to the Departmental Representative.

- .2 After approval, incorporate Cx Schedule into Construction Schedule.

- .3 CxA will monitor progress of Cx against this schedule.

1.18 CX REPORTS

- .1 Submit reports of tests, witnessed and certified by Cx Team to CxA who will verify reported results.
- .2 Include completed and certified PV reports in properly formatted Cx Reports.
- .3 Before reports are accepted, reported results to be subject to verification by CxA and the Departmental Representative.

1.19 ACTIVITIES DURING WARRANTY PERIOD

- .1 Cx activities must be completed before issuance of Interim Certificate, it is anticipated that certain Cx activities may be necessary during Warranty Period, including:
 - .1 Fine tuning of HVAC systems.
 - .2 Adjustment of ventilation rates to promote good indoor air quality and reduce deleterious effects of VOCs generated by off-gassing from construction materials and furnishings.

1.20 FINAL SETTINGS

- .1 Upon completion of Cx to satisfaction of CxA and the Departmental Representative, lock control devices in their final positions, indelibly mark settings and include in Cx Reports.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 91 13 – General Commissioning (Cx) Requirements.
- .2 Section 01 91 31 – Commissioning (Cx) Plan.
- .3 Section 01 91 41 – Commissioning Training.

1.2 SUMMARY

- .1 Section Includes:
 - .1 Commissioning forms to be completed for equipment, systems and integrated systems.
- .2 Acronyms:
 - .1 BMM – Building Management Manual.
 - .2 Cx – Commissioning.
 - .3 CxA – Commissioning Agent / Authority.
 - .4 ICLs – Installation / Start-Up Check Lists.
 - .5 PI – Product Information.
 - .6 PV – Performance Verification.

1.3 INSTALLATION/START-UP CHECK LISTS (ICLs)

- .1 Include the following data:
 - .1 Product manufacturer's installation instructions and recommended checks.
 - .2 Special procedures as specified in relevant technical sections.
 - .3 Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.
- .2 Equipment manufacturer's installation/start-up check lists are acceptable for use. As deemed necessary by Departmental Representative and CxA, supplemental installation/start-up check lists will be required for specific project conditions.
- .3 Use ICLs for equipment installation. Document check list verifying checks have been made, indicate deficiencies and corrective action taken.
- .4 Installer to sign ICLs upon completion, certifying stated checks and inspections have been performed. Return completed check lists to Departmental Representative and CxA. Check lists will be required during Commissioning and will be included in Building Maintenance Manual (BMM) at completion of project.
- .5 Use of ICLs will not be considered part of commissioning process but will be stringently used for equipment pre-start and start-up procedures.

1.4 PRODUCT INFORMATION (PI) FORMS

- .1 Product Information (PI) forms compiles gathered data on items of equipment produced by equipment manufacturer, including nameplate information, parts list, operating instructions, maintenance guidelines and pertinent technical data and recommended checks that is necessary to prepare for start-up and functional testing and used during operation and maintenance of equipment. This documentation is to be included in the BMM at completion of work.
- .2 Prior to Performance Verification (PV) of systems, complete items on PI forms related to systems and obtain Departmental Representative and CxA's approval.

1.5 PERFORMANCE VERIFICATION (PV) FORMS

- .1 PV forms to be used for checks, running dynamic tests and adjustments carried out on equipment and systems to ensure correct operation, efficiently and function independently and interactively with other systems as intended with project requirements.
- .2 PV report forms include those developed by Contractor, records, measured data and readings taken during functional testing and Performance Verification procedures.
- .3 Prior to PV of integrated system, complete PV forms of related systems and obtain CxA and Departmental Representative's approval.

1.6 SAMPLES OF COMMISSIONING FORMS

- .1 CxA will develop and provide to Contractor required project-specific Commissioning forms in hard copy or electronic format complete with specification data.
- .2 Revise items on Commissioning forms to suit project requirements.
- .3 Samples of Commissioning forms will be provided prior to commencement of commissioning.

1.7 CHANGES AND DEVELOPMENT OF NEW REPORT FORMS

- .1 When additional forms are required, but are not available from CxA, develop appropriate verification forms and submit to Departmental Representative and CxA for approval prior to use.
 - .1 Additional commissioning forms to be in same format as provided by CxA.

1.8 COMMISSIONING FORMS

- .1 Use Commissioning forms to verify installation and record performance when starting equipment and systems.
- .2 Strategy for Use:
 - .1 CxA provides Contractor project-specific Commissioning forms with Specification data included.
 - .2 Contractor will provide required shop drawings information and verify correct installation and operation of items indicated on these forms.
 - .3 Confirm operation as per design criteria and intent.
 - .4 Identify variances between design and operation and reasons for variances.
 - .5 Verify operation in specified normal and emergency modes and under specified load conditions.
 - .6 Record analytical and substantiating data.
 - .7 Verify reported results.
 - .8 Form to bear signatures of recording technician and reviewed and signed off by CxA.
 - .9 Submit immediately after tests are performed.
 - .10 Reported results in true measured SI unit values.
 - .11 Provide Departmental Representative and CxA with originals of completed forms.
 - .12 Maintain copy on site during start-up, testing and commissioning period.
 - .13 Forms to be both hard copy and electronic format with typed written results in Building Management Manual in accordance with Division 01 – General Requirements.

1.9 LANGUAGE

- .1 To suit the language profile of the awarded contract.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 91 13 – General Commissioning (Cx) Requirements.
- .2 Section 01 91 31 – Commissioning (Cx) Plan.
- .3 Section 01 91 33 – Commissioning Forms.

1.2 SUMMARY

- .1 Section Includes:
 - .1 This Section specifies roles and responsibilities of Commissioning Training.
- .2 Acronyms:
 - .1 Cx – Commissioning.
 - .2 CxA – Commissioning Agent / Authority.
 - .3 O&M – Operation and Maintenance.
 - .4 PV – Performance Verification.
 - .5 TAB – Testing, Adjusting and Balancing.

1.3 TRAINEES

- .1 Trainees: personnel selected for operating and maintaining the facility. May include Property or Facility Manager, building operators, maintenance staff, security staff, and technical specialists as required.
- .2 Trainees will be available for training during later stages of construction for purposes of familiarization with systems.
- .3 Trainees may participate in PV testing as part of training activities.

1.4 INSTRUCTORS

- .1 Instructors to provide instruction in either English and/or French as required.
- .2 Departmental Representative will provide:
 - .1 Descriptions of systems.
 - .2 Instruction on design philosophy, design criteria, and design intent.
- .3 Contractor and certified factory-trained manufacturers' personnel: to provide instruction on the following:
 - .1 Start-Up, operation, shut-down of equipment, components and systems.
 - .2 Control features, reasons for, results of, implications on associated systems of, adjustment of set points of control and safety devices.

- .3 Instructions on servicing, maintenance and adjustment of systems, equipment and components.
 - .4 Contractor and equipment manufacturer to provide instruction on:
 - .1 Start-up, operation, maintenance and shut-down of equipment they have certified installation, started up and carried out PV tests.
- 1.5 TRAINING OBJECTIVES
 - .1 Training to be detailed and duration to ensure:
 - .1 Safe, reliable, cost-effective, energy-efficient operation of systems in normal and emergency modes under all conditions.
 - .2 Effective on-going inspection, measurements of system performance.
 - .3 Proper preventive maintenance, diagnosis and trouble-shooting.
 - .4 Ability to update documentation.
 - .5 Ability to operate equipment and systems under emergency conditions until appropriate qualified assistance arrives.
- 1.6 TRAINING MATERIALS
 - .1 Instructors to be responsible for content and quality.
 - .2 Training materials to be provided in English and/or French as required.
 - .3 Training materials to include:
 - .1 "As-Built" Contract Documents.
 - .2 Operating Manuals.
 - .3 Maintenance Manual.
 - .4 TAB and PV Reports.
 - .4 Departmental Representative and CxA reserve the right to review and approve the training materials.
 - .5 Training materials to be in a format that permits future training procedures to same degree of detail.
 - .6 Provide sufficient handouts for all Trainees.
 - .7 Supplement training materials:
 - .1 Multimedia presentations.
 - .2 Manufacturer's training videos.
 - .3 Equipment models.
- 1.7 SCHEDULING
 - .1 Include in Commissioning Schedule time for training.
 - .2 Deliver training during regular working hours, training sessions to be 4 hours in length. Schedule sufficient sessions to cover all topics, for all trainees.

- .3 Training to be completed prior to acceptance of facility.

1.8 RESPONSIBILITIES

- .1 Be responsible for:
 - .1 Implementation of training activities.
 - .2 Coordination among instructors.
 - .3 Quality of training, training materials.
- .2 Provide:
 - .1 Qualifications of instructors.
 - .2 Written agenda for the training session(s).
 - .3 Training manuals, tools, O&M manuals and training handouts.
- .3 Departmental Representative and CxA reserve the right to evaluate training and training materials.
- .4 Upon completion of training, provide written report, signed by Instructors, witnessed by Departmental Representative and/or CxA outlining:
 - .1 Time, date and location.
 - .2 Name of instructor(s).
 - .3 Topics of training.
 - .4 List of trainees.

1.9 TRAINING CONTENT

- .1 Training to include demonstrations by Instructors using the installed equipment and systems.
- .2 Content to include:
 - .1 Review of facility and occupancy profile.
 - .2 Functional requirements.
 - .3 System philosophy, limitations of systems and emergency procedures.
 - .4 Review of system layout, equipment, components and controls.
 - .5 Equipment and system start-up, operation, monitoring, servicing, maintenance and shut-down procedures.
 - .6 System operating sequences, including step-by-step directions for starting up, shut-down, operation of valves, dampers, switches, adjustment of control settings and emergency procedures.
 - .7 Maintenance and servicing.
 - .8 Trouble-shooting diagnosis.
 - .9 Inter-Action among systems during integrated operation.
 - .10 Discussion of relative health and safety issues.
 - .11 Review of O&M materials and spare parts.
 - .12 Review of O&M documentation.

- .13 Warranty and guarantee information.
 - .3 Provide specialized training as specified in relevant Technical Sections of the construction specifications.
- 1.10 VIDEO-BASED TRAINING
 - .1 Manufacturer's video recordings to be used as training tool with Departmental Representative and CxA's review and written approval 3 months prior to commencement of scheduled training.
 - .2 On-Site training videos:
 - .1 Video record training sessions for use during future training.
 - .2 To be performed after systems are fully commissioned.
 - .3 Organize into several short modules to permit incorporation of changes.
 - .3 Production methods to be professional quality.
- Part 2 Products
 - 2.1 NOT USED
- Part 3 Execution
 - 3.1 NOT USED

END OF SECTION